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Review Article / Derleme

Using Simulation-Based Education to Improve Residents' Clinical Decision Making Skills in Developing Countries

Gelişmekte Olan Ülkelerde Asistanların Klinik Karar Verme Becerilerini Geliştirmek İçin Simülasyon Temelli Eğitim Uygulaması

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ABSTRACT

Background: Recently, a significant increase occured in the use of medical simulation technology for teaching and assessment. Improved patient safety during medical education has driven simulation-based education (SBE), particularly in resident education. Although many countries have integrated SBE into their undergraduate programs, some developing countries, including Turkey, have been slow to apply SBE into their graduate programs. We propose a review of existing examples of SBE used which may promote the implementation of similar curricula in developing countries. **Methods:** To derive a representative sample of relevant curricula, we performed a web-based literature review using the search terms "simulation" and (" graduate, resident") and ("clinical decision-making" or ''clinical reasoning") and "training''. **Results:** Of the 83 original articles, ten resulting articles were relevant to SBE used to support residents' clinical decision-making in six clinical areas. We summarize the ten curricula and discuss them in the context of three primary considerations (course administration, content development, and assessment program evaluation) so they may be applied in similar graduate curricula in Turkey and others.**Conclusions:** It is obvious that simulation-based education offers benefits. In particular, graduate-level training programs used to support clinical decision-making are critical to the development of competent physicians around the world.

Key words: Simulation, resident, curriculum, clinical decision-making

ÖZET

Amaç: Son zamanlarda, eğitim ve değerlendirme için tıbbi simülasyon teknolojilerinin kullanımı önemli bir derecede artış göstermektedir. Tıp eğitimi sırasında hasta güvenliğinin önemli hale gelmesi özellikle asistan eğitiminde, simülasyon temelli uygulamaları harekete geçirdi. Çoğu ülkelerin mezuniyet öncesi eğitim programlarının içine simülasyon temelli uygulamalar entegre olmasına rağmen, Türkiye'nin de içinde olduğu bazı gelişmekte olan ülkelerin mezuniyet sonrası programlarına simülasyon temelli eğitim uygulamalarının dahil olması yavaş olmuştur. Gelişmekte olan ülkelerin benzer müfredat uygulamalarını desteklemek için, varolan simülasyon temelli eğitim örneklerinin derlenmesi amaçlanıldı. **Yöntem:** Müfredat ile ilgili sunulan literatür örneklerini araştırmak için "simülasyon'' ve ("mezuniyet sonrası, asistan'') ve ("klinik karar verme ya da klinik akıl yürütme''ve "eğitim'' kelimelerinden oluşan web tabanlı bir literatür taraması yapıldı.**Sonuç:** Altı klinik alanda, asistanların klinik karar verme becerilerini destekleyen simülasyon temelli eğitim ile ilgili 83 orijinal makaleden on tanesinin sonuçları derlenildi. Türkiye ve diğer ülkelerde benzer mezuniyet sonrası eğitim müfredatları içerisinde uygulanılabilmesi için özetlenen bu on müfredat üç temel başlıkta (kurs yönetimi, müfredat geliştirme ve ölçme-değerlendirme programı) tartışıldı. **Tartışma:** Simülasyon temelli eğitimin sunduğu yararlar açıktır. Özellikle, mezuniyet sonrası eğitim programlarının kullanımı, dünyadaki klinisyenlerin yeterliliklerinin gelişimi için gerekli klinik karar verme sürecinde kritik bir öneme sahiptir.

Anahtar kelimeler: Simülasyon, asistan, müfredat, klinik karar verme

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BACKGROUND

Simulators have been used in clinical education since the 1950s, but their use for standardized learning, practice and assessment has significantly increased over the past 20 years in many countries due to increased availability, improved fidelity, and the widespread acceptance of simulation as a fundamental teaching modality in undergraduate and graduate medical education.[1] Simulation also addresses a universal need to provide novice learners with early clinical exposure to a broad set of clinical conditions and procedures in a safe environment allowing the ability to practice and demonstrate competency prior to patient contact in addition to the ability to standardize experiences common to core clinical trainees. The use of simulation also uniquely addresses the needs of adult learners.

