

The emergence of simulation-based clinical training outside of the western world

Or

The Growing Trend of Simulation as a form of Clinical Education. A Global perspective

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Abstract

Simulation as a credible mode of advanced clinical education is becoming well established throughout Europe, North America, and Oceania however similar developments are becoming increasingly visible outside of these continents. Educational concepts using simulation are better understood when people see beyond the “tool” however technologically advanced it might be (Alinier, 2007a) and start to recognise the importance of the “technique” employed to use it (Gaba, 2004). Reported activities emerging from

Africa and predominately Asia is continuing to grow. From psychiatry OSCE training in Iran (Taghva et al. 2010), the use of virtual patient simulators in Japan (Taguchi and Ogawa, 2010), to using simulators to teach ACLS to paramedics in India (Delasobera et al. 2010), simulation as a form of clinical education is advancing globally. This paper aims to highlight the recent advancement of simulation globally through examples of workshops and research occurring outside of Europe, North America, and Oceania, and begin to highlight some of the current simulation education centre projects that are being planned across the globe. Categories of simulation within this paper refers to simulation education using standardised patients, patient simulators, mannequins, part-task trainers, computer-based simulation, and virtual reality simulators, primarily used for surgical skills training. This paper aims to give readers a glimpse into some of the projects and research that is occurring within simulation education outside of the western world.

Keywords

- **Patient Simulation**
- **Computer Simulation**
- **Clinical Education**
- **International perspective**
- **International Simulation Centres**

Background

With technological advances and a greater understanding of the educational benefits of healthcare professionals being immersed in real life experiences for educational purposes, simulation has grown into a popular modality of clinical training (Issenberg 2006).

Simulation has many roles to play in healthcare education, not only can it teach specific skills but it is also becoming imperative in patient safety training, interdisciplinary training, communication, team training, and crisis resource management (Smith and Cole 2009). These points have also been emphasised in one of the latest annual reports from the Chief Medical Officer for England (Donaldson, 2009) where the use of simulation at all levels is strongly recommended. As described by one of the recognised pioneers, “When Integrated appropriately into learning and competence testing, simulation plays an important role in acquiring the critical and reflective thinking skills needed to provide competent, safe patient care.” (Gaba 2004).

Many well established centres already exist across Europe, Australia, with the highest number of simulation centres being located in the United States (BMSC, 2011). Centres such as the Mayo Clinic Simulation Centre, Harvard, Hertfordshire, and Bristol are a very small sample of institutions that have been pioneers in developing simulation programmes, techniques, and simulation research across the disciplines (Alinier 2007b, Friedrich 2002, Gardner 2007, Malec et al. 2007). The continents they represent also lead the way in building a growing simulation community with societies and associations such as the Society for simulation in Healthcare (SSH, www.ssih.org), the Society in Europe for Simulation Applied to Medicine (SESAM, www.sesam-web.org), the Association for Simulated Practice in Healthcare (ASPiH, www.aspih.org.uk), and the Australian Society for Simulation in Healthcare (ASSH, www.assh.org.au).

Simulation education across frontiers

A number of simulation facilities, programmes, and research projects have recently emerged from or are taking place in Asia and Africa. In order to promote the development of simulation in other parts of the world, some of the aforementioned societies support the organisation of affiliated conferences in other continents such as the first Asia Pacific conference which took place in June 2011 Hong Kong, affiliated with SSH, and the second European/Latin-American meeting on Health Care Simulation and Patient Safety (ALASIC, www.alasic.net) in November 2011 in São Paulo, Brazil, affiliated with SESAM. In addition, other initiatives such as workshops or humanitarian projects supported by industry help simulation developments in many countries where simulation is not current practice due to a simple lack of awareness, or for cultural or economical reasons. Such examples are the “Helping Babies Breathe” project (Korioth 2010, www.helpingbabiesbreathe.org) which is also backed up by the World Health Organisation (WHO), the American Academy of Pediatrics and many other partners, and other courses run by experts in their field to update clinicians on the current best practice as illustrated for example in Figure 1 in the United Arab Emirates. Other activities include more realistic simulation workshops for educators such as the ones illustrated on Figures 2 and 3 involving the University of Hertfordshire, China, Mauritius, and Sri Lanka.

Although many of these activities have a limited short time effect, it is expected that they will empower some enthusiastic participants to become the local educational pioneers and implementers of the knowledge and ideas they will have acquired during the workshop. In

turn the simulation activities of these people will impact on others and more importantly improve training standards, hence eventually benefit patients in the region.



