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Urological Training Simulators made from simple materials: are these advantageous for residents and young urologist in our country?

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Abstract

Background: *In medical science specially in surgery Halsteadian principle, which includes "see one, do one, teach one" has shifted to the paradigm of "See several, simulate many, do one perfectly". Repeated practice in simulators has a great role to be familiar with the procedures before going to practice in practical field. In Bangladesh access to a simulator system is difficult due to less accessibility and availability. Though Bangladesh is a developing country and unable to spend more money for simulator based educational system homemade simulators.*

Objective: *To evaluate feasibility and appropriateness of homemade simulations in urological training system.*

Method: *This observational study was conducted in the Department of Urology, NIKDU and in a private hospital from February 2019 to October 2019. Sample was collected by purposively from Urology residents and young urologist of NIKDU. Total participants were twenty six (26). Urology residents and young urologists who were interested to take part in simulation training and survey are included in this study. A questionnaire was prepared. A good number of residents and young urologists were present in the study. All of them performed procedures in TURP simulator, URS simulator, PCNL simulator and laparoscopy simulator. The questionnaire was supplied to the residents and young urologists after the procedures. All papers were collected and results were calculated.*

Results: *During the study out of 26 participants, 20 (76.9%) participants expressed no incorporated simulation training program in residency curriculum and 23 (88.4%) participants have no access to a simulation education centre. 20 (76.92%) participants think that there is a role for a standardized simulator training curriculum during your residency period. 25(96%) participants agreed that simulators would improve operating room performance. 16 (61.5%) participants think cost is a limiting factors and 10(38.46%) participants didn't agree that cost is a limiting factor. 19 (73.08%)*

Keywords: **Keywords:** Simulator, Homemade, Participants

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participants think that simulation practice can reduce patients risk & complications during surgery while 7 (26.92%) think not like that. 18 (69.23%) participants thinks the necessity to improve the quality of these homemade simulators to further improve the quality of simulator training program, while 8 participants thinks these simulators are sufficient for training. 92.31% participants believe it is necessary to include the simulation training program in urology residency. Most of the participants (96.15%) thinks that these cost effective homemade simulators are helpful in improving surgical skills.

Conclusion: *In the early period of one's urological career, simulators would help shorten the learning curve by enabling repetitions and revisions. Homemade simulators could be a solution to meet the current needs in the field of urology in our country.*

Introduction

From the first day of mankind, everybody learns from their environment. When they see anything they recall and reproduce it. By repeated practice, men acquire skills in a particular field. In medical science, there is a popular principle named Halsteadian principle, which includes "see one, do one, teach one" .[1] This method produced many highly skilled surgeons for generations in the surgical field. However, due to increased awareness of patient safety in recent years, this model is not acceptable for trainees to obtain competency at a certain level.[2,3] So, a modern appropriate alternative was needed to overcome it. As a result, Simulation-based training is taking an increasingly important place in surgical training and is becoming mandatory in many countries. [4] Because skills and dexterity can be improved by using simulators.[5]

Urology is the forerunner of minimally invasive surgery. The procedures of urology produce additional learning challenges and possess a steep initial learning curve. Training processes and assessment methods in urology are known to lack clear structure and often rely on differing operative flows experienced by individuals and institutions.[6] Usually, the residents and young urologists do not have access to more sophisticated and expensive training systems. Developing and practicing basic surgical skills via the apprenticeship model of training and their assessment are no longer considered appropriate in the operating room. This fact, in conjunction with the long learning curve of the urological procedures and issues of patient safety, makes the practice of urological simulators necessary before the ûrst steps in urological procedures. So, the residents and the young urologists are encouraged to practice urological techniques on simulators.[7]

Barriers to Surgical Simulation are the small market, few simulators validated for teaching, the high cost of software design, the high cost of simulators at centers, and selecting and retaining suitable faculty.[8]

In the urology training program of the USA 68% of institutes have simulation education centers.[9] In the West, training in complex endourological procedures and laparoscopy is on models, with mentors, and simulators. Training in developing countries in these areas is still in the operating room for real patients.[10]

In the field of urology, the greatest number of procedure-specific models and subsequent validation studies have been carried out in the field of endourology.[3] Some are low fidelity, and the rest are high fidelity with high cost.

