DOI: https://doi.org/10.53350/pjmhs20221612320

ORIGINAL ARTICLE

Simulation in Urological Training: The Hybrid Model of Institute of Kidney Diseases Peshawar A Comparative Study

LIAQAT ALI[1], MUHAMMAD SHAH[2], MOHAMMAD SHAHZAD[3], FAIZA HAYAT[4], MOHAMMAD HANIF[5], NASIR ORAKZAI[6]
[1]*Associate Prof Department Of Urology & Transplantation Institute Of Kidney Diseases Peshawar*
[2]*Asst. Prof Department Of Surgery Mti Hayatabad Medical Complex Peshawar*
[3]*Associate Prof Department Of Urology & Transplantation Institute Of Kidney Diseases Peshawar.*
[4]*Consultant Department Of Urology & Transplantation Institute Of Kidney Diseases Peshawar*
[5]*Consultant Department Of Urology & Transplantation Institute Of Kidney Diseases Peshawar*
[6]*Prof Department Of Urology & Transplantation Rehman Medical Institute Peshawar*
Corresponding authors: Muhammad Shah, Mohammad Shahzad, Email: drmuhammadshah@ yahoo.com, shahzadtauni@hotmail.com

ABSTRACT
Background:"I fear the man who has practised one kick 10,000 times." Lee Bruce This aphorism highlights the growing importance of simulation in postgraduate urology training, especially during the COVID 19 pandemic, when all teaching and training activities were stopped, jeopardising postgraduate residents' education. Postgraduate residents must perform hours of surgical training to overcome urological learning curves. According to study, residents educated on simulators boost their summative scores. By introducing simulation to urology training in a way comparable to the well-known Halsted apprenticeship model, the current study emphasises the hybrid model of IKD.

Objective: to compare the formative assessment results between residents taught on simulators and residents in the conventional apprenticeship model on factors of communication skills, technical competence, and overall capacity to conduct procedure on OSAT and DOPS.

Material & Methods: from 2019 to 2021 this comparative study was conducted in the Department of Urology by Team C at the Institute of Kidney Diseases Peshawar. Group A (10 residents) and Group B (10 residents, 5 from the second and third years) received STEPS method OT instruction in the first phase. These simulators were used to impart knowledge to Group "B" Harvey for counseling and medical examinations Simulator for PCNL The second phase included a six-month training assignment swap between the two groups. A standard QSAT and DOPS proforma was used to evaluate each resident. Data analysis was done using SPSS 24.0.

Results: Residents in Group A, who were originally exposed to the conventional technique, considerably outperformed Group B on Harvey (mean: 50.5; standard deviation: 2.21.1) in terms of communication skills, professionalism, and ethical concern during the first phase (p 0.001). However, the Group p0.05 shown considerably higher technical proficiency and overall process performance capacity. The mean technical skill and overall capacity to finish the process had a somewhat positive association in phase 1 in favour of group B (r=0.630, p 0.01). All QSAT and DOPS metrics significantly improved in the second phase. However, both groups did not vary significantly (p> 0.05). According to Pearson coefficient correlation, both groups considerably overcame their gaps in technical proficiency, communication skills, and procedural competence. (P= 0.001) Results are shown in Figures 1 through 06 and Tables 1 through 2.

Conclusion: To improve the standard of urology residency in Pakistan, a hybrid paradigm that includes both simulation and actual performance is necessary.

Keywords: simulation, education, learning, skills, innovation, urology

INTRODUCTION
The surgical student historically obtained operating experience by "see one, perform one, teach one"01. This foundation has sustained surgical excellence for more than a century, but contemporary educators challenge its relevance. 1 Before consulting, trainees had 8000 rather than 30,000 hours of operational experience. This decline is likely attributable to the Calman Report for Specialist Training (2005) and the European Working Time Directive (EWTD) in junior doctor contracts in the UK and NI. Due to these limits, proficiency examinations must be more severe and competency-based rather than dependent on past knowledge03. In the UK, a move from consultant-driven to consultant-delivered care has reduced "after-hours" procedures and increased patient hostility to being "practiced" on. Minimally invasive surgery (MIS) has increased the complexity of treatments in various surgical specialties04. Due to urological subspecialization, increasing public scrutiny of surgical performance (due to easy access to national audit data), and the introduction of EWTD05, trainee urologists spend less time in the main operator role. Concerned are surgical education groups. How can we teach surgeons without compromising patient safety? Given the complexity of MIS, high patient expectations, and risk of intraoperative mistake in junior-led surgeries, is patient training ethical? How can the Halstedian apprentices' high standards be maintained when teaching today's physicians in limited environments? Simulation06 might hold the key. We highlight the promise of simulation as a surgical training supplement, with specific application to urology trainees, by a narrative description of the different simulation models available and clinical data confirming their efficacy07.