Figure 1: Skills workshop for Obstetricians and Midwives organised by one of the co-authors of this paper in Abu Dhabi, UAE (Photo used with the kind permission from the Baby Life Line Charity, UK).



Figure 2: Example of an industry supported course run in Mauritius for medical and nursing educators, and organised by one of the co-authors of this paper (Alinier et al. 2011).



Figure 3: Industry sponsored simulation facilitator workshop held in Hangzhou for representatives from medical and nursing schools in China.

The published evidence of the globalisation of simulation

A PubMed search using the MESH terms; Education, patient simulation or computer simulation, Africa or Caribbean region or Central America or Latin America or South America or Antarctic Regions or Arctic Regions or Asia or Indian Oceans was performed to retrieve relevant research articles published. The continents or regions of interest are shown in green on Figure 4.

143 articles were found using this search criterion, of which 26 were eliminated as not directly linked to simulation education or the research emerged from Europe, North and Central America, or Oceania. The Middle East has been separated from Asia in the results presented in Table 1 due to its unique economical context and the current expansion in healthcare simulation activities in this particular region.

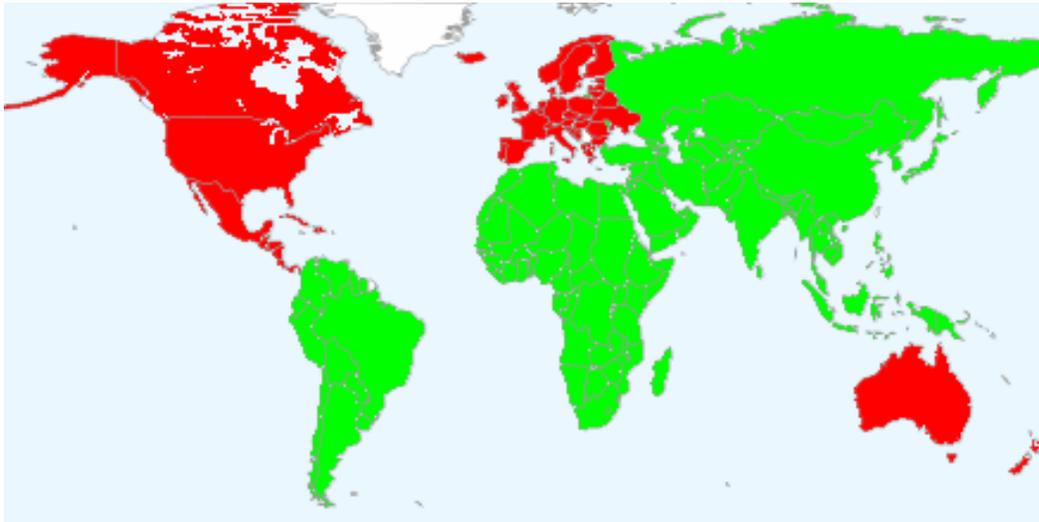


Figure 4: Map of the world showing the geographical regions included in the literature search in green (<http://www.aneke.com/map.php>).

Geographic Location	Africa	Asia	Middle East	South America	Other (Arctic)	Total
Number of articles found in PubMed	16	55	33	12	1	117
Percentage of articles from each location	14%	47%	28%	10%	1%	100%

Table 1: Results of the PubMed search by continent or geographical region of interest.

Reviewing the trends within the published research.

As reported in table 1, when excluding Europe, North and Central America, and Oceania, the majority of the published research at present appears to be emerging from Asia. This trend is clearly reflected in the number of centres that have opened in South East Asia in the recent years and been registered on the informal and worldwide database of simulation centres hosted by the Bristol Medical Simulation Centre website (Table 2, BMSC, 2011).

The reported projects from South East Asia use a mix of standardised patients, mannequin-based simulation, and computer-based or virtual reality simulators. Researchers from Japan, Korea, Malaysia, and China have published on the use of standardised patients as a mode of assessing clinical performance in their clinical education programmes (Myung et al. 2010, Taguchi and Ogawa 2010, Loh and Kwa 2009, Tai and Chung 2008), demonstrating that simulation developments are not necessarily driven by the adoption of technology, but rather by the adoption of a new educational modality underpinned by an emerging pedagogy (“andragogy”, in fact as we are talking of adult education) engaging learners to put safely in practice what they have learnt.