The major issue with the use of these devices in the developing world is their cost. However, efforts are required to attain high levels of training more quickly without compromising the safety and quality of care given to patients. This means that the developing world needs low-cost simulators for the training of urological residents.[11]

In Bangladesh access to a simulator system is difficult due to less accessibility and availability. Though Bangladesh is a developing country and unable to spend more money on a simulator-based educational system homemade simulators are introduced to see the feasibility and appropriateness of these instruments.

Materials and Methods

This was an observational study conducted in the Department of Urology, NIKDU, and in a private hospital from February 2019 to October 2019. The sample was collected by Purposive sampling. Participants were collected from Urology residents and young urologists of NIKDU. Total participants were twenty-six (2)6. Among them, Twenty (20) were urology residents and Six (6) were young urologists.

Urology residents and young urologists who were interested in taking part in simulation training and survey are included in this study.

We collected the required materials to make simulators from simple materials for domestic usage and some from nearby shops and electronic markets.

TURP Simulator

TURP homemade simulator (Figure 1) was made from a Lolypop box and white cement and the penis part is made of plastic pipe with part of the injection port of a two-liter saline bag. Boiled eggs or potatoes are used as the prostate. Whole things were kept in a container to collect water and then drain.

Figure 1: *TURP Simulator*

Ureterorenoscope (URS) Simulator

Within the URS simulator (Figure 2) urinary bladder was made of plastic football the ureteric orifice was made of a part saline bag and the body of the ureter was made by a soft plastic pipe and part of the injection port of two two-liter saline bags. Whole things were kept in a container made of used water bottles to collect water and then drain.

Figure2: *Ureterorenoscope (URS) Simulator*

PCNL Simulator

We used part of a condemned patient bed as a patient body in the PCNL simulator (Figure 3). Within it gloves filled with contrast mixed water is used as a kidney calyceal system.

Figure 3: *PCNL Simulator*

Laparoscopic Simulator

The trainer box of the Laparoscopic homemade simulator (Figure 4) was a baby bathtub collected from a local DIY shop and purchased webcam from an electronic market. The webcam was mounted inside the baby bathtub. The energy-saving fluorescent light was mounted behind the webcam. Holes were made and patched with part of the injection port of a liter saline bag to accommodate the insertion of laparoscopic instruments. Appropriate electrical connections were made and a simple laptop computer was used to monitor the simulator inside.

