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Original article

The UCH bladder manikin – A locally designed teaching aid for suprapubic catheterization in low-resource countries



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KEYWORDS

Low-cost;
Manikin;
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Abstract

Introduction and objectives: The ability to perform emergency open or percutaneous suprapubic catheterization (SPC) is an indispensable skill in medical practice. In Nigeria, the majority of the general medical practitioners and non-urological residents lack formal training in SPC. A low-cost manikin was designed to train such doctors. This paper describes the development of the manikin and assesses its usefulness in teaching SPC.

Methods: The Ibadan PIUTA (Pan African Urological Surgeons Association [PAUSA] Initiative for Urological Training in Africa) Centre organized a workshop during which general medical practitioners and non-urological residents were taught SPC using the locally manufactured manikin. At the end, the effectiveness of the manikin in SPC training was assessed using questionnaires. Six months later, the questionnaires were distributed again to the surgical residents to evaluate the impact of the training on their practice.

Results: Twenty-five medical practitioners attended the workshop. The open and closed techniques were taught using the manikin. By the end of the workshop, 100% of the participants stated that the manikin was an effective teaching aid. Six months later, 67% of the surgical residents had independently performed successful SPCs, using the percutaneous technique alone (83%) or both the open and percutaneous methods (17%).

Conclusion: The UCH bladder manikin is an effective, low-cost and easily manufactured aid for teaching doctors emergency SPC. We recommend its use in centers in low-resource countries.

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Background

Emergency suprapubic catheterization is a basic surgical procedure the knowledge of which is indispensable to the practising medical doctor. It is indicated in patients with urinary retention in whom urethral catheterization is contraindicated or has failed [1]. In this situation, the extra-peritoneal (distended) bladder can be catheterized through the abdomen with a minimal risk to the intraperitoneal structures.

In an emergency situation, suprapubic catheterization (SPC) may be done via a percutaneous (with the use of a trocar) or an open approach. Results of an earlier study showed that the percutaneous trocar method as an emergency bedside procedure is safe and swift in the hands of trained doctors [2]. However, a trocar may not be readily available in many hospitals. In this case the open technique is the commonplace alternative. Thus, tutelage in both methods is advisable.

Unfortunately, adequate knowledge of the procedure and acquisition of the ability to perform both the open and closed techniques are deficient amongst general medical practitioners and non-urological surgical residents in our environment [3,4]. Additional challenges in the Nigerian health-care sector are shortage and maldistribution of the workforce, and low resource allocation. This is typified by the fact that the services of a single urologist in Nigeria are to be shared amongst 3.8 million people [5]. These prevailing issues buttressed the need for a urological workshop aiming to train both surgical residents and general medical practitioners in the technique of suprapubic catheterization as well as other basic urological skills. This was undertaken by the PIUTA Ibadan Centre as part of capacity building skills in urology.

A manikin of an in situ distended urinary bladder was required for the training session. This was designed and constructed using readily available materials at a low cost burden.

This paper describes the manikin and its suitability for use in SPC training.

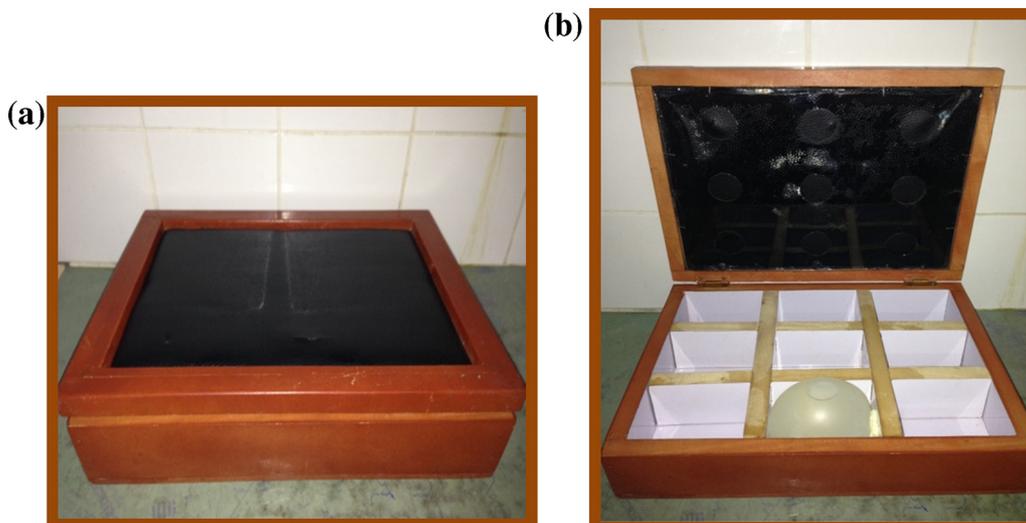


Picture 2 Manikin, closed to allow training on how to insert supra-pubic catheter.