Name of Centre or Institution	Country
Anhui Shengli Hospital (Chinese Public Hospital)	China
Beihua University, Jilin Medical College	China

Aomori Prefectural Hospital	Japan
Seoul National University College of Nursing	Seoul
Buddhist Tzu Chi General Hospital	Taiwan
Chi-Mei Medical Center Taiwan	Taiwan
Busan Fire Department Central Headquarters	Korea
Universiti Malaysia Sabah	Malaysia
Ngee Ann Polytechnic	Singapore
SAAD Specialist Hospital	Saudi Arabia
Al-Zarqa Private University	Jordan
Arelano University Manila	Philippines
University of Kwazulu-Natal Inkosi Albert Luthuli Central Hospital	South Africa
University of Kwazulu-Natal Simulation Lab	South Africa
Hospital Israelita Albert Einstein	Brazil
University Diego Portales	Chile

Table 2: Examples of simulation centres that have opened since 2008 outside of Europe, North America and Oceania (www.bmsc.co.uk).

This part of the world is also active in terms of simulation related technological developments. For example, work from four related projects (the Visible Human Project, the Visible Korean, the Chinese Visible Human, and the Virtual Chinese Human (VCH)) resulted in serially sectioned images of whole cadavers becoming available worldwide and to be used for interactive computer or virtual simulation applications (Tang and Chung 2010). The

researchers encourage the use of the data from their four human cadavers into virtual reality surgical simulators with haptics capability.

Another region of the world which is currently experiencing a huge growth in building up its simulation-based training capacity with well funded projects is the Middle East. Many large scale simulation centres have recently opened or are in the planning or building phase in Oman, Saudi Arabia, United Arab Emirates, and Qatar. It is expected that all of them will adopt most simulation modalities and be fitted out with state-of-the-art simulation and audio/visual equipment. These centres are being setup because of the recognised need to expand their healthcare workforce and to keep clinical staff up to date with their practice. The clinical workforce expansion will usually involve recruiting staff from all over the world with a variety of skills and educational backgrounds. Simulation is one modality of learning that is now being recognised as an evaluation technique to skill-validate healthcare workers; hence these new simulation centres will play an important role in the recruitment and on-boarding of new clinical staff to meet patient safety goals. This is in line with the philosophy that simulation can be used to facilitate staff recruitment, improve safety, and foster changes in work procedures and systems (Gaba 2004).

In this particular context simulation will have an even more significant role as clinical staff, coming most probably from a wide range of cultural background, will need to adapt their practice to a different cultural environment while ensuring patient safety and patient-centred care at all times, and simulation will provide the most appropriate context for the

remodelling of clinical practice, to raise cultural awareness, and in some cases to up-skill to clinical staff recruited.

Some of these centres are linked to the opening of a new hospital and are hence in a unique position to fully integrate and use simulation to its maximum potential. The Sidra Medical and Research Centre due to open next year in Qatar (www.sidra.org) is one of these examples which has a unique opportunity to conduct research on the effectiveness of recruiting, on-boarding, and orientating new staff using a significant simulation component. It will involve skill validation and competency assessment through Objective Structured Clinical Examination (OSCE) and scenario-based simulation type sessions (Alinier 2003, Seropian 2003).

More established centres do exist in Saudi Arabia, Bahrain, and Israel. The Israel Centre for Medical Simulation (MSR), is a comprehensive, national, multimodality, multidisciplinary medical simulation centre dedicated to enhancing hands-on medical education, performance assessment, patient safety, and quality of care by improving clinical and communication skills (Ziv et al. 2006). This pioneering centre uses an "error-driven" educational approach, which recognizes that errors provide an opportunity to create a unique and beneficial learning experience (Ziv et al. 2005) whereby participants have the opportunity to temporarily "live through" the consequences of their errors in a safe environment and be guided in their reflection process during a post-simulation debriefing session. Allowing participants to make errors in the simulation environment is expected to

help them learn not to make the same errors in the clinical setting, and hence to enhance patient safety.

One third of the published research analysed however came out from less resource rich areas such as Africa and South America. Similarly to the majority of the work emerging from Asia, the projects within these continents also appeared to utilise standardised patients and part-task trainers to provide simulated modes of education to healthcare workers. Some of these projects are part of wider initiatives supported by the WHO and other professional bodies as in the earlier example of the “Helping Babies Breathe” programme. An innovative idea that is being used to provide education to birth attendants are a low-tech pregnancy simulation device called “Mama Natalie” (Figure 5) in combination with an inflatable baby called “Neo Natalie” which are commercialised by Laerdal Medical. This helps to address the high costs of purchasing sophisticated mannequins and associated maintenance but instead requires the use of an actor who plays the role of the pregnant woman. It creates a form of hybrid simulation experience whereby what can be considered a part-task trainer is used alongside a standardised patient as used, for example, in the assessment of communication skills during a simple clinical procedure such as suturing (Kneebone et al. 2002). “Mama Natalie” will be used to teach midwives in developing countries how to handle deliveries and emergency situations to increase the skills of the birth attendants in order to reduce maternal and infantile mortality and morbidity. This project has been put in place to help the WHO meet its goal of reducing child morbidity by two thirds from 1990 levels by 2015 (Korioth 2010). Data is presently being collected to monitor the effect of this training intervention in terms of clinical outcome (<http://www.laerdalglobalhealth.com> and