Adult educational theory advocates that learning occurs through sequential phases of cognitive analysis. Initial experience is retained as a memory, incorporated with existing knowledge, and then internally transformed to provide general meaning or understanding of the event. When repeated, similar meaningful experiences reinforce memory and provides broader pattern recognition critical to complex tasks. This concept is now widely accepted in many industries and areas of study such as aviation, the nuclear power industry and the military, all of whom broadly utilize simulation throughout training programs and for ongoing maintenance of skills.[2]

Learning Health Sciences:

Traditionally, clinical clerkships associated with undergraduate medical education combine academic and apprenticeship experiences, so students may participate in a daily routine of knowledge acquisition, patient care, and the study of differential diagnoses and treatment plans. At the same time, students also attend lectures and/or small-group sessions that highlight basic concepts and disease models. This approach is intended to maximize students' ability to gain a large body of knowledge to which general meaning is applied to experiences they may eventually face in clinical practice.[3] Some suggest these learning modalities do maximize students' knowledge, but are not effective at promoting the highest level of learned knowledge, and clinical reasoning that reflection and metacognitive analysis occur independently, only after extended periods of time when students assimilate previous experiences with their existing knowledge.[4] Because students rarely witness several patients that present with the full range of a particular disease process within a short time period, their opportunity to apply clinical reasoning in an authentic process is limited by the patients' presented. Furthermore, while faculty intend to teach disease concepts during academic sessions, their efforts may not effect students' performance at patients' bedsides.[5]

Needs of Modern Learners:

The current learners in medical education are from the millenial generation (also called "Generations Y"), and were born loosely between 1980 and 2000. These learners have been reported as having evolving learning styles that are driven by evolving technologies and available resources. For example, millenial learners have been characterized as active learners who prefer experiential learning with immediate feedback,[6-8] and prefer learning aided by technology.[7-10] The same learners have also been reported to be and academically disengaged,[6,8] and most troubling, characterized as lacking critical thinking skills.[7,8,11] These characteristics seem to be common across developing countries, including Turkey.[12] As Dilullo and colleagues explain, "Millennials have grown up with astonishing exposure to unvetted internet resources. "The predilection for millennial students is to make big gains quickly and with minimal effort, which has conditioned them to select the first or most easily available information source.[13] One researcher posits that millennials' increased efficiency at information gathering may have eroded their critical thinking skills, particularly in higher education.[14]

Although we align with researchers who caution against broad generalizations about learners,[15] we propose medical educators should be mindful of learner differences and target medical curricula to modern learners' needs while engaging them in dynamic learning activities in an authentic setting that allows for immediate feedback. We propose well-developed simulation-based education is particularly useful at addressing modern learners' needs.

Utilizing Simulation-based Education in Medicine

Simulation-based education offers a unique opportunity to engage doctors in training in an authentic, yet safe environment, so thay may advance learning and improve their clinical practice. Unlike traditional, passive academic training strategies that focus on increasing students' fund of knowledge via didactic sessions, simulation creates an active, participatory, authentic learning environment where students can practice skills that are directly related to patients and their care. Well-developed simulation-based education meets the need for medical education reform and also improves patient safety by supporting students as they develop skills across the many domains of of clinical practice in a safe environment, outside the actual clinical environment.[15,16]

Simulation uses emotion to stimulate recall and assimilation of knowledge while minimizing risk to patients or learners. This modality, one that incorporates personal clinical experience for the assimilation of scientific learning, is the foundation of the Flexnerian ideal. A century ago, Flexner was a champion of a new curriclum, one that allowed medical students to study at the patient bedside so that they could apply science to clinical care with oversight of experienced physicians.[17] Since the Flexner report, medical schools have included an “advanced” apprenticeship model for medical students following basic sciences instruction, thusly, providing clinical clerkship experiences. Modern medical education reforms are founded on Flexner’s desire to combine basic science and clinical instruction during a doctor’s training program. Today, simulation-based education is used as a modality to foster simultaneous integration of preclinical and clinical content in a way that Flexner would have appreciated. Although Flexner was a champion of the preclinical– clinical curricular sequence, it is unlikely that he was aware of the possibilites simulation would eventually offer to the medical education. The simulated clinical environment now allows clinical experience to be safely incorporated into the curriculum from the first days of medical school, providing early scaffolding to facilitate enhanced understanding and application of medical knowledge.[18]