The efficiency of simulation in urological applications outside of medicine: Real simulation Simulation helps aviation workers. Commercial and military pilots must complete full-flight simulation modules and non-technical training before flying. Pilots and surgeons handle expensive equipment in real-time, three-dimensional scenarios under physiological and psychological stress. Given the success of simulators in aviation, surgical instructors are using simulation to overcome training challenges09.

Simulation Platforms: Surgical simulators have been utilised for 22 years. Surgical simulation tools are task- or procedure-oriented, reality- or virtual reality-based, and method-based (open, endoscopic, laparoscopic, or robotic) [10]. Full immersion or augmented reality are hybrids (Figure 1). 06,07 Many surgical specialties have effective surgical simulation models for medical trainees and seasoned surgeons[11].

MATERIAL & METHODS
from 2019 to 2021 this comparative study was conducted in the Department of Urology by Team C at the Institute of Kidney Diseases Peshawar. Group A (10 residents) and Group B (10 residents, 5 from the second and third years) received STEPS method OT instruction in the first phase. These simulators were used to impart knowledge to Group "B" Harvey for counseling and medical examinations Simulator for PCNL The second phase included a six-month training assignment swap between the two groups. A standard QSAT and DOPS proforma was used to evaluate each resident. Data analysis was done using SPSS 24.0.

RESULTS

Residents in Group A, who were originally exposed to the conventional technique, considerably outperformed Group B on Harvey (mean: 50.5; standard deviation: 2.21.1) in terms of communication skills, professionalism, and ethical concern during the first phase (p 0.001). However, the Group p0.05 shown considerably higher technical proficiency and overall process performance capacity. The mean technical skill and overall capacity to finish the process had a somewhat positive association in phase 1 in favour of group B (r=0.630, p 0.01). All QSAT and DOPS metrics significantly improved in the second phase. However, both groups did not vary significantly (p> 0.05). According to Pearson coefficient correlation, both groups considerably overcame their gaps in technical proficiency, communication skills, and procedural competence. (P= 0.001) Results are shown in Figures 1 through 06 and Tables 1 through 2.

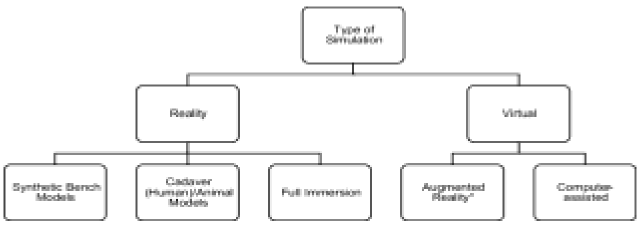


Figure 1: surgical simulation models, specifically. *Hybrid experience*

Endoscopic Workspaces: Endoscopic platforms imitate upper and lower urinary tract operations. Cystoscopy, ureteroscopy, TURP, TURBT, and percutaneous nephrolithotomy are simulated (PCNL). 6 Using training platforms is helpful for PCNL, where the learning curve is 40–65.[12].

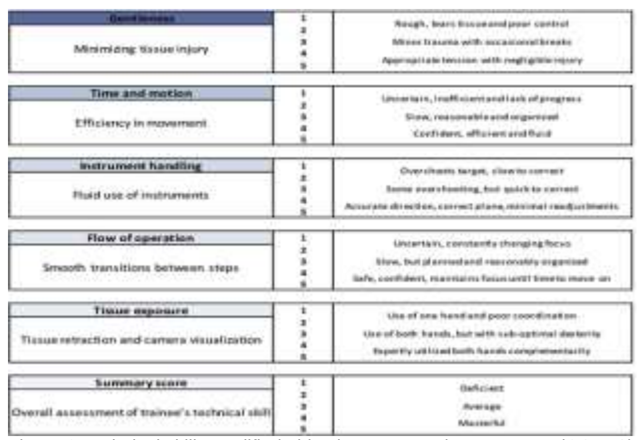
Figure 2: Literature shows residents taught on simulators had somewhat better summative scores.

Figure 3: Simulation-based training and assessment in urological surgery

Laparoscopic Workspaces: Laparoscopic surgery simulators are either physical boxes or videos. These use genuine laparoscopic surgical devices to familiarize learners with them (Figure 2) Learners can pass things, cut, suture, and tie using surgical equipment. Laparoscopic platforms help surgical trainees learn laparoscopic techniques. Using reality-based or virtual reality-based laparoscopic training increased surgical residents' scores in simulation and the operating room. No substantial difference was found between the two systems' performance[13].

