Editorial

Is simulation the only keystone of surgical training?

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Gaba defines simulation as a "technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion" (1). Simulation is a burning issue in the field of surgery; its use is constantly growing up in wealthy countries where residents can improve their expertise without operating on humans (2). Most advanced surgical simulators involve the use of computers reproducing a virtual anatomy through a realistic 3D view, which requires a large investment to be produced and installed. Therefore, it's essential to cut the costs and increase the simulation in low and middle-income countries (LMICs) where it could be harnessed for good to make the society and the health care assistance better. In this article of the *Annals of Thoracic Surgery* published on June 2018, Ramirez and her colleagues from the University of Virginia present a sensational article approaching simulation in general thoracic surgery in LMICs such as Rwanda which is located in East Africa, with a population of 11,262,564, an estimated total GDP of 24.717 billion and a per-capita of $2,090 (3). This country has been classified as "LMIC" based on the GDP per capita. The authors focused on few surgical procedures counted as the most crucial operations in Rwanda, such as thoracotomy positioning, performance of a thoracotomy, ruptured diaphragm repair, lung decortication, and oesophageal perforation repair. The epidemiology of diseases differs from high-income countries to LMICs. As a matter of fact, in the latter the main reasons for surgery are oncological diseases while in the former surgeries are mostly done to treat traumatic and infectious aetiologies. The procedures listed above represent the basis of thoracic surgery, the first step to be done in thoracic surgery training and are of fundamental importance in LMICs to improve the health care assistance and outcomes for patients. Simulation in surgery and more specifically in thoracic surgery, as mentioned above, is a pivotal part in the training (4) of young surgeons as it is essential to transfer skills and capabilities to less experienced physicians, to shorten their learning curve in an effective manner and to accelerate their way to master the skill of surgery. Despite the fact that simulation is well known and used in high-income countries the most useful benefits of it could be increasingly experienced in LMICs where it's easy to find several limitations related to the inconstancy of funds available to cover all the health care system expenses. Even if this topic is well known and published all over literature, simulators in LMICs are still uncommon due to the significant time it takes and financial investment it needs; these two major factors limit the spreading of surgical simulators all over the country. Moreover, the lack of teachers in that contest is another limiting factor to the development of simulators in LMICs as it limits the real effectiveness and availability of surgical simulation training. Rwanda, has been chosen several times (5-7) as an ideal representative of LMIC because of its high population density and also, as many other LMICs, because of its shortage in physicians which are estimated to be around 0.49 surgeons per 100,000 population while in Canada (8), for example, this ratio is about 27 per 100,000 population, a much higher value. On

the other side another limiting factor is the feasibility of thoracic surgery procedures in a country where funds are extremely low even if Rwanda Government have improved the number of surgeons, have implemented residency programs and international programs such as Human Resources of Health (HRH) that have invested money and supported the national leadership. Currently very little is known about thoracic surgery in Rwanda but there are, essentially, two major issues. The first one is the lack of experienced surgeons who can face the most frequent surgeries, which regard infectious or inflammatory diseases. This condition doesn't reflect the situation in high-income countries where oncological diseases are the main cause of surgery. Low cost simulation has a vital role in improving medical assistance in countries where medical education is not sufficient to guarantee a very extensive coverage for all thoracic surgery indications. The other main issue is represented by the lack of resources, especially specific surgical equipment (9), even in the most advanced hospitals. This shortage of surgical instruments implicates the impossibility to perform surgeries even if the operator is well trained. As a consequence in Rwanda, the number of thoracic surgeries has been stable for the last 5 years even with the implementation of focused workshops and a clear increase of all general surgery operations. This is the reflection of a complex situation where various factors are all mixed up and are related to the absence of specialized faculty and the lack of exposure to thoracic surgical training and resources. So it's necessary, in the very near future, to find resources to have a permanent trained surgeon and a cardio-thoracic anaesthetist. In fact, a dedicated anesthetise remarkably improve the possibility to increase surgical volume and hence to the training for thoracic surgery and anaesthesia residents. Choosing this approach is easy to improve the quality, effectiveness and coverage of Rwandan medical and surgical care and aside from the perioperative outcomes benefit to patients of having a dedicated thoracic surgeon (10), studies from similar developing contexts support the rationale and feasibility of this proposal. Tenwek Hospital in Western Kenya observed a sudden but constant increase in patient access and volume of thoracic surgery following the addition of a cardiothoracic surgeon to their staff (11,12). The same situation is also present in India and South Africa where the role of thoracic surgeons is well recognized and relevant support systems is central to respiratory care in these contexts, especially because the incidence of lung cancer is now rising. This emphasizes the role of a trained, skilled thoracic surgeon with a dedicated team in area where is now absent. This issue has a primary role in our modern world where training is now more complex, time for teaching to younger generations isn't adequate and we have to face the higher cost for modern surgery and so simulation has begun to improve and adjuvate the training for younger generations without replacing, at all, the real surgery (13). This is probably the most controversial feature affecting simulators and simulation in general in all surgical fields where skills learned must be applied in the real field, otherwise the efforts applied during the simulation training will be lost after a very short period of time. This is the actual core of all the discussion where simulation represents the basis in which we have to start to introduce surgeons in LMICs to the thoracic surgery and, on the other hand, invest resources to create a proper unit where surgeons after the simulation training can expand their horizons and apply all the knowledges acquired. Rwandan surgeons can be so fully instructed and ready to face all the technical difficulties you can find through the experience on the real anatomy. The topic treated has, therefore, a crucial importance in our modern world for several reasons. First of all, it's essential to spread all over the world the proficiency in all medical specialties, thoracic surgery included, in order to level out all the differences between high income countries and LMICs. This aim, even if it has several limitations and requires a very long time to be carried out, must be taken into account from all high-income countries. Sharing all the economical efforts and team working can make this concept more feasible and applicable which is the pivotal part of our discussion. Anyway in the framework of efforts being made to bring the medical knowledge closer to all citizens, simulation isn't the only and exclusive option. Without a full time thoracic surgeon or a well-trained general surgeon available, supported by a valid team all the skills acquired during the simulation course cannot be harnessed for patients care and remain poor knowledge which is, when taken independently, a weak primer. Subsequently Rwanda and all LMICs need to be supported and encouraged by providing dedicated funds to increase and improve medical training. And so, starting from simulation is the smartest decision in a country where thoracic surgery isn't very applied and available and can lead to a self-sustaining process able to expand this branch of surgery in less wealthy countries providing, then, a major shift towards excellence in treating diseases. This process has the basis in the increase of number of surgeries which they are obviously related to an increase in financial efforts but it's crucial to

remember that money naturally flows to where utility and value are being provided. In this case utility means treatment of any kind of diseases and our strongest value is represented by human lives. Once accomplished this target the natural order of things will follow a set path and lead to a progressive increase of rate of treatment. This is, probably, an extremely optimistic point view, but not unrealizable at all, when considered in perspective. Everything must be analysed in a perspective way because nothing is unmanageable when, in the wings, there are people armed with goodwill, attached to their land and proud to have the chance to improve the shortcomings in the place where they live. Giving the chance of learning to surgeons who have followed a less effective training means to trust the capability of mankind and foster the values of self-esteem, driving force of medical training. This rule is applicable worldwide and represents the take home message of every resident, fellow or even an experienced surgeon because in medicine nothing is an accident and every single effort yields its own rewards.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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