A Simulation Center for continuous professional development in Vietnam- A 21st Century skill approach for patient safety and quality of care

Charles A Gullo[2], Nga T T Vu[3]

Corresponding author: Dr Charles Gullo immune01@gmail.com
Institution: 2. VinUniversity Health Sciences Project, 3. Vinmec Medical Simulation Center
Categories: Educational Strategies, Teachers/Trainers (including Faculty Development), Technology

Received: 29/05/2018
Published: 08/06/2018

Abstract

Vietnam is a rapidly expanding country with increasing demands for quality healthcare and although it ranks well for developing countries in this area, it still requires significant improvements in its workplace-based clinical training environment. In order to address deficits in both nursing and physician training, the Vinmec private healthcare system recently established a work placed-based simulation center in association with its flagship, JCI accredited hospital in Hanoi. The center has initially focused on advanced life support, communication, invasive and non-invasive diagnostic skills and nursing skills training in partnership with MSR, an Israeli-based medical simulation center. The center has trained simulated patients, future trainers and physicians and nurses and has clocked over 1292 man hours with its various simulators. The center in now poised to further expand its train the trainers program, provide undergraduate training for nursing and medical students and continue to expand its workplace based training to healthcare professionals. It is hoped that this center will set an example for others in the region and will contribute greatly to the professional development of medical trainees, nurses and doctors in Vietnam.

Keywords: Simulation center, Nursing Skills, Standardized Patients, Work-place based education

Background

Overview of the healthcare system in Vietnam

Vietnam is a middle-income country, located in South East Asia (SEA) and has a population of 91,713 million people as of 2015. Vietnam has been regarded as a middle-income country since 2015 when its average GDP per capital reached $US 2,000. Vietnam has a health care system that is controlled at the central level by the Ministry of Health and at the community level by the municipal health authorities. By the end of 2016, Vietnam has a total of
13,591 health facilities, 77,500 doctors, 57,200 doctors’ assistants and 106,700 nurses spread across the country, according to Vietnam General Administration of Statistics\(^{(ii)}\). Compared to other countries with similar socio-economic conditions, Vietnam has much better health indicators, i.e. longer life expectancy with the median age of 75 in 2015. However, the improvement in income and quality of life throughout the country is uneven and there is a concomitant need for higher quality healthcare services in Vietnam (Duc Cuong Le, 2010) in all areas.

**Healthcare workforce education and training**

To train the health workforce for the future healthcare industry, Vietnam has eight state-funded Medical Schools of which the oldest dates back to more than 115 years (Gonzales, 1996). In these medical schools, undergraduate and postgraduate programs usually exist for both medicine and nursing. There are also a number of private medical and nursing schools where undergraduate trainings is delivered. All medical and nursing training programs are centralized and managed by the Ministry of Education and Training (MOET) and the Ministry of Health (MOH). However, for a long time, the quality of medical and nursing training in Vietnam has faced several shortcomings such as out-of-date training programs and lack of practicum training for both medical and nursing students, as well as, novice health care providers performing much of the clinical education at the various health facilities (Duc Cuong Le, 2010). Vietnam is currently significantly lacking in both quality and quantity in the healthcare workforce (Duc Cuong Le, 2010; Takashima, Wada, Tra, & Smith, 2017; Vietnam Ministry of Health and Health Partnership Group, 2016).

To supplement the quality of health care services provision in Vietnam, there is a system of technical support and on-site training for practicing physicians at public hospitals, led by the central hospitals (Takashima et al., 2017). Nonetheless, the quality of healthcare provision is still suboptimal. A 2015 published study conducted in 2 public hospitals revealed a relative high rate of medical errors, particularly medication errors of nearly 40% (Nguyen, Nguyen, van den Heuvel, Haaijer-Ruskamp, & Taxis, 2015). Another study reported a fairly high rate of medication errors at approximately 70% in intensive care and post-surgical units at a large public hospital (Nguyen et al., 2014).