Simulation in Turkey

Since 2003 Turkey has undergone changes in it’s healthcare system.[19] Nationally, an increased awareness of best practices in patient safety and governmental support for an increased need of medical practioners have led to an increace in the number of medical schools. Within the current framework of medical education, simulation is becoming a standard learning modality in *undergraduate* medical education in Turkey. Turkish undergraduate medical education programs not only facilitate students’ learning of required knowledge, but they also employ simulation-based education for students’ skills acquisition during medical training later in their program.[12] Simulation-based mastery learning (SBML), consisting of simulation-based education with the addition of defined mastery criteria and rigourous assessment, is considered to be the best practice in clinical education by some medical educators,[20] but is even further from implementation in Turkish programs. In spite of the growing interest in simulation’s value in *undergraduate* medical education, simulation-based education has not yet been established as best practice in Turkish *graduate* medical education programs, particularly in the area of development of clinical decision-making skills.

Simulation in Developed Countries

In some countries, preclinical curricula have evolved over the last two decades, moving away from didactic content and increasing focus on the facilitation of problem solving, group learning, and reflective processing. Adult education models support this approach, and use of these models has resulted in higher levels of understanding and retention among students.[21] For clinical curricula, educators have attempted to support learners by restructuring curricula, developing small-group sessions, and increasing self-directed learning and independent research. In spite of these improvements, a disconnection still exists between the classroom and the clinical environment, and many students feel that they are inadequately trained in history taking, physical examination, diagnosis, and management.[22] Further, increased public awareness of academic medical centers’ teaching practices has compelled medical educators to improve their programs’ focus on patient safety and quality.[23]

Simulation-based education (SBE) has been recognized as the ‘best-practice’ modality that can bridge educational gaps, and at the same time, improve patient safety.[24,25] Because of this, simulation-based training has emerged as a cornerstone of many medical training programs in developed countries. Robust simulation-based education is founded on well-defined learning objectives and it fosters repeated, deliberate practice of specific tasks that occur infrequently or expose patients to risk when performed by novice learners.[23] Simulation allows complex procedures to be deconstructed into more manageable tasks, and offers learners the opportunity to practice and apply developing clinical decision-making skills.

We intend to promote the use of SBE in developing countries’ graduate training programs by identifying existing curricula that target residents’ clinical decision-making skills and by addressing percieved challenges associated with development and through implemention of such programs. We highlight the graduate-level programs that demonstrated effective use of simulation to improve clinical decision-making across a variety of specialties using an assortment of simulation-based education applications.

METHODS

To identify examples of simulation-based curricula used to support residents’ clinical decision-making, we conducted a focused literature review. To derive a representative sample relevant curricula we performed a literature review in Medsearch (Ovid) and Pubmed using the search terms “simulation” and (“intern,” or “graduate, or “resident”) and (“clinical decision-making” or clinical reasoning”) and “training.” Of the 83 resulting original articles reviewed, 71 articles were removed. Of these, 44 articles were focused on assessment or assessment validation, research processes, or were editorial in nature, while the other 27 were targeted toward medical, nursing, and/or ancillary health students.

Two relevant articles were removed because they failed to adequately describe their curriculum in enough detail to be reproducible. We summarize the resulting 10 articles relevant to simulation-based curricula used to support residents' clinical decision-making in six clinical areas.

