A LUMP MODEL FOR MEDICAL STUDENTS' CLINICAL EVALUATION

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ABSTRACT

Introduction: **Soft tissue masses are commonly encountered in surgical and general medical practice. The graduating medical student should therefore be competent in the physical examination of a lump. Paucity of real patients makes it paramount that models be used for teaching and evaluation. This study purposed to describe the perception of graduating medical students to the use of a low-cost lump model for Objective Structured Clinical Examination (OSCE).**

Methods: **This was a cross-sectional survey of final year medical students who participated in a surgery OSCE utilizing an innovative low-cost lump model.**

Results: **One hundred and sixty students undertook the OSCE examination while 130 (81.3%) students completed the survey questionnaire. One hundred and forty students (87.5%) passed (score ^{3} 5) the skills assessment using the lump model. The median age of the students who completed the questionnaire was 25 (range 24-27) years. There were more males N=84 (65.6%) than females N= 44 (34.4%). Two thirds (67.2%; n=84) of the students said the model simulated a true lump. Nearly all the students agreed that the signs of site (97.6%; n=127), size (97.6%; n=127), shape (95.4%; n=124) and transillumination (95.4%; n=124) were clearly demonstrable with the model. A lower proportion of agreements were seen with signs such as tenderness (64.6%; n=82), attachment (77.7%; n=80) and warmth (58.6%; n=75) while more students disagreed with pulsatility (51.5%; n=67)**

Conclusion: **The medical students had a positive perception to the use of the model. However, further refinements would be needed for more signs to be demonstrable.**

Keywords: Lump model, Objective structured clinical examination, Simulation, Medical students

INTRODUCTION

Soft tissue masses are commonly encountered in surgical as well as general medical practice. The major identifying feature is the presence of a lump characterized by specific signs elicited on physical examination of the patient. While most of these masses are benign, it is crucial that malignant masses are identified early.[1,2] Examination of a lump is therefore a competency-based skill medical students must acquire. In addition, determination of possible causes of the lump based on the characteristic signs form the basis for examination of the students' foundational knowledge of these common masses.

The Objective Structured Clinical Examination (OSCE) has become a core component of undergraduate and postgraduate medical education. It has been proven to be valid and reliable for the measurement or assessment of clinical competency.[3–5] These competencies span knowledge, skills, and attitudes all of which the medical student is expected to become proficient in by the end of the training. Turner and Dankoski emphasized the importance of focused review of OSCE methods to improve its validity in measuring these core competencies.[6] While the widespread use of OSCE attests to its importance, inherent potential breaches exist such as test security and validity of the examinations, which coordinators must intentionally seek to identify and address.[7–10] Additionally, evaluation of physical examination skills at OSCE stations needs to be examined periodically to ensure its validity.[10]

The OSCE methods have evolved from using real patients to standardized patients and models for demonstration of clinical competencies. Simulation based medical education is accepted in many countries.[11–13] Simulation with the use of mannequins in medical education ensure training on clinical skills and provide an avenue for repeated practice outside the clinical setting. Factory produced mannequins using materials such as silicone are of high fidelity. However, while the integration of high-fidelity mannequins into

OSCE skill stations may be available in high resource settings, this is not feasible in low resource settings and the need to develop low-cost mannequins for teaching clinical skills is germane in the latter.[14–16] The innovative use of low cost readily available materials for development of mannequins in low resource settings ensures sustainability.

This study determines the pass rate of graduating medical students who used the innovative low-cost lump model for OSCE and describes their perception of the model.

MATERIALS AND METHODS

Setting

Surgical exposure of medical students

Medical students have three phases of exposure to core aspects of surgery at the university where the authors are based. Each phase spans six, eight and six weeks in their third, fourth and sixth years of training at the university, respectively. During these exposures, the students rotate through the different surgical specialties. The students receive lectures on examination of a lump prior to their surgical rotations. They also have tutorial sessions on examination of a lump and the clinical demonstration of this is done on real patients in the surgical outpatient clinic. In addition, the students are expected to clerk patients with lumps, perform physical examinations of the lumps under supervision and proffer diagnoses and treatment plans while being supervised by assigned faculty. The students do not routinely use models for simulation of lumps during their clinical rotations.