**Simulation and state of the art of simulation training in healthcare in Vietnam**

Simulation training is used widely in medical and nursing training and assessment (Issenberg, McGaghie, Petrusa, Lee Gordon, & Scalese, 2005). Literature comparing simulation training with other training modalities has demonstrated that simulation training yields greater training outcomes in: i) improving knowledge and skills and shortening intervention time for intensive care practicing physicians (Ilgen, Sherbino, & Cook, 2013); and has been shown to be particularly helpful with airway management skills (Kennedy, Cannon, Warner, & Cook, 2014) cardiac arrest resuscitation (Mundell, Kennedy, Szostek, & Cook, 2013) and endotracheal tube placement (Kennedy, Maldonado, & Cook, 2013); ii) shortening time and improving surgical skills for novice laparoscopic surgeons (Nagendran, Gurusamy, Aggarwal, Loizidou, & Davidson, 2013); iii) enhancing breast and pelvic examination skills (Dilaveri, Szostek, Wang, & Cook, 2013); iv) improving care and treatment services (Zendejas, Brydges, Wang, & Cook, 2013) and iv) a new and important training methodology for cardiovascular interventions (Trehan, Kemp, & Yang, 2014).

To the authors’ best knowledge, there are pre-clinical teaching labs at almost every medical and nursing school in Vietnam. These facilities often equipped with basic nursing manikins and provide basic skills training primarily for both medical and nursing students. Concurrently, there are few more advanced simulation units located in some central public hospitals in Vietnam. However, there is little known about the operation and outcomes of these facilities.

**Vinmec and its simulation center for continuous professional development**
In 2016, Ministry of Health issued a Plan for People’s Health protection, care and improvement for the period from 2016-2020, in which there are six priority areas, including the reform and improvement of healthcare delivery (Vietnam Ministry of Health and Health Partnership Group, 2017). The Government is also committed to the expansion of international cooperation and private involvement in health care services development in the country (Vietnam Ministry of Health and Health Partnership Group, 2017).

Thus, in 2012, Vingroup Corporation JSC. (Vingroup), one of Vietnam’s leading private corporations, opened its Vinmec Health Care System which aims to provide first-class health care services, the first of which was built in Hanoi. By 2018, the Vinmec has extended its operation into 6 regions of the country, with hospitals located in all the large urban areas of Vietnam. It is expected that by 2020, the private hospital system will open 4 additional hospitals. Meanwhile, recognizing the need for more quality health care workforce for Vietnam, Vingroup has recently signed a strategic partnership agreement with an international university system which will provide assistance with the development of a new medical, nursing, and residency program in Hanoi, under the VinUniversity Project.

Similar to other public hospitals, Vinmec hospitals are experiencing a severe shortage of highly qualified healthcare personnel, creating a significant challenge to their goal of providing first-class and internationally recognized health care services. Largely to address these concerns, Vingroup and Vinmec developed a Medical Simulation Center to provide continuous professional development for their healthcare staff. The ultimate goal of the Center is to assure patient safety and standardized quality of care delivered in all its hospitals. Additionally, the Center is expected to pave a ground for the development of a more holistic and comprehensive Medical Simulation Center for medical and nursing training programs of the Faculty of Health Sciences, VinUniversity in the very near future.

[i] General Statistics Office of Vietnam

[ii] General Statistics Office of Vietnam

Methods

Vinmec Medical Simulation Center (VMSC) was officially established in July, 2017 and is located next to Vinmec Hospital in Hanoi, Vietnam. To ensure the facility’s training programs are in-line with current practices in other simulation centers in high-income countries, Vinmec signed a Strategic Partnership Contract with the Israel Center for Medical Simulation (MSR) for technical assistant and support for its VMSC. MSR’s scope of work with VMSC includes transferring its simulation-based training models and training clinical instructors for VMSC’s training courses. For now, simulation trainings at VMSC can be classified into four main domains:

1. American Heart Association (AHA) certified courses
2. Invasive and non-invasive diagnosis and treatment practicing, using high-fidelity simulators with virtual reality technology
3. Nursing process-based skill training program
4. Communication skills training

American Heart Association (AHA) certified courses

Recognizing the importance of primary identification and intervention of cardiac arrest conditions in reducing related mortality and morbidity, Vinmec and the VMSC have spent great efforts to set up an AHA-certified International Training Center (ITC) in Vietnam. VMSC is working closely with MSR to organize an AHA-certified
Instructor courses for basic life support course (BLS), advanced life support course (ACLS), pediatric advanced life support course (PALS) and a Heart®Saver course. In 2018, there has already been an ACLS Instructor course, yielding a cadre of 14 ACLS instructors who attended the course and successfully passed all the skills and written tests. Candidates for ACLS instructors were carefully chosen from experienced practicing physicians and nurses with teaching capability, working at either emergency rooms or ICUs of Vinmec Hospitals. In addition, after over two months of preparation and application to become an AHA certified ITC within Vietnam, VMSC had officially signed an agreement with the AHA in May, 2018.