RESULTS

Anesthesiology

Faculty from Mount Sanai School of Medicine (NY, US) presented the benefits of using standardized patients (trained, non physician actors) in a simulation-based curriculum for Anesthesiology residents as they learn and practice interpersonal and communication skills, and clinical decision-making.26 Levine and Swartz offered a practical "how to guide" to facilitate a simulation-based curriculum that employs standardized patients to portray a patient and surgeon colleague in two clinical scenarios. Details of the resources available are found in Table 1.

Table 1. Description of available simulation-based curricula resources used to support decision-making skills across six clinical disciplines

Disclipline	Resources
Anesthesiology	
Levine & Swartz, 2008	✓ Detailed description of the 2 cases, complete with clinical background information, presentations, and applied scripts ✓ Performance checklists
Emergency Medicine	
Grall et al., 2014	✓ Detailed description of each of the 4 stages of instruction for 13 modules ✓ Curriculum program evaluation survey questions.
Lee et al., 2012	✓ Detailed description of the 4 cases, including clinical presentations, and required interventions ✓ Reference for validation neonatal resuscitation scoring tool [38], and weighting scheme.
Okuda et al., 2014	✓ Practical description of team organization and case roles ✓ Illustration of physical room set-up ✓ Required equipment list ✓ Sample case scenario ✓ Review of associated challenges.
Internal Medicine	
Mathai et al., 2014	✓ Description of curriculum components ✓ Description of teaching methods, session organization, resource requirements, and skills assessed
Cohen et al., 2013	✓ Description of session organization and timing ✓ Reference for detailed teaching and assessment methods used during intervention [40-44].
Pediatric Medicine	
Sam et al., 2012	✓ Description of curriclum objectives across each of the 3 years ✓ Sample learning objectives for specific scenarios ✓ Description of typical session schedule across learner groups.
Surgery	
Buchholz et al., 2014	✓ Description of course design ✓ Description resourcs required for each of the three training sessions ✓ Description of session organization and timing ✓ Reference to resource of didactice materials, modules (SCORE) [48].
Kellicut et al., 2014	✓ Description of course design ✓ Checklists used for feedback -Prehospital-trauma evaluation checklist -Triage/resuscitation evaluation checklist -Surgery brief guide ✓ Example, After Action Report for formal feedback ✓ Program evaluation survey tool questions.
Urology	
Shamim et al., 2013	✓ Description of course design ✓ Description of simulators used to teach technical and non-technical skills ✓ General description of scenarios used to teach non-technical skills.

Emergency Medicine

Emergency Medicine faculty of the University of Arizona (Tucson, US) used a progressive, four-stage, multi-module, simulation-based mastery curriculum to increase residents' knowledge and procedural skills in 13 difficult or uncommon emergency medical procedures.[27] Grall and colleagues combined cognitive training with hands-on procedural instruction using high- and low-fidelity simulation. The advantages of this application were: 1) strongly founded in education theory, 2) Assessment aligned with ACGME competencies, 2) concurrently providing theoretical, technical, and instructional experience to the residents.

Faculty of Tufts University (Boston, US) implemented and evaluated a novel neonatal resuscitation curriculum.[28] Lee and colleagues found that the task-specific simulation-based educational intervention significantly improved Emergency Medicine residents' confidence, knowledge, and performance of the critical initial steps in neonatal resuscitation. The primary advantage of this application was residents who engaged in the intervention outperformed their peers on a number of critical actions and time required to complete the targeted critical actions. This curriculum is highlighted for it's application to improve residents' affect, knowledge, and performance in clinical setting.

Multi-institutional collaborative work by Okuda and his colleagues described a practical application of "SimWars" competetion that allowed practice/assessment of decision-making process during management of simulated complex scenarios.[29] The advantages of this application were: 1) the competetion format was considered exciting and enjoyable, and promoted long-term learner motivation, and 2) SimWars experiences at national conferences has led to increased interest by faculty in using simulation as an educational tool at their own institutions.