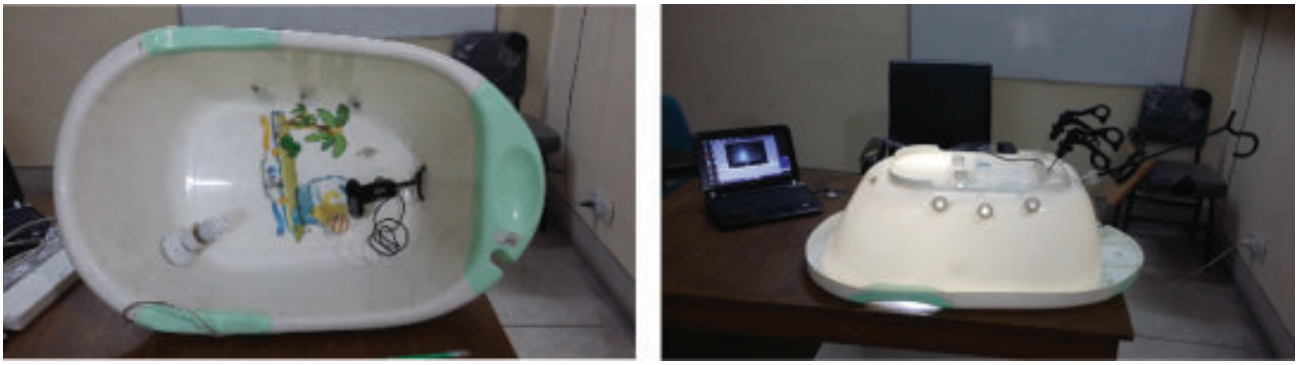


Figure 4: *Laparoscopic Simulator*

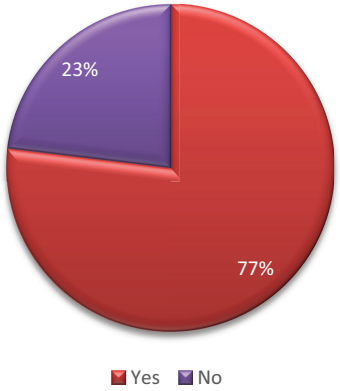
All simulators were made of domestic material of low cost and easily available. After making simulators, those were examined in an institution. Pros and cons were documented in black and white. Then we decided to perform a study among the urology residents and young urologists. A questionnaire was prepared. A good number of residents and young urologists were present in the study. Among them, 20 were urology residents and six were young urologists. All of them performed procedures in the TURP simulator, URS simulator, PCNL simulator, and laparoscopy simulator. The questionnaire was supplied to the residents and young urologists after the procedures. All papers were collected and results were calculated.

Questionnaire

1.	Is there any incorporated simulation training program in your residency curriculum?	Yes	No
2.	Do you have access to a simulation education center?	Yes	No
3.	Do you think there is a role for a standardized simulator training curriculum during period? your residency	Yes	No
4.	Do you agree that simulators would improve operating room performance?	Yes	No
5.	Do you think cost is a limiting factor?	Yes	No
6.	Do you agree a simulation program would reduce patient risks and complications?	Yes	No
7.	Do you think it's necessary to improve the quality of these homemade simulators?	Yes	No
8.	Do you believe that simulation training should be a requirement of Urology residency?	Yes	No
9.	Do you think these homemade simulators are helpful for you?	Yes	No

Results:

1. Is there any incorporated simulation training program in your residency curriculum?

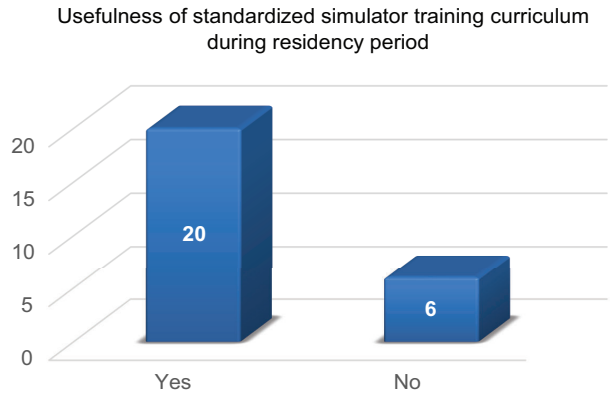


Out of 26 participants, 20 (76.9%) participants expressed no incorporated simulation training program in the residency curriculum.

2. Do you have access to a simulation education center?

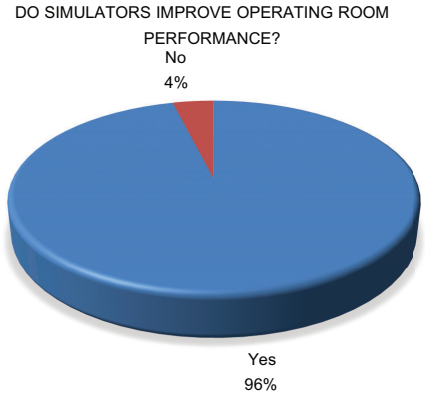
23 (88.4%) participants have no access to a simulation education center

3. Do you think there is a role for a standardized simulator training curriculum during your residency period?



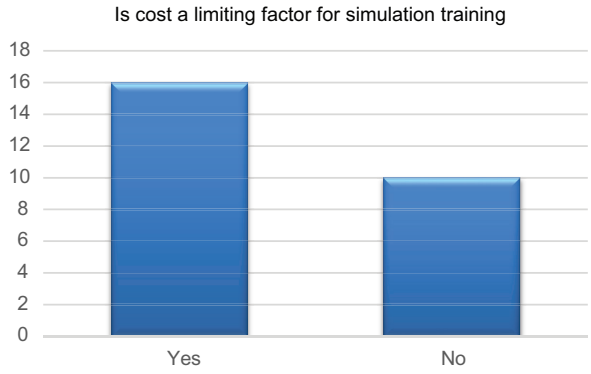
Out of 26 participants, 20 (76.92%) participants think that there is a role for a standardized simulator training curriculum during your residency period.