**Enhancing invasive and non-invasive diagnosis and intervention, using high fidelity simulator**

VMSC has purchased a series of Simbionix’s (3D Systems, Littleton, CO USA) simulators that use virtual reality technology with the most updated teaching and practice modules in 2017, including a LAP mentor for practicing laparoscopic surgeries, an ultrasound mentor for practicing ultrasound diagnosis, a GI and Bronchi mentor for practicing gastro-intestinal and bronchial endoscopy diagnosis and interventions and lastly an ANGIO mentor for cardiovascular interventions.

The principles of using Simbionix simulators is based on a set of essential elements for an effective high-fidelity simulator training from a systematic review of more than 109 published articles from 1969 to 2003 on practicum training with high-fidelity simulators (Issenberg et al., 2005). Practicing clinical skills with high-fidelity simulators has been proven to prepare healthcare workers to better respond to emergency cases, improve patient safety and the quality of care and treatment for patients, as well as, enhance communication skills of health staff (Kothari, Shah, & Barach, 2017). The criteria for inclusion in these SIM sessions include: a) debriefing upon completion of the practicum; b) objective-based and repeated practicing course; c) an integrated curriculum; d) practicing with increasing level of difficulty; e) applying multiple learning strategies; f) including a variety of clinical cases; g) learning in a controlled environment where errors and correction are allowed; h) individualized training program and i) available on-site simulators. The majority of these elements were proven to be effective in a systematic review published in 2015 (Kothari et al., 2017). Additionally, in-hospital settings and using high-fidelity simulators also assists with assessment of clinical skills (Cook et al., 2013).

**Nursing skill stations**

As with AHA courses, MSR assisted VMSC with the nursing skill instructor course. The nursing skill stations were developed based on the adaptation of MSR simulation training model for nursing skills and nursing process in which there are four stages that a practicing nurse should go through. These include evaluation, planning, implementation and assessment. Training materials were developed in reference to a book by Pamela Lynn entitled "Taylor's Clinical Nursing Skills. A nursing process approach." (Pamela Lynn, 2011). The training stations were also developed based on several learning theories, including adult learning theory, task-based learning strategy, experiential learning and motivational learning theories (Pasquale, 2013). For each nursing station, a complete set of training materials which includes its specific objectives, prior required knowledge and skills, a teaching plan, procedure instruction, list of required equipment, medications and consumables and procedure checklists were developed. The station begins with a brief ice breaking where instructors and trainees get to know each other and training objectives and learning rules are introduced. In addition, trainees also have the opportunity to briefly explore functions of the manikins they will work with. The station continues with instructors’ demonstration of the learning skills while trainees are required to carefully observe the procedure. Following demonstration, each trainee practices the whole procedure with support from instructor if needed. At the end of each station, there is a debrief where trainees reflect their learning experience during the station, an analysis of the practiced skills is summarized by the instructors and take-home points are provided. Nursing skill stations are based on the principle of creating a safe learning environment for
Communication skill training

The communication skill training was designed based on identified physicians and nurses' communication gaps. This training program is fashioned after a scenario-based practice with standardized patients (SP) and is based on the analysis of Vinmec patient’s complaints, particularly those that related to communication and attitude. The training was designed by MSR with a physician or nurse encounters using a video-taped scenario with SPs. Practitioners receives feedback from SPs and then participate in the post-scenario debriefing with other trainees, using the taped video of their encounter. The debriefing provides participants with their strength and areas that need improvement based on a relevant communication model. It is important to note that SP were recruited and trained here in Hanoi with the assistance of MSR (see below for more information).

Results

Infrastructure and equipment

The 860 square meter VMSC facility is physically located in next to the Vinmec Hospital in Hanoi. The facility contains six multifunctional simulation training rooms which can be set up to accommodate different types of trainings and assessments, including objective structured clinical examination (OSCE). Each training room is installed with a one-way mirror, allowing for observation from the adjoining control room and equipped with a camera system which can facilitating real-time observation from the debriefing room and video extraction for end-of-training discussion. There are also two simulated emergency training rooms which can be converted into an ICU or Operation Theater with two accompanying debriefing rooms.