<http://savinglivesatbirth.net>). In addition to this a team of clinicians from the USA and Ghana striving to reduce maternal mortality has worked on the development of a low-cost simulator for bimanual compression training for the management of postpartum haemorrhage in the developing world (Perosky et al. 2011). They report that research is ongoing in this application.

The use of standardise patients has also been effective in developing education programs for healthcare workers and community health projects such as the management of sexually transmitted diseases in urban pharmacies in Gambia and evaluating client-provider interactions within clinical settings (Leiva et al. 2001, Huntington and Schuler 1993).

Another example that highlights the importance of simulation training in a resource restricted area is an educational programme in Botswana, Africa, organised by the Department of Surgery, Toronto Western Hospital, Canada (Okraimec et al. 2009). A total of 20 surgeons and trainees participated in a 3-day Fundamentals of Laparoscopic Surgery (FLS) course. This was the first time the FLS program was taught in Africa and it enabled the participants to significantly improve their FLS technical skills, however most of the local surgeons did not reach the FLS passing scores. From the outcome of this training intervention, we can conclude that more than 3 days may have been required to help surgeons perform at a satisfactory level to obtain FLS certification. From our perspective, this programme highlights the importance of such courses being customised to the learners and the local context to develop the clinicians' skills.



Figure 5: Example of a low-cost simulation device for hybrid simulation, the Laerdal Mama Natalie birthing trainer. Picture used with the kind permission from Laerdal Medical Norway.

These are examples of how even with limited resources; educational programmes can be delivered using various modalities of simulation. Numerous other educational activities using simulation must be occurring globally but without any research infrastructure hence limiting the chances of the work ever being published and shared with the simulation community for wider dissemination.

Conclusions

As many more simulation centres and education programmes are developing, more research will start to appear from outside the more developed simulation communities. The effect on patient outcome of enhanced education through simulation may be more visible outside of the western countries where no form of simulation was previously used. Educational projects aiming at reducing maternal and infantile mortality and morbidity are currently ongoing in several African, South American, and Asian countries. Collaborations across geographical frontiers through voluntary, sponsored, or humanitarian projects, regional conferences, workshops, and technological developments have a significant role to play in the development and use of simulation practice in parts of the world where it is not commonly used for training and education for cultural or economical reasons, or simply due to a lack of awareness of the learning opportunities offered by simulated practice. Some of the initiatives presented in this paper demonstrate that simulation training does not necessarily require the purchase of highly sophisticated and expensive equipment to run hands-on and highly beneficial training sessions. The development of clear and concise learning objectives along with the approach adopted by the educators play an important part in the learning experience. The resources required to achieve the intended learning

outcomes can often be kept to a minimum. Existing simulation programmes or courses sometimes need to be adapted to the local context to be run successfully or with the desired effect.

Key Points

- Simulation is growing internationally.
- Research projects driven by experts from established centres and using various modalities of simulation are being conducted in parts of the world where simulation activities were previously very scarce.
- Simulation related research outside of Europe, USA and Oceania mainly stems from Asia.
- Many new and large centres are under development especially in the Middle East.

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References

- Alinier G, Pem N, Rawat V. (2011). SimBaby and his dad Kelly on duty in Mauritius for an educational workshop! *Education through Simulation*, 13:12-15
- Alinier G. (2007a). A typology of educationally focused medical simulation tools. *Medical Teacher*, 29(8):e243-250
- Alinier G. (2007b). Enhancing trainees' learning experience through the opening of an advanced multiprofessional simulation training facility at the University of Hertfordshire. *British Journal of Anaesthetic and Recovery Nursing*, 8(2):22-27
- Alinier, G. (2003). Nursing students' and lecturers' perspectives of objective structured clinical examination incorporating simulation. *Nurse Education Today*, 23(6):419-426