The unavailability of sufficient number of real patients with identical lumps for the different batches of candidates at the final examinations led to the innovation of a lump model for examinations of medical students. Each examination, over a day period, would require six to 12 patients with identical lumps to be suitable for a station. These models have been used for five years but have not been previously evaluated.

Model design

Materials (Figure 1):

Water
Cling film
Rubber band
Paper tape
Surgical glove (size 8, wrist length) X1
Surgical glove (elbow length) X1

Technique

The digits of the size 8 surgical glove are all tied together (Figure 2a). This leaves the palmar area of

Figure 1: Materials needed for lump model

the surgical glove as a receptacle for the water. Approximately 50mls of water is poured into the palmar area. The opening of the glove is then tied thereby retaining the water (Figure 2b). A rubber band is used to bring the two loose ends together hereby accentuating the balloon like (lump)model (Figure 2c). The application of the rubber band is done to provide flanges of the latex that will serve as anchors. The attached video demonstrates the application of the model to the forearm of a simulator. The volunteer trained simulator sits comfortably, and the lump model is secured to the volar surface of the forearm using paper tape and cling film. Care is taken to ensure it is not tight and that the lump model is mobile. The elbow length glove is then worn to cover the entire area (figure 3 and video demonstration). The students are expected to be seen demonstrating all clinical signs of a lump using this model.

Pattern of OSCE examination

The students are required to go through 11 OSCE stations. Each student spends five minutes in each station and is prompted by a bell to move to the next station. One of the stations contains the lump model on a volunteer trained simulator as well as an examiner who observes the student during the process of the

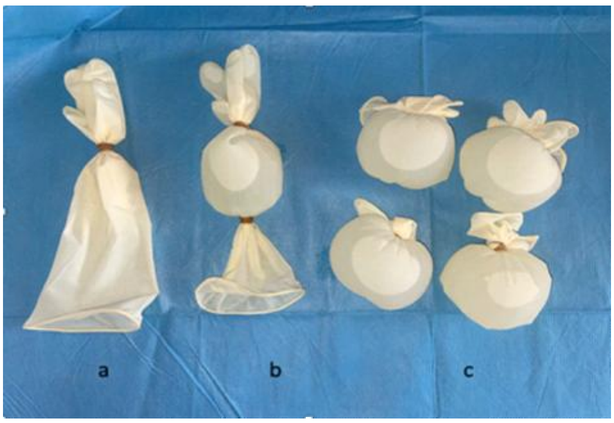


Figure 2: a - rubber band used to fasten glove digits, **b** - water retained in glove, **c** - Lump models

Figure 3: Lump model on forearm of simulator

examination. The examiner awards scores for each of the steps as provided in a score guide. At the conclusion of the examination the student proceeds to the next station, which is the follow up station. This station provides questions directed at the expected diagnosis obtained on the examination of a lump and the expected management plan. This follow up station is not manned by an examiner but the candidates are required to answer on specified examination papers and drop their answers in an envelope before leaving the station. A member of the examination organizing team is stationed nearby to observe proceedings at the follow up station. Each station has a total score of 10 and the pass mark is set at 5.

Survey

At the end of the OSCE a 20-item anonymized questionnaire was administered to the students after obtaining an informed consent. The questionnaire included a Likert scale section assessing the view of the respondents on which of the typical signs of a lump were demonstrable with the model. The anonymized scores of the students for both the examination and follow up stations were retrieved from the examination coordinators. This study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendment.