The Center is equipped with four basic, low-fidelity manikins for basic nursing skills trainings, a set of AHA-required ACLS manikins which include a computerized high-fidelity ACLS manikin with defibrillation capability, two manikins for basic life support and two manikins for basic airway management. The center also has a task trainer for practicing advanced airway management, a task trainer for central catheter placement and four Simbionix, high-fidelity simulators. To extend its training scope, VMSC will purchase another ACLS high-fidelity manikin and a set of manikins for new nursing skill practice.

Adult Advanced Life Support Course

After the ACLS Instructor course in February 2018, two courses have already been organized, resulting in 23 physicians and nurses having successfully completed the ACLS Provider course and receiving AHA certificates. All courses follow teaching requirements of AHA and use AHA training materials. In 2018 alone, VMSC plans to organize at least 14 ACLS courses, providing ACLS training to at least 168 health care providers across all Vinmec Hospitals.

Training by Simbionix simulators

Training using Simbionix simulators are individualized such that each session is based on experience, gaps of knowledge and skill, and career goal of each physician. Each physician has a separate learning plan and is he/she is required to practice with the simulator for at least one weekly section of 2 to 3 hours. Novice physicians are particularly interested in practicing their diagnosis and intervention skills with Simbionix simulators and highly appreciate its usefulness in improving their clinical skills. Since these simulators have been put into operation,
roughly 13 practicing physicians and nurses have trained using Simbionix's simulators.

**Nursing skill training**

The first training for instructors was facilitated by MSR in August, 2017. Eleven instructors successfully completed the course with basic nursing stations in intramuscular and subcutaneous injections, intravenous placements, urine catheter intubations and nasal gastric intubations. From these four nursing stations, VMSC has developed three new additional stations in blood transfusion, blood withdrawal and wound cleaning. In 2018, in collaboration with Vinmec Nursing Management Board, VMSC is developing 21 new nursing skill stations to meet the needs of clinical nursing training needs. To accommodate the training need from Vinmec Hospitals, VMSC conducted the second training for train the trainers in December, 2017. In sum, VMSC now has a cadre of 22 nursing instructors who are experienced practicing nurses at Vinmec Hospital in Hanoi. To date, there has been 593 nurses with approximately a total 1292 person hours being recorded as having received training at VMSC.

**Communication skill training**

In March, VMSC conducted a series of trainings for SPs, instructors and healthcare providers of Vinmec Hospital in Hanoi, facilitated by MSR. During a three-day training, professional actors were trained on acting in healthcare simulation sessions, communication models in medical encounters and feedback provision to health care providers. An initial group of five SPs successfully completed the course. This training was followed by a training for 11 instructors who are experienced, mid-career practicing physicians of Vinmec who have demonstrated as having good communication skills and facilitation skills. The training began with instructors being directly immersed into medical simulated scenarios with a SP, followed by practicum sessions on observation of simulation with SPs, preparing for the debrief and practicing debriefing, under the guidance and coaching from MSR trainers. All scenarios were video-taped and extracted for debriefing at the end of each simulation session. The first two communication training delivered by VMSC’s instructors have been organized, with planned training for 20 physicians and nurses soon. By the end of 2018, all physicians of Vinmec will be trained in communication skills.

**Discussion**

VMSC is likely one of the very first comprehensive medical simulation center for continuous professional development in the healthcare system of Vietnam. Given Vinmec’s aim to become the top private health system that provides the highest quality healthcare services and a lack of qualified physicians and nurses in Vietnam, VMSC may become an excellent learning environment for clinical skill and knowledge improvement for Vinmec practicing physicians and nurses. First, nursing skill stations are not only skill-based but actually an excellent integrated learning environment where trainees can practice the whole nursing process, improve their communication and improve their incident resolution skills. Second, VMSC proves that advanced training in life support can be done in a setting outside US while ensuring that international learning standards and requirements remain. Third, a new approach for teaching communication skills by utilizing simulation sessions with SPs who are trained actors that provide practicing physicians and nurses with an excellent opportunity to improve their communication skills, learn essential communication elements and receive valuable feedback.