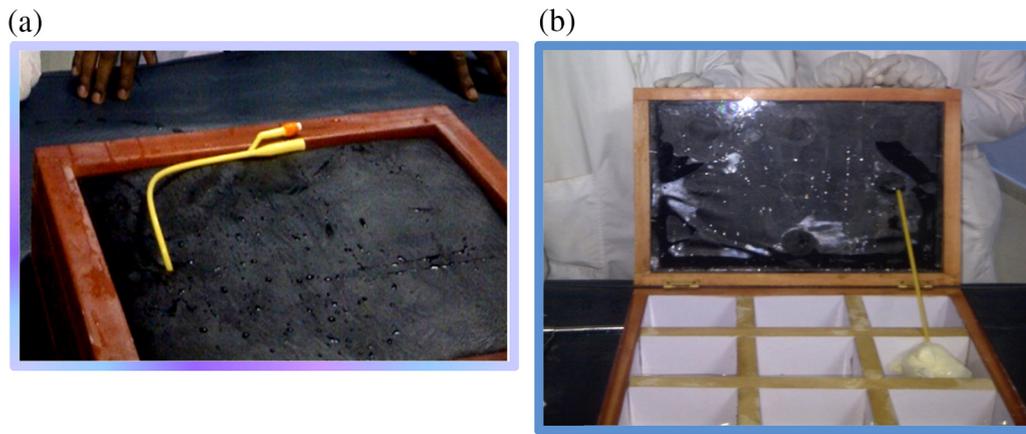
The UCH bladder manikin®

The design (Pictures 1–3)

The manikin consists of a wooden box with a base and a lid. The base represents the rigid pelvis housing the simulated in situ distended bladder. The lid is lined with a tri-laminar hood consisting of foam sandwiched in between two layers of leather. These are analogs of the skin, sub-cutis and fascia of the anterior abdominal wall. This tri-laminar hood covers a Perspex sheet with multiple 5 cm diameter holes for catheter insertion. When using the open method, these layers of the “anterior abdominal wall” are severed sequentially at the landmark stoma site. The layers are then retracted, displaying the simulated distended bladder underneath made of water-filled gloves (Pictures 1–3).



Picture 1 The UCH bladder manikin (a) closed and (b) open, with in situ distended bladder.



Picture 3 Manikin, closed (a) and open (b), showing the bladder successfully catheterized by participants at the workshop using the trocar technique.

Methods

A “Foundation of Urology” workshop was organized by the Ibadan PIUTA Centre in March 2013. At the workshop, general medical practitioners and surgical residents were instructed in basic urological skills including urethral catheterization, emergency suprapubic catheterization, endourology and uroflowmetry. Training in open and percutaneous techniques of SPC was done in two stages. First, the techniques were demonstrated to the participants by consultant urologists. Then the participants practised both techniques under supervision. The locally manufactured UCH bladder manikin® was used for these purposes (Picture 1).

At the end of the workshop, questionnaires were distributed to evaluate the effectiveness of the manikin in SPC training. A follow-up review on how the clinical practice of the surgical residents who had attended the workshop had changed was conducted via questionnaire six months after the workshop had taken place.

Results

Twenty-five participants attended the workshop. Eighteen of them were non-urological surgical residents; the others were family physicians and gynecologists. All participants were taught and practised the open and percutaneous techniques using the manikin. They were divided into small groups to facilitate learning. At the end of the workshop, 67% of the participants preferred the percutaneous method of suprapubic catheterization, while 33% preferred both the open and percutaneous methods. All of the participants stated that the manikin was an effective teaching aid. All participants confirmed that the training session would enhance their ability to carry out the procedure in their various practices. Ninety-five percent (95%) of the candidates expressed their desire to attend the workshop again. All attendees affirmed that they would recommend the workshop to colleagues.

A follow-up review on the changes in clinical practice of the surgical residents who had attended the workshop was conducted via questionnaire six months after the workshop had taken place. This was to test the short-term skill retention of the participants. All the residents reported that the manikin had been an effective training tool for SPC. The reasons supporting this statement included

its practicability (56%), simplicity (33%) and ability to simulate the necessary landmarks as well as the “real-life experience” (11%). By the time of the review 67% had performed an SPC in their practice. Of these, 83% had used the percutaneous technique only, while 17% had applied both the open and percutaneous techniques (Chart 1). No post-procedural complications had occurred.