- BMSC. (2011). Bristol Medical Simulation Centre Database. www.bmsc.co.uk. Accessed on June 12th 2011
- Delasobera BE, Goodwin TL, Strehlow M, Gilbert G, D'Souza P, Alok A, Raje P, Mahadevan SV. (2010). Evaluating the efficacy of simulators and multimedia for refreshing ACLS skills in India. *Resuscitation*, 81(2):217-23
- Donaldson L. (2009). 150 years of the annual report of the chief medical officer: On the state of public health 2008 (No. 293338). London.
- Friedrich MJ. (2002). Practice makes perfect: Risk-free medical training with patient simulators. *JAMA*, 288(22):2808-2812
- Gaba D. (2004). The future vision of simulation in Health care. *Quality and Safety in Healthcare*, 13:2-10.
- Gardner R. (2007). Simulation and simulator technology in obstetrics: past, present and future. *Expert Review of Obstetrics & Gynecology*, 2(6):775-790
- Huntington D, Schuler SR. (1993). The simulated client method: evaluating client-provider interactions in family planning clinics. *Stud Fam Plann*, 24(3):187-93
- Issenberg SB. (2006). The scope of simulation based healthcare education. *Simulation in Healthcare*, 1(4):203-8
- Kneebone R, Kidd J, Nestel D, Asvall S, Paraskeva P, Darzi A. (2002). "An innovative model for teaching and learning clinical procedures." *Medical Education*, 36(7):628-634
- Korioth T. (2010). "Helping Babies Breathe" New global program to boost newborn survival rates." *AAP News*, 31(8):1-2
- Leiva A, Shaw M, Paine K, Manneh K, McAdam K, Mayaud P. (2001). Management of sexually transmitted diseases in urban pharmacies in The Gambia. *Int J STD AIDS*, 12(7):444-452
- Loh KY, Kwa SK. (2009). An innovative method of teaching clinical therapeutics through role-play. *Medical Education*, 43(11):1101-2.
- Malec JF, Torsher LC, Dunn WF, Wiegmann DA, Arnold JJ, Brown DA, Phatak V. (2007). The Mayo High Performance Teamwork Scale: Reliability and Validity for Evaluating Key Crew Resource Management Skills. *Simulation in Healthcare*, 2(1):4-10
- Myung SJ, Kang SH, Kim YS, Lee EB, Shin JS, Shin HY, Park WB. (2010). The use of standardized patients to teach medical students clinical skills in ambulatory care settings. *Medical Teacher*, 32(11):467-470
- Okraïnec A, Smith L, Azzie G. (2009). Surgical simulation in Africa: the feasibility and impact of a 3-day fundamentals of laparoscopic surgery course. *Surg Endosc*, 23(11):2493-2498
- Perosky J, Richter R, Rybak O, Gans-Larty F, Mensah MA, Danquah A, Debpuur D, Kolbilla D, Ofori A, Anderson F, Marzano D, Andreatta P. (2011). A Low-Cost Simulator for Learning to Manage Postpartum Hemorrhage in Rural Africa. *Simulation in Healthcare*, 6(1):42-47
- Seropian M A. (2003). General concepts in full scale simulation: getting started. *Anesthesia & Analgesia*, 97(6):1695-1705

- Sidra Medical and Research Centre (2011) Sidra, HMC Plan first simulation centre. Published 5th Oct 2009. www.sidra.org accessed on 14th June 2011
- Smith JR, Cole FS. (2009). Patient Safety: effective interdisciplinary teamwork through simulation and debriefing in the neo-natal ICU. *Critical Care Nursing in North America*, 21(2):163-79
- Taghva A, Panaghi L, Rasouljan M, Bolhari J, Zarghami M, Esfahani MN. (2010). Evaluation of reliability and validity of the Psychiatry OSCE in Iran. *Acad Psychiatry*, 34(2):154-7
- Taguchi N, Ogawa T. (2010). OSCEs in Japanese postgraduate clinical training Hiroshima experience 2000-2009. *Eur J Dent Educ*, 14(4):203-9.
- Tai CY, Chung UL. (2008). The development of a competency-based group health teaching performance examination model for BSN graduates. *J Nurs Res*, 16(4):275-85.
- Tang L, Chung MS, Liu Q, Shin DS. (2010). Advanced features of whole body sectioned images: Virtual Chinese Human. *Clin Anat*, 23(5):523-9.
- Ziv A, Erez D, Munz Y, Vardi A, Barsuk D, Levine I, Benita S, Rubin O, Berkenstadt H. (2006). The Israel Center for Medical Simulation: a paradigm for cultural change in medical education. *Acad Med*, 81(12):1091-1097
- Ziv A, Ben-David S, & Ziv M. (2005). Simulation based medical education: an opportunity to learn from errors. *Medical Teacher*, 27(3):193-199