Figure 4: Wet Lab

Figure 5: Examples of Task-Based Simulation. (A) Laparoscopic Box Trainer. (B) Suturing. (C) Peg Transfer.



Gentleness	1	Rough, tears tissue and poor control
Minimizing tissue injury	2 3 4 5	Minor trauma with occasional breaks Appropriate tension with negligible injury
Time and motion	1	Uncertain, inefficient and lack of progress
Efficiency in movement	2 3 4 5	Slow, reasonable and organized Confident, efficient and fluid
Instrument handling	1	Overshoots target, slow to correct
Fluid use of instruments	2 3 4 5	Some overshooting, but quick to correct Accurate direction, correct plane, minimal readjustments
Flow of operation	1	Uncertain, constantly changing focus
Smooth transitions between steps	2 3 4 5	Slow, but planned and reasonably organized Safe, confident, maintains focus until time to move on
Tissue exposure	1	Use of one hand and poor coordination
Tissue retraction and camera visualization	2 3 4 5	Use of both hands, but with sub-optimal dexterity Expertly utilized both hands complementarily
Summary score	1	Deficient
Overall assessment of trainee's technical skill	2 3 4 5	Average Masterful

Figure 6: technical skills modified objective structured assessment (OSATS)

Table 1: Both groups' Soft Skills scores are A and B.

Group	Score Group A (Traditional system	Score Group B (Simulations)	P-Value
Professionalism	5	3	P <0.05
Ethical Consideration	5	2	
Communication skills	5	3	
Seek help	4.7	2	
Aseptic techniques	4.3	2	
Mean	4.8±0.3	2.4±0.5	

Table 2: Both groups' Technical Skills scores are A and B.

Group	Score Group A (Traditional system)	Score Group B (Simulations)	Std
Over all ability to complete procedure	5	5	P>0.05
Technical ability	5	5	
Instrument handling	4	5	
Flow of operation	4	5	
Summary score	5	4	

ROLE OF EDUCATION AND CERTIFICATION IN DISCUSSION

A surgical simulator must show validity, educational value, and cost-effectiveness for training and assessmen[14]. Face (experts and novices identify the tool's worth), substance (expert rating), and build (there is a measurable difference when using the tool between expert and novice) Fidelity reflects the model's realism, although its use in simulation training is debatable. 16 A tool for assessing surgeon competence must meet even higher requirements[15]. Following simulation, the tool should reflect actual skill acquisition Objective Structured Assessment of Technical Skill (OSATS) was created to objectively evaluate clinical competence. FLS is a prerequisite for American Board of Surgery certification[16]. Global Evaluative Assessment of Robotic Skills (GEARS) analyzes 06 areas (depth perception, bimanual dexterity, efficiency, autonomy, force sensitivity and robotic control) for robot-assisted surgery credentialing. 26 This tool is part of various universities' robotic surgery curricula[17]. Lendvay et al. used anonymous reviewers to crowd-source a surgical skills evaluation Crowd-Sourced Assessment of Technical Skills (CSATS) corresponds with expert evaluations and predicts patient outcomes Simulation has improved new residents' knowledge, familiarity with instruments, and confidence[18].Full immersion training situations with integrated equipment, audio, and lighting have also been detailed.Lendvay et al. found that professional surgeons benefit from a short virtual reality warm-up session before robotic simulation activities[19].

There are no US certification standards for particular procedures. Hospitals base credentialing on the surgeon's caseload. Simulation platforms' importance in credentialing will certainly grow as they're used more in education[20].

Future simulation technologies: The selection and training of urologists both should rely heavily on simulation, possibly in addition to more traditional methods. The availability and realism of simulators will increase with further technical advancements, making up for the loss of the real-time theatrical experience[21]. Simulations should be a part of contemporary proficiency-based curricula, with recurrent exposure over time. By utilizing low-fidelity models to teach the foundational surgical skills before moving on to full-procedural simulations, performance feedback would enable focused learning. UK trainees have access to the Intercollegiate Surgical Curriculum Program Logbook to record their simulation experience. Currently, construct validity may be established using the centrally coordinated urological simulation program SIMULATE[22].

CONCLUSION

Simulation provides a safe environment for developing and maintaining surgical skills. Several simulation platforms have been found to enhance surgical abilities. Simulation has been shown to reduce process durations and mistakes. Simulation in training is now part of the surgical residency curriculum due to work-hour limits and an emphasis on patient safety. 30 We anticipate this tendency to continue, and surgical credentialing will gain importance. New technologies or uses of current technology are transforming the medical environment and might enhance surgical training, credentialing, maintenance, and patient outcomes.

REFERENCES

1 following the Halstedian master-apprenticeship paradigm of “see one, do one, teach one,” the surgical trainee historically acquired operational experience. (n.d.).