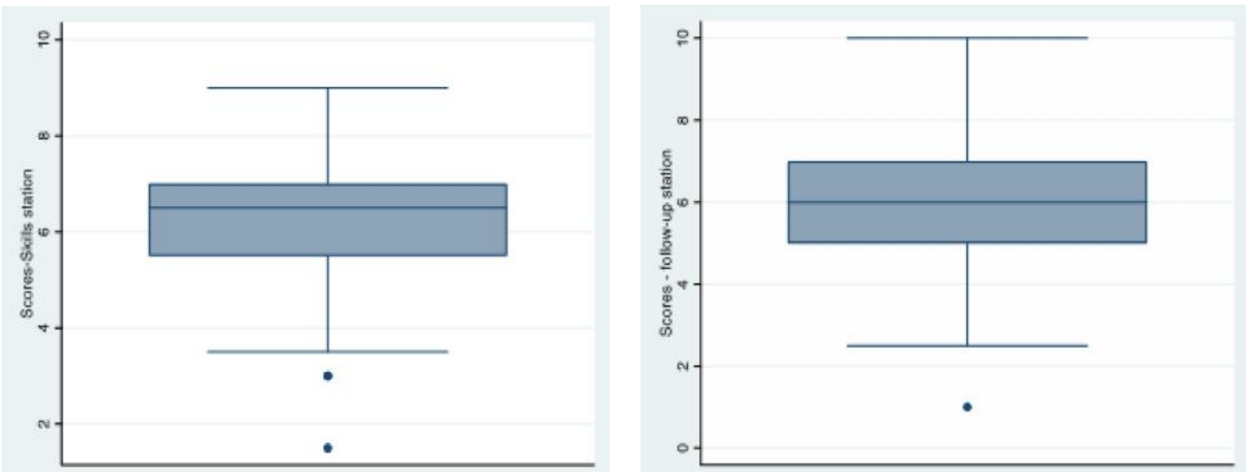
Data analysis

Data were analyzed using Stata statistical software, version 17.0 (Stata Corp, Texas, USA) .

The five-item Likert scale responses were dichotomized to "agree" and "disagree" by combining "strongly agree" and "agree" as "agree", while "neutral", "disagree" and "strongly disagree" were taken as "disagree". Categorical variables were presented as frequencies and percentages and continuous variables presented as mean ± standard deviation if normally distributed. Normality of continuous variables was tested with Shapiro Wilk test and displayed as box plots. Correlation between the score obtained at the examination station and the follow up station was tested using the Spearman's rank test. Missing responses were excluded from the entire analysis. A P-value < 0.05 was set as statistically significant.

RESULTS

One hundred and sixty students undertook the OSCE while 130 (81.3%) students completed the survey questionnaire. One hundred and forty (140) students (87.5%) passed (score ³ 5) the skills assessment using the lump model. The scores for the skills station were not normally distributed, Figure 4a. The median score was 6.5 (range 5.5-7.0). There were two outliers with rather low scores. The scores for the follow up station were normally distributed, Figure 4b. The mean score was 5.8 (±1.5). There was one outlier with a score <2.



a b

Figure 4: Box plots of scores obtained at skills (a) and follow-up stations (b)

There was no correlation between the skills station scores and scores obtained in the follow-up station. $r_s = .1108$, $p = .1630$.

The median age of the students who completed the questionnaire was 25 (range 24-27) years. There were more males (65.6%; n=84) than females (34.4%; n=44). Nearly all (92.3%; n=120) the students had not been exposed to this method of simulation for a lump with only ten (7.7%) having a prior exposure. Two thirds (67.2%; n=84) of the students said the model simulated a true lump, Figure 5.

The proportion of students who agreed that the characteristic signs of a lump were demonstrable on

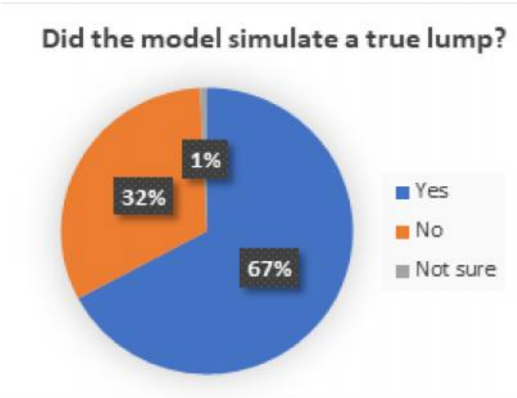


Figure 5: Students responses on whether the model simulated a true lump

the lump model is depicted in Figure 6. Nearly all the students agreed that the signs of site (97.6%; n=127), size (97.6%; n=127), shape (95.4%; n=124) and transillumination (95.4%; n=124) were clearly demonstrable with the model. A lower proportion of agreements were seen with signs such as tenderness (64.6%; n=82), attachment (77.7%; n=80), warmth (58.6%; n=75) and pulsatility (48.5%; n=63)

