Arab Journal of Urology (2017) **15**, 166–169

Arab Journal of Urology
(Official Journal of the Arab Association of Urology)

www.sciencedirect.com

EDUCATION/TRAINING
MINI-REVIEW

Simulators in the urological training armamentarium: A boon or a bane?

Gaurav Aggarwal *, **Samiran D. Adhikary**

Department of Urology, Apollo Hospital Bhubaneshwar, Odisha, India

Received 27 October 2016, Received in revised form 16 December 2016, Accepted 15 January 2017
Available online 3 April 2017

KEYWORDS

Simulators;
Urology;
Training;
Medical simulators

ABBREVIATIONS

TURBT, transurethral resection of bladder tumour;
URS, ureteroreno-scopy;
VR, virtual reality

Abstract Simulation devices have grasped the attention of almost all industries worldwide and the medical field has not been exempt. With technological advancement, it becomes important to assess whether medical simulators are the way forward as an adjunct or as a replacement to traditional training approaches by assessing their safety, efficacy and cost-effectiveness, and whether they should be made mandatory in the curriculum of urology training.

The present review aims to clarify some of these issues, as well as assess their role in urological training and present both the pros and cons of this simulation-based training.

Introduction

Simulation in Urology...
Is it a myth or is it real...
Training via virtual reality...
Would it make life...really surreal?

Since their inception, simulators have grasped the attention of almost all industries worldwide, and the medical field has not been exempt. However, with technological advancement, are medical simulators the way forward as an adjunct or as a replacement to traditional training approaches? How safe, efficacious, cost-effective and user-friendly are they? Should they be made mandatory in the curriculum of any medical trainee?

These are just some of the questions that arise when one thinks about medical simulation in general and simulation in urology in particular.

* Corresponding author at: Department of Urology, Apollo Hospital Bhubaneshwar, Old Sainik School Road, Odisha 751005, India.
E-mail address: drgaurav1981@rediffmail.com (G. Aggarwal).

Peer review under responsibility of Arab Association of Urology.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.aju.2017.01.006

To clarify, let us look at the inception, initiation, inculcation, innovation, as well as the inadvertent growing inclination of society, towards simulators.

What is simulation?

Simulation implies creation of an artificial environment, as near as possible to a real-life situation, so as to assess the response and reaction of an individual to that particular situation. In other words, it can be called a 'dress rehearsal' for the finale [1].

Initiation of simulation

Simulators have been used vociferously in the aviation industry for over a century, and today's pilots have a mandatory requirement of a certain number of 'simulator flying hours' before they can be deemed safe to fly even as second-in-command [1].

In addition to the airline sector, military personnel have been using various simulation techniques in their training programmes. Simulator war preparedness is an excellent way to judge an individual's response to life-threatening situations, during real-time war situations. The 'Combat trauma patient simulation' programme is one such simulator-based technology established in the USA to assess and analyse the feasibility of simulation in a battlefield situation [2].

Not to mention, the hedonistic entertainment industry, comprising movies, films, video games of all genres, so as to cater to all age groups of society. Various simulated-gaming consoles have been developed to give near-realistic environments to the gamers.

However, the medical field is a safety-critical domain where the lives of real people are at stake and thus the widespread use of simulators could form an important adjunct to the training of an individual.

Inculcation of simulation in surgery

The earliest medical simulators were mere simple human models made of clay and stone, followed by mannequins, mock-patients, and plastic simulators.

Developments in simulator technology have resulted in a plethora of new, improved versions, to the extent that a 'Society For Simulation in Healthcare' was formed in 2012 to enable and promote interprofessional advances in the application of medical simulation [3].

Traditionally, surgical skills were gained by long-term apprenticeship alongside senior surgeons, with very long learning curves. However, in the current economic climate, institutions cannot invest so much time, effort and money, in to such a long apprenticeship.

Additionally, today, where accountability and results are so important, simulators could probably be the way forward. Patients are no longer considered as mere 'training objects' and the Halstedian apprenticeship model of '*see one, do one, teach one*' is no longer apt [1,2]. Each and every case is different and occasionally, a surgeon may get only one chance at success.

In the infancy of one's surgical career, simulators would help shorten the learning curve by enabling repetitions and revisions, thus making the young surgeon adept at dealing with real-life intraoperative situations in a better and less stressful manner. Such training is well-controlled, stepwise and when supervised, can be tailored to meet individual needs.

Additionally, simulation training significantly reduces operative times, as well as the possibility of complications.

Simulation in urology

Urology, of all the surgical disciplines, is best suited to make maximum use of simulation technology, as a vast majority of surgeries are laparoscopic and endourological.

The various applications in urology worldwide are as follows:

a) **Learning about anatomy** [4,5]**:** The 'Visible Human Project', an initiative of the National Library of Medicine in the USA, is a large dataset of digitalised CT, MRI and tissue images, generated at intervals of 1 mm, which can be rotated in three-dimensions to understand the intricate anatomy of the pelvis. Additionally, surgical trainees may even indulge in virtual dissections.

b) **DRE simulation** [6,7]**:** Carcinoma of the prostate is a leading cause of death amongst elderly men and a DRE forms an important and sensitive screening tool and can be enunciated as the 'Pandora's box' of the urologist, akin to the abdomen for a gastrointestinal surgeon. Students are initially taught DRE on rubber prostatic models having beads inserted into them, to enable the trainee to get the feel of a malignant gland. Burdea et al. [7] using virtual simulation with a 'PHANToM' haptic interface (to provide sensitive feedback to an examiner's finger), were able to show the feasibility of the DRE simulator.

c) **Cystoscopy** [8]: Cystoscopy forms the backbone of any endourological procedure and thus the need for it to be surgically precise. Additionally, residents must be well versed with the instrument and its assembly. Cystoscopy simulation has been found to significantly reduce the scope-assembly times and aid in smooth insertion and scope removal. This could probably have long-term benefits, such as reduced urethral stricture rates, but this needs evaluation.

d) **TURP/transurethral resection of bladder tumour (TURBT)** [9,10]**:** TURP surgery forms the *'bread and butter'* for every urologist, and thus the need to be adept at this procedure. Ballaro et al. [9] and Schout et al. [10] have assessed the validity of simulation in TURP/