4. Do you agree that simulators would improve operating room performance?



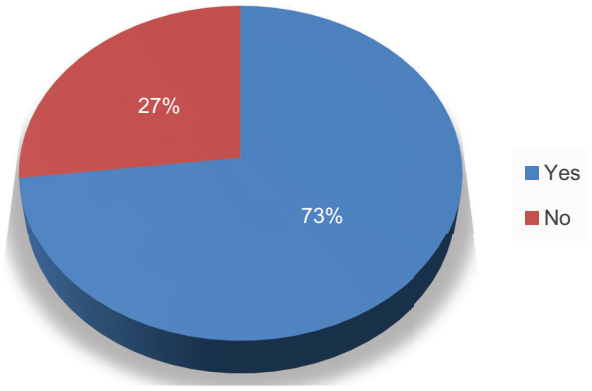
25 (96%) participants agreed that simulators would improve operating room performance.

5. Do you think cost is a limiting factor?



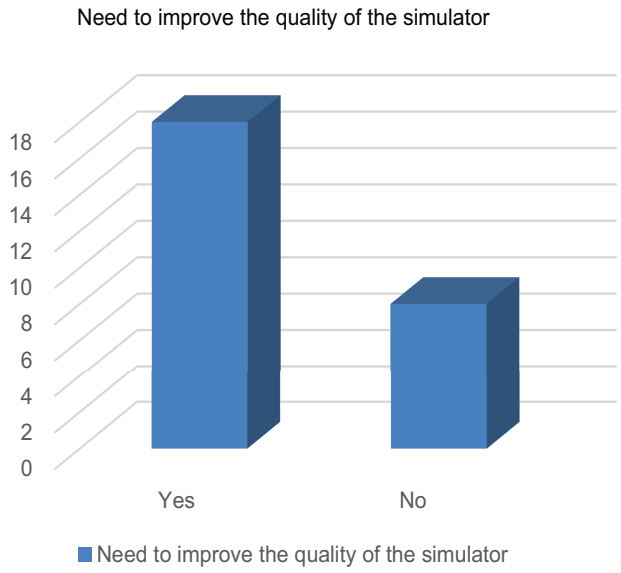
Out of 26 participants, 16 (61.5%) participants think cost is a limiting factor and 10(38.46%) participants didn't agree that cost is a limiting factor.

6. Do you agree a simulation program would reduce patient risks and complications?



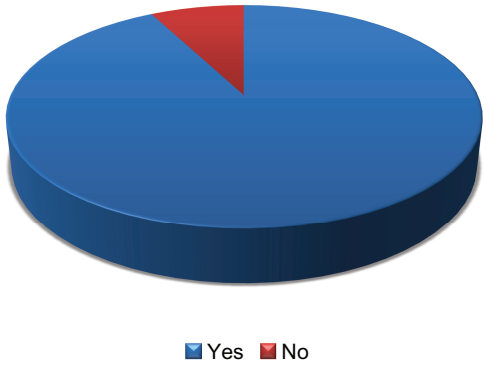
19 (73.08%) participants think that simulation practice can reduce patient's risk & complications during surgery while 7 (26.92%) think not.

7. Do you think it's necessary to improve the quality of these homemade simulators?



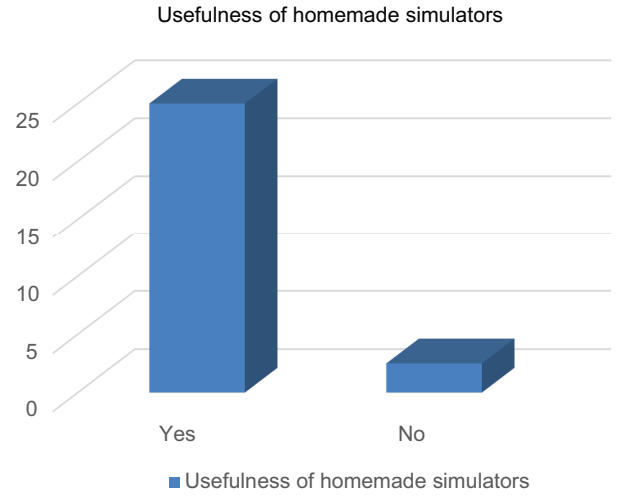
18 (69.23%) participants think the necessity to improve the quality of these homemade simulators to further improve the quality of the simulator training program, while) 8 participants think these simulators are sufficient for training.