Discussion

The art of medicine stems from apprenticeship, the three phases of which are observation, skill acquisition and experimentation [6]. This was the basis for initiating the foundation of urology courses designed to teach the participants the techniques of suprapubic catheterization and other essential urological skills, as well as to enable these doctors to practise these skills in a hands-on setting before applying them to patients. An appropriate manikin for suprapubic catheterization was not available, and those that could be imported were not affordable [7,8]. It was therefore necessary to find an appropriate manikin to be used in the local environment. Suprapubic catheterization, although commonly described as a simple procedure, may be complicated in up to 10% of cases by bowel injury (2.4–2.7%), stomal bleeding or stomal infection, septicemia or even mortality (0.8–1.8%) [9]. A practitioner should therefore know the indications, contraindications and techniques of suprapubic catheterization. Similar workshops on urological skills have been conducted in third-world countries. These workshops usually

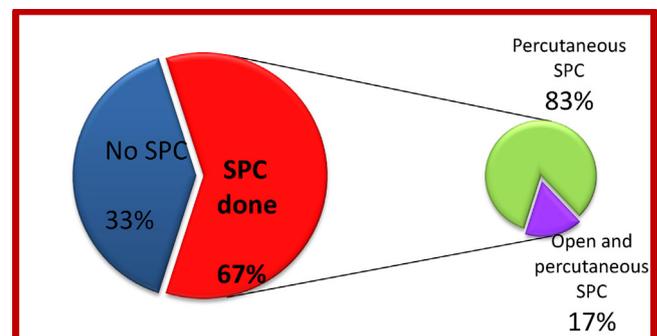


Chart 1 Percentage of residents who had done an SPC six months after the workshop.

use imported manikins at notable cost and/or involving administrative burdens [7,8,10]. Thus, the sustainability of these workshops is arduous and precarious [10]. In 1988, Professor Elebute (Professor of Surgery, University of Lagos, Nigeria) identified the need “to fashion equipment from locally available materials and devise treatment maneuvers suited to the structural background of our working environment” [11]. Tran et al. advocated the use of teacher-made models in low-resource countries as these are more affordable, hence large numbers can be provided for training, and replacements can be made or models repaired faster [10]. The UCH bladder manikin® design allows for comfortable concomitant use by multiple trainees, making it even more cost-effective. The tri-laminar hood of the lid is replaceable allowing repeated use. All other components are reusable.

To the best of our knowledge, there is no documentation of the development of a manikin similar to that of our faculty in any other low-resource country for use in their environment. Neither has there been any documentation on a manikin to be used for the demonstration and practice of both the open and percutaneous techniques of suprapubic catheterization in other countries of the world. A “UroEmerge” bladder designed by Shergill et al. in 2008 may be the only low-cost predecessor for training in percutaneous suprapubic cystostomy [12], however we were unaware of its existence when designing our device and carrying out our urology course. Importantly, our manikin is cheaper and easier to maintain. Our device can be also be used for training sessions on diagnostic peritoneal lavage, as the principles are the same.

Our results showed that six months after the course 67% of our participants had been able to carry out suprapubic catheterization. In addition to the percutaneous technique, 17% of them had also performed the open method in their patients. Those who had not yet performed suprapubic catheterization in practice had not rotated through the urology division within the six-month time frame of this study and therefore, had not encountered patients in need of the service.

Our finding of an increase in the frequency of suprapubic catheterization by participants who had attended our course is similar to that of other reports in the literature [10,12]. It confirms that skill acquisition and practice using manikins boosts the practitioners' confidence when facing actual patients.

Conclusion

The UCH bladder manikin® is an effective and low-cost aid for teaching doctors SPC.

It is easily manufactured, consists of readily available materials and will encourage the safe utilization of SPC by personnel so trained. We recommend it to be used in centers in low-resource countries.

Authors' contribution

Professor E.O. Olapade-Olaopa is the major author of the article and in association with Dr. S.A. Adebayo was responsible for the conceptualization and production of the design. Dr. I.N. Chibuzo, Dr. A.O. Takure, Professor L.I. Okeke and Professor O.B. Shittu are the co-investigators of this study.

Conflict of interest

The authors have no conflict of interest to declare.

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