Internal Medicine

Faculty of Massachusetts General Hospital Department of Medicine (Boston,US) describe the expansion of an eight-case, simulation-based curriculum that offers deliberate practice in the management of common acute clinical ICU cases to a large residency program where faculty resources are limited.[30] According to Mathai and her colleagues, the success of the program is attributed, in part to the residents who served as session facilitators and chairpersons of the program.

Faculty of Northwestern University's Department of Internal Medicine (Chicago, US) implemented a three-day simulation-based mastery learning "bootcamp" consisting of targeted ICU clinical skills.[31] The curriculum from Cohen and her colleagues included five skills; 1) recognition of physical examination findings (cardiac auscultation), 2) performance of paracentesis, 3) performance of lumbar puncture, 4) management of critically ill patients (intensive care unit skills), and 5) communication with patients (code status discussion). All intern boot camp participants were required to meet or exceed predefined mastery standards before beginning their internship. The primary advantage of this application was the use of established individualized training programs to ensure competency prior to patient interactions.[32-36]

Pediatric Medicine

Faculty of BC Children's Hospital (Vancouver, CA) introduced a novel pediatric acute care longitudinal simulation-based curriculum that focused on complex medical cases and crisis resource management.[37] Sam and his colleagues developed, implemented, and evaluated the longitudinal "mock code" curriculum that consisted of sequential modules across the 3-year training period, and "just in time" in situ mock codes. Targeted learners included the entire multidisciplinary code team and crisis support systems. The advantages of this application were: 1) application of scaffolded learning, 2) inclusion of entire code team to ensure cohesive training, and 3) use of "just in time" in situ mock code to reinforce learning.

Surgery

Multi-institutional collaborative work by Kellicut and his colleagues described the novel Surgical Team Assessment Training (STAT) program, a multidisciplinary team-training program that teaches teamwork and trauma-specific resuscitation roles, founded on TeamSTEPPS approach.[38] The program targeted learners such as physicians, nurses, medics, OR technicians, and other medical support personnel who have been deployed to serve in military. The one-day program consists of two trauma simulations, video review and discussion, didactic session, and a follow-up simulation and video review, all in a context relevant to learners, military combat environment. The advantages of this application were 1) the use of a well-established program (TeamSTEPPS) to address targeted learning needs, 2) the use of well-developed scenarios relevant to the learners, and 3) using an formal feedback report form that has been previously-established in military context (AAR; After Action Report).

Faculty of Penn Medicine (Philadelphia, US) developed a novel surgery curriculum to support junior residents as they learn and refine technical and non-technical skills.[39] Buchholz and his colleagues introduced the new simulation-based "clinical care pathway" biliary disease-based curriculum in three sessions across 3 days. Residents were able to practice non-technical skills via an initial simulated "pre-operative" consultation with a standardized patient, technical skills via hands-on training in a simulated operating room ("intra-operative"), and then to refine non-technical skills via the "post-operative visit" with the same standardized patient. The advantages of this application were: 1) engagement of learners for training technical and non-technical skills in authentic setting, and 2) use of standardized scenarios and associated assessments that were reviewed and approved by certifying body (American Board of Surgery), 3) and deliberate alignment with the competencies defined by the US accrediting body (ACGME).[40]

Urology

Multi-center collaborative work at King's College (London, UK) by Shamim and his colleagues produced a comprehensive Urology training program that incorporated procedural skills, decision-making, and communication and team-working skills.[41] To meet the learning objectives, technical skills sessions incorporated virtual reality simulators and bench-top task trainers, and were scheduled for 14 half-days, while non-technical skills sessions employed patient simulators and were conducted over seven full days of training, alternating weekly. The primary advantages of this application was the comprehensive nature of the on-going curriculum for a targeted audience.