8. Do you believe that simulation training should be a requirement of Urology residency?



92.31% of participants believe it is necessary to include the simulation training program in urology residency.

9. Do you think these homemade simulators are helpful for you?



Most of the participants (96.15%) think that these cost-effective homemade simulators help improve surgical skills.

Discussion

In a study Residency program directors at Accreditation Council for Graduate Medical Education (ACGME)-accredited urology training programs in the USA were invited to respond to an anonymous electronic survey. The study evaluated the program directors' experiences and opinions for the current usage of existing urology simulators. Among them, 60% (25/42) said that they have incorporated simulation into their curriculum[12]. In our study we could not accumulate the directors who are involved in the academic curriculum but the residents and young urologists. They commented that 23.08% (6/26) of them have incorporated simulation systems into their curriculum. But it is far away from the educational system of the countries. The main reason for this situation may be the high cost of the simulators and the mindset of the trainers.

The residents and young urologists were asked to answer about access to a simulation education center during their residency period. The answers were quite frustrating. Affirmative answers were too low at 11.54%. Where in a study of ACGME in the USA 97% (42/43) of responders reported having access to a simulation education Centre. But here the responders were the program directors.[12]

Another study was conducted among program directors in the USA. Among respondents, (41) access to a laparoscopy simulator was 76 % and reported access to cystoscopy, ureteroscopy, Transurethral

resection, and percutaneous access simulators was 16%,21%,8%, and 12% respectively.[13]

In our study participants were 26. 25 of them (96.15%) answered that simulation is beneficial for residents and young urologists. The result of the study is similar to other studies. Chow et al showed that Ninety-seven percent (63/65) viewed the laboratory as beneficial to their education [16]. Kamel et al. 2017 showed that 87% (37/43) agreed that there is a role for a standardized simulator training curriculum.[12]

Halsteadian principle, which includes "see one, do one, teach one" has shifted to the paradigm of "See several, simulate many, do one perfectly"[14]. Repeated practice in simulators has a great role to be familiar with the procedures before going to practice in the practical field. In our study, 96.15% believe that simulators would build their confidence to improve operating room performance. In the study by Kamel et al. (2017), 75% (30/40) agreed that simulators would improve operating room performance.[12]

Bangladesh is a country with a poor economy and with huge population. Though its economy is going fast. But our country has less capacity to buy high-fidelity simulators like Uromentor, Surgical SIM TURP simulator, URO-Trainer VR simulator, etc. The high cost of these simulators is a huge hindrance for the poor countries. The reflection of this hindrance is shown in the study. Here 61.54% (16/26) have a perception that cost is a limiting factor for simulation in our country. The study by Kamel et al 2017 showed that a total of 64% (27/42) agreed that cost was a limiting factor.[12]

Complications are part and parcel of a surgeon's life. Most of the time it happens due to a lack of expertise and experience. When a resident practices in a urological simulator will help enhance clinical competence by enabling an easier and earlier amalgamation of technical and decision-making skills, and a calm response to stressful surgical situations. As a result, he will face fewer complications than others in his surgical life. In the study, we found that 73.08% (19/26) believe that a simulation program would reduce patient risks and complications. Kamal et al 2017 commented that 38% (16/42) agreed a simulation program would reduce patient risks and complications.[12] Additionally, Aggarwal & Adhikary 2017 said that simulation training significantly reduces operative times, as well as the possibility of complications.[15]

Homemade simulators are made of household materials. A polished appearance and high fidelity are not possible. A reflection of this situation is found in our study. Most of the participants 69.23% (18/26) realized the improvement of the simulators.

Among 26 participants 92.31% (24/26) persons emphasized that simulation training should be a requirement of urology residency. Because without this it will be difficult for young urologists to survive in the field of competition. Chow et al. 2017 found that sixty-seven percent (42/63) believe that simulation training should be a requirement of Urology residencyw[16]

Optimistic results came out when most of the participants (96.15%) thought that these cost-effective homemade simulators help improve surgical skills.