Although a thorough evaluation of VMSC trainings in different domains is still needed, initial outcomes of VMSC trainings across its training domains indicate a well-accepted and appreciated learning method by both the leaders and healthcare staff of Vinmec. This is a result of a thoughtful approach to developing simulated trainings at VMSC, which includes a careful assessment of training needs from Vinmec, partnership with an international-recognized,
well-regarded simulation training center (MSR) and participatory consultation and collaboration with clinical practitioners at Vinmec. Additionally, a careful selection and well-designed training for simulation instructors, both for physician and nursing training are essential elements that has contributes to the initial success of VMSC. Furthermore, potential development and expansion of VMSC can be also be envisioned in the following areas: i) building a strong network of instructors who are veteran and experienced practitioners and nurses at Vinmec with real-life clinical experience and ii) building capacity for the increased need for resuscitation courses in Vietnam. As such, these trainings can provide useful guidance and support for trainees during and after their simulation courses. We have also been fortunate to have full support from Vingroup leadership via financial support from Vinmec for the strategic development of simulation training, especially for the procurement of necessary equipment and simulators that meet with international standards.

Nevertheless, VMSC faces several challenging which may prevent the center from achieving an even greater effective simulated trainings program. First, since its instructors are all practicing physicians and nurses of Vinmec with little teaching background, continuous support and coaching for teaching methodologies are extremely important in maintaining quality trainings (more faculty and staff development is needed within the hospital system itself). Second, the Simbionix simulators are proven to attract novice physicians primarily. Thus, a policy with appropriate incentives, that encourages using these simulators for clinical skills improvement for more seasoned physicians should be in place for greater usage of the simulators. Third, since simulation training in health care is still fairly new in Vietnam, networking with likewise organizations in high-income countries, participating in international medical education or simulation in healthcare conferences is needed to remain updated and relevant with new development for the application of simulation in healthcare training and education. All of these issues are not insurmountable, but continuous improvements and evaluations are needed to ensure they are not neglected. Finally, VMSC is expected to develop to a more comprehensive simulation training center for undergraduate and postgraduate training program of VinUniversity, and learning from other Universities with active simulation programs for teaching medical and nursing students and networking with these higher education centers is a crucial factor for VMSCs future success. It is hoped that the use of simulation in the future undergraduate education at VinUniversity synergizes and strengthens the current use of simulation in clinical workplace training.

Take Home Messages

- Vietnam is a rapidly growing country with increasing expectations and needs for quality healthcare
- A comprehensive work-placed based simulation center has been established in Hanoi to help meets unmet needs
- Standardized Patients, trainers, Medical Doctors and Nurses have been successfully put through simulation training in the first year of operation
- The new simulation center focuses on communication skills, advanced life support, diagnostic skills and nursing skills
- Undergraduate nursing and medical school training using simulation is the next step for this center

Notes On Contributors

Dr. Gullo is the director for pre-clinical education for the VinUniversity Health Sciences project which includes a future nursing and medical school, as well as, residency program.

Dr. Nga is the simulation educationalist for the Vinmec Medical Simulation Center in Hanoi, Vietnam.
Acknowledgements

We would like to extend our deepest gratitude to MSR who we have contracted to assist us with this ambitious project. We would also like to thank Mr. Viet the COO of this center, Dr. Linh our director of Health Sciences education, and the entire simulation team, for without their efforts this endeavor would have not been possible.

Bibliography/References

Cook, D. A., Hamstra, S. J., Brydges, R., Zendejas, B., Szostek, J. H., Wang, A. T., . . . Hatala, R. (2013). Comparative effectiveness of instructional design features in simulation-based education: systematic review and meta-analysis. Med Teach, 35(1), e867-898.

https://doi.org/10.3109/0142159X.2012.714886

Dilaveri, C. A., Szostek, J. H., Wang, A. T., & Cook, D. A. (2013). Simulation training for breast and pelvic physical examination: a systematic review and meta-analysis. Bjog, 120(10), 1171-1182.

https://doi.org/10.1111/1471-0528.12289

Duc Cuong Le, T. K., Yoshihira Fujino, (2010). Health Care System in Vietnam: Current Situation and Challenges. Asian Pacific Journal of Disease Management, 4(2), 23-30.

https://doi.org/10.7223/apjdm.4.23

Gonzales, J. (1996). [History of the birth and development of the Ecole de medecine de Hanoi]. Hist Sci Med, 30(1), 61-70.