DISCUSSION

Medical education in Turkey has a rich history.[42] Currently, there are over 60 Medical Schools in Turkey and 3 graduate training programs. 34 out of 56 medical faculties (%60,7) is mixed, 18 of them (%32,1) implement training centered, 4 of them (%7,1) use student centered training models.[43] When we have a chance to assess , 47 of these curriculums (%83,9) use system based (integrated), 5 of them (%8,9) use classic, 3 of them (%5,3) use problem based and 1 of them (%1,7) use integrated and classic curriculum. While problem based training provides less than 10 percent of the entire curriculum in 30 faculties, in 8 of them it includes only 10-25 percent of the curriculum.[44] Over the last decade, some Turkish medical training programs have implemented simulation-based education, although the paucity of available literature has indicated simulation-based applications have yet to be broadly integrated into Turkish training programs.

Our non-exhaustive summary suggests there are existing simulation-based curricula that target clinical decision-making for the graduate learner that can be readily employed by graduate training programs in Turkey. The programs identified by our review have included resources that can be used for the development of a novel clinical decision-making skills course in Turkey and other developing countries. Information associated with the curricula might be presented as three primary categories that are considered during course development,– 1) course administration, 2) content development, and 3) assessment and program evaluation, as summarized below.

Course Administration. All ten articles included a detailed description of their course design.[26-31,37-39,41] All but one program reported using immersive simulated clinical scenarios in their curricula.[27] Five programs reported using didactic session/lecture in their programs,[27,28,31,37,39] and were reported as being as short as 15 minute introduction to 2-hour lectures.[27,38] Another program used web-based modules to support pre-learning.[31] Seven programs included task/procedural training in their program.[27-29,31,37-39,41] Of these, six programs included task or procedural skills in the immersive clinical scenario,[28,29,37-39,41] while five programs incorporated additional stand-alone task/procedural stations.[27,31,37,39,41] Six programs reported using debriefing in their curricula to support learning, while one program used a question and answer period to promote reflection.[28-31,34,37,38,41] Three programs discussed cost of implementing the curricula,[30,31,39] and reported cost ranged from $17,500 (US) to approximately $50,000.[30,37]

Content Development. Five articles described detailed case scenarios used in their programs' sessions,[26,28-30,39] while one provided specific scripts associated with their clinical scenarios.[26] Three programs provided a list of resources required, including staff and/or simulators and equipment,[29,39,41] while one of these also provided an illustrated guide of the room set-up.[29] Seven programs employed standardized patients or confederates to aid in training,[26,29-31,38,39,41] while three programs did not explicitly report this information. Another provided the link to available teaching materials used in their curriculum.[39]

Assessment and Program Evaluation. Five articles described their assessment methods used in their sessions.[26,30,31,38,41] These authors also provided the assessment forms (performance checklists) in the article[26,30,38] or referenced the resource for the assessment tools they used.[41] Program evaluation methods were described in three articles.[27,30,41] The authors of two programs provided the program evaluation tools used.[27,38]

The curricula, and the resources made available in the articles, are specific to the authors' clinical context, but they may be used to develop similar curricula, and the concepts extended to other clinical disclipines to develop other novel clinical decision-making skills. The benefits of applying SBE for training graduate learners clinical decision-making are clear. Recently, two independent meta-analyses by McGaghie and colleagues and McMahan and colleagues have demonstrated that simulation has large effects on outcomes of knowledge, skills, and behavior, and moderate effects on patient-related outcomes.[45,46] Benefits of simulation-based education extend beyond reducing error and promoting patient safety. According to Cook and colleagues, patient simulation may also be particularly effective at promoting reflective and comparative analysis of core concepts, which are critical to practioners' clinical decision-making processes.[47] Although the benefits of simulation-based education have been demonstrated in undergraduate and graduate programs at academic medical institututions around the world, in some developing countries such as Turkey, simulation-based education has only recently been introduced, and seems to be limited to undergraduate programs.The challenges associated with employing simulation-based eudcation should not be ignored.