2 Heron M. Deaths: leading Causes for 2016. Natl Vital Stat Rep. 2018;67.

3 Anderson JG, Abrahamson K. Your health care may kill you: medical errors. Stud Health Technol Inform. 2017;234:13–17.

4 Jabbour N, Snyderman CH. The economics of surgical simulation. Otolaryngol Clin North Am. 2017;50:1029–1036. doi:10.1016/j.otc.2017.05.012

5 Birkmeyer JD, Finks JF, O'Reilly A, et al. surgical skill and complication rates after bariatric surgery. N Engl J Med. 2013;369:1434–1442. doi:10.1056/NEJMsa1300625

6 Childs BS, Manganiello MD, Korets R. novel education and simulation tools in urologic training. Cur Urol Rep. 2019;20(12):81. doi:10.1007/s11934-019-0947-8

7 Abboudi H, Khan MS, Guru KA, et al. Learning curves for urological procedures: A systematic review. BJU Int. 2014;114:617–629. doi:10.1111/bju.12315

8 Steigerwald SN, Park J, Hardy KM, Gillman LM, Vergis AS. Does laparoscopic simulation predict intraoperative performance? A comparison between the fundamentals of laparoscopic surgery and lapVR evaluation metrics. Am J Surg. 2015;209:34–39. doi:10.1016/j.amjsurg.2014.08.031

9 Song PH. Current status of simulation-based training and assessment in urological robot-assisted surgery. Investig Clin Urol. 2016;57:375–376. doi:10.4111/icu.2016.57.6.375

10 Dawe SR, Pena GN, Windsor JA, et al. Systematic review of skills transfer after surgical simulation-based training. Br J Surg. 2014;101:1063–1076. doi:10.1002/bjs.9482

11 Sethi AS, Peine WJ, Mohammadi Y, Sundaram CP. Validation of a novel virtual reality robotic simulator. J Endourol. 2009;23:503–508. doi:10.1089/end.2008.0250

12 Chowriappa A, Raza SJ, Fazili A, et al. Augmented-reality-based skills training for robot-assisted urethrovesical anastomosis: A multi-institutional randomised controlled trial. BJU Int. 2015;115:336–345. doi:10.1111/bju.12704

13 Millán C, Rey M, Lopez M. LAParoscopic simulator for pediatric ureteral reimplantation (LAP-SPUR) following the Lich-Gregoire technique. J Pediatr Urol. 2018;14:137–143. doi:10.1016/j.jpurol.2017.11.020

14 Hossack T, Chris B-B, Beer J, Thompson G. A cost-effective, easily reproducible, suprapubic catheter insertion simulation training model. Urology. 2013;82:955–958. doi:10.1016/j.urology.2013.06.013

15 Filippou P, Odisho A, Ramaswamy K, et al. Using an abdominal phantom to teach urology residents ultrasound-guided percutaneous needle placement. Int Braz J Urol. 2016;42:717–726. doi:10.1590/S1677-5538.IBJU.2015.0481

16 Brewin J, Ahmed K, Khan MS, Jaye P, Dasgupta P. Face, content, and construct validation of the Bristol TURP trainer. J Surg Educ. 2014;71:500–505. doi:10.1016/j.jsurg.2014.01.013

17 HOST. Simulated Surgicals, LLC n.d. Available from: http://www.simulatedsurgicals.com/host/. Accessed January 7, 2020.

18 Schulz GB, Grimm T, Kretschmer A, Stief CG, Jokisch F, Karl A. Benefits and limitations of transurethral resection of the prostate training with a novel virtual reality simulator. Simul Healthc. 2019. doi:10.1097/SIH.0000000000000396

19 Whitehurst SV, Lockrow EG, Lendvay TS, et al. Comparison of two simulation systems to support robotic-assisted surgical training: a pilot study (swine model). J Minim Invasive Gynecol. 2015;22:483–488. doi:10.1016/j.jmig.2014.12.160

20 Smith B, Dasgupta P. 3D printing technology and its role in urological training. World J Urol. 2019. doi:10.1007/s00345-019-02995-1

21 Ghazi A, Campbell T, Melnyk R, et al. Validation of a full-immersion simulation platform for percutaneous nephrolithotomy using three-dimensional printing technology. J Endourol. 2017;31:1314–1320. doi:10.1089/end.2017.0366

22 Cheung CL, Looi T, Lendvay TS, Drake JM, Farhat WA. Use of 3-dimensional printing technology and silicone modeling in surgical simulation: development and face validation in pediatric laparoscopic pyeloplasty. J Surg Educ. 2014;71:762–767. doi:10.1016/j.jsurg.2014.03.001