Ilgen, J. S., Sherbino, J., & Cook, D. A. (2013). Technology-enhanced simulation in emergency medicine: a systematic review and meta-analysis. Acad Emerg Med, 20(2), 117-127.

https://doi.org/10.1111/acem.12076

Issenberg, S. B., McGaghie, W. C., Petrusa, E. R., Lee Gordon, D., & Scalese, R. J. (2005). Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Med Teach, 27(1), 10-28.

https://doi.org/10.1080/01421590500046924

Kennedy, C. C., Cannon, E. K., Warner, D. O., & Cook, D. A. (2014). Advanced airway management simulation training in medical education: a systematic review and meta-analysis. Crit Care Med, 42(1), 169-178.

https://doi.org/10.1097/CCM.0b013e31829a721f

Kennedy, C. C., Maldonado, F., & Cook, D. A. (2013). Simulation-based bronchoscopy training: systematic review and meta-analysis. Chest, 144(1), 183-192.

https://doi.org/10.1378/chest.12-1786
Kothari, L. G., Shah, K., & Barach, P. (2017). Simulation based medical education in graduate medical education training and assessment programs. Progress in Pediatric Cardiology, 44, 33-42.

https://doi.org/10.1016/j.ppedcard.2017.02.001

Mundell, W. C., Kennedy, C. C., Szostek, J. H., & Cook, D. A. (2013). Simulation technology for resuscitation training: a systematic review and meta-analysis. Resuscitation, 84(9), 1174-1183.

https://doi.org/10.1016/j.resuscitation.2013.04.016

Nagendran, M., Gurusamy, K. S., Aggarwal, R., Loizidou, M., & Davidson, B. R. (2013). Virtual reality training for surgical trainees in laparoscopic surgery. Cochrane Database Syst Rev(8), Cd006575.

https://doi.org/10.1002/14651858.CD006575.pub3

Nguyen, H. T., Nguyen, T. D., van den Heuvel, E. R., Haaijer-Ruskamp, F. M., & Taxis, K. (2015). Medication Errors in Vietnamese Hospitals: Prevalence, Potential Outcome and Associated Factors. PLoS One, 10(9), e0138284.

https://doi.org/10.1371/journal.pone.0138284

Nguyen, H. T., Pham, H. T., Vo, D. K., Nguyen, T. D., van den Heuvel, E. R., Haaijer-Ruskamp, F. M., & Taxis, K. (2014). The effect of a clinical pharmacist-led training programme on intravenous medication errors: a controlled before and after study. BMJ Qual Saf, 23(4), 319-324.

https://doi.org/10.1136/bmjqs-2013-002357

Pamela Lynn. (2011). Taylor's Clinical Nursing Skills. A nursing process approach (C. Brandon Ed. Third Edition ed.): Wolters Kluwer Health | Lippincott Williams & Wilkins.

Pasquale, S. J. (2013). Education and Learning Theory. In A. I. Levine, S. DeMaria, A. D. Schwartz, & Alan Sim (Eds.), the comprehensive textbook of healthcare simulation. New York Springer

https://doi.org/10.1007/978-1-4614-5993-4_3

Takashima, K., Wada, K., Tra, T. T., & Smith, D. R. (2017). A review of Vietnam's healthcare reform through the Direction of Healthcare Activities (DOHA). Environ Health Prev Med, 22(1), 74.

https://doi.org/10.1186/s12199-017-0682-z

Trehan, K., Kemp, C. D., & Yang, S. C. (2014). Simulation in cardiothoracic surgical training: where do we stand? J Thorac Cardiovasc Surg, 147(1), 18-24.e12.

https://doi.org/10.1016/j.jtcvs.2013.09.007

Vietnam Ministry of Health and Health Partnership Group. (2016). Joint Annual Health Review 2015. Strengthening primary health care at the grassroots towards universal health coverage.

Vietnam Ministry of Health and Health Partnership Group. (2017). Joint Annual Health Review 2016. Towards Healthy Aging in Vietnam.
Zendejas, B., Brydges, R., Wang, A. T., & Cook, D. A. (2013). Patient outcomes in simulation-based medical education: a systematic review. J Gen Intern Med, 28(8), 1078-1089.

https://doi.org/10.1007/s11606-012-2264-5

Appendices

Declarations

The author has declared that there are no conflicts of interest.

This has been published under Creative Commons "CC BY 4.0" (https://creativecommons.org/licenses/by-sa/4.0/)

AMEE MedEdPublish: rapid, post-publication, peer-reviewed papers on healthcare professions’ education. For more information please visit www.mededpublish.org or contact mededpublish@dundee.ac.uk.