Challenges of implementing simulation-based education: The challenges associated with implementing effective simulation-based education in Turkish graduate programs parallel the challenges expressed by medical educators from other countries. The most often-discussed challenges associated with simulation-based education in medicine are practical in nature, and range from limited financial resources and faculty time to decreased availability of manpower/staff and resources. Other literature indicated faculty's concern regarding a lack of student interest and their own institution's failure to recognize teaching commitments.[48,49]

Turkey's predicament is somewhat exemplified by the availability of simulation centers listed in international directories, such as those maintained by the Society for Simulation in Healthcare (SSIH) and Society in Europe for Simulation Applied to Medicine (SESAM) with over 220 simulation centers located in the US and 28 in Europe, but only one of which is in Turkey. Perhaps best summarized by McGaghie and colleagues, we should not ignore the most challenging barriers to implementing simulation-based education in graduate programs, "educational inertia, and conventional thinking," along with the "financial disincentives and bondage to time-based educational schedules".[50]

InTurkey, interest in clinical simulation has been markedly improved within the last decade. However, with the exception of certain limited examples, even basic simulation applications, are not yet commonly employed. There are a number of specific challenges associated with implementing simulation in Turkey to consider. First, there are a limited number of medical centers who have been committed to the development of clinical simulation centers for their learners. Second, there are few qualified faculty who have been adequately trained to implement and promote simulation-based training programs for on-going success. These primary challenges are likely to have impacted sustainability of newly-initiated programs. These limitations have led to a lack of research in the area, with little scholarly work being disseminated at national level, and even less at the international level.

If graduate medical training programs are to become successfully sustained in Turkey, a number of actions are required. These are;

1) Build new simulation centers for the existing medical trainig centers, and improve existing clinical simulator centers in Turkey,
2) Develop or adapt existing successful "train the trainer" programs to increase the pool of qualified trainers and mentors committed to teach future trainees,
3) Improve training of clinical simulator centers' staff to ensure highest quality support during development and implementation of training programs,

4) Develop new or adapt existing programs into Universities' Medical curricula, and
5) Promote scholarship by supporting national and international research in simulation training programs.

Although SBE is potentially expensive, the cost-effectiveness of it should also be examined in developing countries with limited resources. In addition, improvement of clinical competency, impact on patient safety and a decrease in clinical practice errors are some benefitial results that can be expected. The new model of medical curricula includes emphasis on patient safety, and the incorporation of the medical technological revolution. To optimize the use of SBE, trainers should be skillful in creating a receptive atmosphere, providing constructive feedback, and using video feedback and debriefing. Also, health systems should be revised for enabling adopting simulation as a standard of training and a certification programme.

Despite the challenges in developing countries such as Turkey, simulation-based education has demonstrated its success and value in undergraduate medical education. Because of this, simulation-based education could be effectively incorporated into curricula for resident training as well. Simulation-based education applications in developing countries should follow best practices demonstrated in other parts of the world. Looking into the future, perhaps it should be considered for applications in continuous professional development and training of trainers in the future. Why not? Aren't patient safety and development of clinical skills necessary for everyone?

CONCLUSION

As medical programs face a shift in teaching paradigms and the needs of the modern learner evolve at a global level, simulation-based education offers obvious benefits. In particular, graduate-level training programs used to support clinical decision-making are critical to the development of competent physicians around the world. We detail several key themes for success in developing simulation in Turkey that could address several needs among medical learners, which could also be extrapolated to other developing countries to improve education and meet the unique needs of medical educators and medical learners.Simulation applications find place in medical training both in providing patient safety and developing technical skills in many countries at an increasing rate.These applications take place in most curriculums of developed countries for graduates and residents; it creates a significant advantage in integration of them in training. In the light of changing perception in the medical training in Turkey, simulation seems to have a better acceptance. Universities that assess their curriculums aim to train better doctors with adequate knowledge as well as with simulation based skills during their trainings that match their students' characteristics. Although these applications are becoming widespread in developing countries including Turkey and being included in curriculums for graduate trainings, it has not been accepted widely in resident trainings as of yet. Benefits of including widespread simulation applications for residents in curriculums and eventually increased quality of medical education due to this fact should not be ruled out. Undoubtedly, future academic articles published in developing countries will prove to help integration in training and attract most needed attention to this issue. This might even bring widespread usage of high technology simulators in trainer training and might bring a different perspective to the medical education in the future.

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