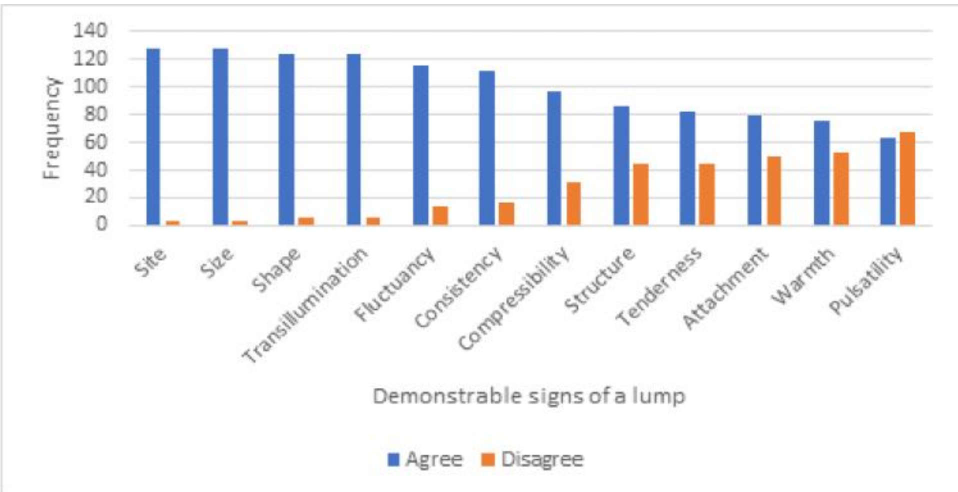


Fig 6: Students level of agreement on what signs of a lump are demonstrable on the lump model

DISCUSSION

We evaluated the use of a lump model in the OSCE in surgery for final year medical students. There was a high pass rate of the students skills with the lump model. This ability to demonstrate the features of a lump using this model was not associated with the scores they obtained in the follow up station, which assessed their cognition. While most of the students agreed that clinical signs of a lump were demonstrable on the model, this agreement was more for signs such as site, size, shape and transillumination than for other signs. More students disagreed with the demonstration of pulsatility using the model.

With the OSCE now a core component of medical education in most climes, it is imperative that the examination structure and content is evaluated periodically.[6] Mannequins used within these contexts need to be evaluated to ensure that the core competencies desired to be measured are achievable.[17] Most of the students in our study passed the examination with the use of the lump model. They were also able to distinguish which signs were demonstrable with the model. Medical students have been found to provide veritable feedback on the ability of simulation models to assess competency-based skills during OSCE.[18] Although most of the students had not been exposed to the model prior to the examination, they had a high pass rate. This may suggest that this low-cost model efficiently simulated a true lump as also provided in their feedback. The feedback of the students also revealed a consideration for further refinements of the model to depict signs such as pulsatility. Alternatively, this sign should not be required of the students in the generation of the marking scheme. Additionally, this model may be utilized for simulation-based learning on lump examination during the clinical rotations of the students. The students would then understand what is expected of them with the signs they have agreed less with. Simulation based learning is a core component of the curriculum of medical students in different climes and students have been reported to have a high value for simulation-based learning.[11,17,19,20] Elliot and Heckman reported that faculty observers have inherent limitations in their observation of physical examination skills during an OSCE.

CONCLUSION

The medical students' feedback suggests that the low-cost lump model was effective in simulating a true lump. However, further refinements would be needed for more signs to be demonstrable.

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