Conclusion:

In the early period of one's urological career, simulators would help shorten the learning curve by enabling repetitions and revisions. If such training is well-controlled and supervised, this practice will make young urologists adept at dealing with real-life intraoperative situations in an intellectual, skilled, and less stressful manner. Homemade simulators could be a solution to meet the current needs in our country's urology field.

References

1. Abhishek G S, 2018, 'Simulation-based training in laparoscopic urology – Pros and cons', Indian J Urol, vol. 34, no.4, pp. 245–253.
2. Abdul LA, Ahmed MAS, Muhammad SK, Prokar D & Kamram A, 2016, Current Status of Simulation and Training Models in Urological Surgeries: A Systematic review, The Journal of Urology. vol.196, pp.312-320
3. Abdul LA, Nicholas R, Muhammad SK, Prokar D & Kamran A 2016, 'Simulation-based training and assessment in urological surgery', Nature Reviews Urology, vol. 13, pp. 503–519.
4. Fiard G, Descotes JL & Troccaz J, 2019, 'Simulation-based training in urology: A systematic literature review', Prog Urol, vol. 29,no.6, pp. 295-311.
5. Khine M, Leung E, Morran C, Muthukumarasamy G 2011, 'Homemade laparoscopic simulators for surgical trainees', Clin Teach, vol. 8,no.2, pp. 118-21.

6. Oliver B, Alessandro V, van der PG, Alexandre MM & Kamran A, 2016, 'Training, Simulation, the Learning Curve, and How to Reduce Complications in Urology', European urology focus, vol. 21, pp. 10-18.

7. Sidiropoulos C, Papathanasiou CA, Triandaûllidis A & Rombis V ,2011, 'Homemade Laparoscopic Training Simulator (LTS) from simple materials: The utilities and the advantages of a low cost construction', European urology supplements, vol. 10, no. 8, pp. 567–570.

8. Wignall GR, Denstedt J, Preminger G & Cadeddu JA, 2008, 'Surgical Simulation: A Urological Perspective', J Urol, vol. 179, no. 5, pp. 1690-9.

9. Laguna MP, de Reijke TM & Rosette JJ, 2009, 'How far will simulators be involved into training?', Current Urology Report, vol. 10, no. 2, pp. 97–105.

10. Rassweiler J, Klein J, Teber D, Schulze M & Frede T, 2007, 'Mechanical simulators for training for laparoscopic surgery in urology', J Endourol, vol. 21, pp. 252–262.

11. Raza SJ, Soomroo KQ & Ather MH ,2011, 'Latex glove laparoscopic pyeloplasty model: a novel method for simulated training', Urol J, vol. 8, pp. 283–286.

12. Kamel M, Eltahawy EA, Warford R, Thrush CR & Noureldin YA, 2017, 'Simulation-based training in urology residency programmes in the USA: Results of a nationwide survey', Arab J Urol, vol. 16,no.4, pp. 446-452.

13. Le CQ, Lightner DJ, VanderLei L, Segura JW & Gettman M, 2007, 'The Current role of Medical Simulation in American Urological Residency Training Programs: An assessment by Program Directors', The Journal of Urology, Vol. 177, no. 1, pp.288-291.

14. Brewin J & Nedas T, 2010, 'Simulation in Urology. In: Dasgupta P., Fitzpatrick J., Kirby R., Gill I.S. (eds) New Technologies in Urology', New Techniques in Surgery Series, Springer, London, vol. 7, pp. 259-267.

15. Aggarwal G & Adhikary SD, 2017, 'Simulators in the urological training armamentarium: A boon or a bane?', Arab J Urol, vol. 15, no.2, pp. 166-169.

16. Chow AK, Sherer BA, Yura E, Kielb S, Kocjancic E, Eggener S, Turk T, Park S, Psutka S, Abern M, Latchamsetty KC & Coogan CL, 2017, 'PlumX Metrics, Urology Residents' Experience and Attitude Toward Surgical Simulation: Presenting our 4-Year Experience With a Multi-institutional, Multi-modality Simulation Model', Urology, Vol. 109, pp. 32–37.