Original Article

Evaluation of Clinical Exodontia Skills of Final Year Students at a Dental School in Karachi

Arfa Baig, Faiza Yousuf, Mehshaar Raheel Khan, Hiba Khalid Khan, Anwar Ali, Shoaib Chawhan

ABSTRACT

OBJECTIVES: The study was conducted to assess the clinical exodontia skills of final year dental students using the Assessment-of-Clinical-Exodontia-Skills (ACES) rating scale during their posting in the department of oral and maxillofacial surgery, and to determine the improvement in clinical exodontia skills after targeted teaching sessions and demonstrations.

METHODOLOGY: An interventional cross-sectional study was performed on undergraduate students of final year at Dr. Ishrat-ul-Ebad Khan Institute of Oral Health and Sciences from October 2019 to May 2020. Both male and female students were included. Students from other academic years, universities, and departments along with the non-consenting students were excluded. They were assessed during their exodontia procedure on their first day of rotation using an ACES rating scale and repeated on the last day of the rotation. Two-tailed Wilcoxon's signed-rank test was used to compare the scores of the first and last day. The data was analyzed using SPSS version 20.

RESULTS: Only 9.4% of students cleared their assessment on the first day of their clinical rotation. However, 70% of students were able to clear it on their last day's assessment. Significant improvement from the first to last day of the clinical rotation was noted in the scores of five main competencies in the ACES rating scale and overall result ($p < .001$).

CONCLUSION: In conclusion, the induction of the ACES rating scale in an interactive environment proved to be a promising approach giving a deep insight into the student's capabilities and additional emphasis required to steer them towards independent practice.

KEYWORDS: Oral & Maxillofacial Surgery, Final-Year Dental Students, Exodontia Skills, Clinical Competency, ACES Rating Scale.

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INTRODUCTION

Clinical schooling in dentistry encompasses carrying out permanently altering clinical skills for which the students are held responsible. This is why learning and practicing these skills is stressful and demanding training. Hence it is deemed highly important that these students are given accurate demonstrations of clinical setups and judged keenly on their clinical hand[1].

Usually, students are judged through oral and written examinations in addition to the logbook quota of clinical procedures that need to be completed throughout the academic year. Recently, a new shift towards competency-based skill assessment has begun whereby students must achieve good control over basic dental skills[2,3]. As per contemporary medical and dental training program guidelines, there is more emphasis on both quality and quantity of procedures being performed by undergraduate students and so in turn by fresh graduates. Recent researches have recognized that the written mode of examination alone is not enough and means of assessing competency in clinical situations is now essential[4]. This method of competency education utilizes assessment as a means of learning.

According to the recent General Dental Council (GDC) outline, a new dental graduate is considered a 'safe beginner' instead of an independent practitioner[5]. This is because freshly graduated dentists may have completed their theoretical learning program but this does not accredit them as independent general dentists. It is difficult to consider that a new dental graduate has completed his or her transition from a supervised to an unsupervised practitioner. So it is significant for undergraduate students to acknowledge the level of their clinical skill limitations to identify cases that are out of their expertise which might require the supervision of a senior.

A similar study was performed in the United Kingdom (UK) to assess the competency of undergraduates. It concluded that students felt less prepared for complicated procedures such as orthodontic treatment needs, treatment planning, crowns, endodontic, research skills, and referral for suspected oral cancer. However, students felt well prepared for inferior alveolar nerve administration, nonsurgical extractions, and tooth-colored fillings[6]. A cross-sectional

observational study was held in the Department of Maxillofacial Surgery and Diagnostic Sciences, Aljouf University, Saudi Arabia regarding the preparedness of undergraduates for clinical procedures. This study revealed 96.9% highest level of confidence in the administration of local anesthesia and the least confidence 56.3% was seen in the extraction of the third molars[7].

In May 2017 a study was performed in Faisalabad Medical College, Pakistan for the development of an assessment scale for clinical skills of undergraduate dental students. An initial scale was formed with the help of the literature and the opinions of experts. The overall response rate in the preliminary round was 71.4 % and then as a result of their responses the form was modified and the Assessment-of-Clinical-Exodontia-Skills (ACES) rating scale was formed[8].

The ACES rating scale is comparatively a new addition to the assessment methods implemented in the local curriculum. To determine whether this rating scale could be incorporated in our curriculum setting, a study to check the clinical reliability of this scale for competency assessment was necessary. The motive was to produce a rounded professional graduate who has a clinical skill set necessary for the preparedness of an independent practitioner.

METHODOLOGY

An interventional cross-sectional study was performed on undergraduate students enrolled in the final year of Dr. Ishrat-ul-Ebad Khan Institute of Oral Health and Sciences, posted in the OMFS department using the convenience sampling technique. It was carried out for eight months from October 2019 to May 2020 after the Institutional Review Board (IRB) approval. Both male and female final year students were included. Students from other academic years, universities, and departments along with the non-consenting students were excluded. Students were given a consent form on their first day of a 2-month clinical rotation as well as on their last day. Participants were assessed during their exodontia procedure using an ACES rating scale under the supervision of assistant professors. Furthermore, ten targeted teaching sessions and demonstrations were conducted during their rotations with emphasis on their particular areas of lacking.

For the assessment, the examiners used the ACES pro forma developed using the Delphi Technique[8]. It comprised of five major competencies namely; preoperative assessment (15% weightage), local anesthesia (30% weightage), extraction technique (35% weightage), cross-infection control (10% weightage), and post-operative management (10% weightage). Each component consisted of a further 28 sub-competencies out of which 14 were marked as mandatory i.e. the student who failed to clear them, was considered as a failed student irrespective of the total score. The sub-competencies were marked using the 5-point Likert Scale (5=excellent, 4=good, 3=satisfactory, 2=unsatisfactory, 1=poor). Students attaining 50% of the total score were declared pass keeping in mind the clearance in mandatory sub-competencies.

The data was analyzed using Statistical Package for the Social Sciences (SPSS) version 20. Two-tailed Wilcoxon's signed-rank test was used to compare the scores of the first day and last day of all the five major competencies and overall scores. Additionally, a comparison was carried out for each student and also independently for each of the 28 sub-competencies using frequency analysis.

RESULTS

A total of 97 students enrolled in the final year rotated as four clinical groups in the Oral & Maxillofacial Surgery department. They were assessed using the ACES rating scale on the first and last day of their 2-month clinical rotation. Of the total of 91 students that appeared in the assessment, six were absent on the first-day assessment and one was absent on the last-day assessment.

Only 9.4% of students cleared their assessment on the first day of their clinical rotation. However, 70% of students were able to clear it on their last day's assessment. **[Figure I]** Significant improvement from first to last day was noted in the scores of the five main competencies in the ACES rating scale and the overall result ($p < .001$). **[Table I]**

Of all the 28 sub-competencies, 14 were considered mandatory making them automatic fails. In comparison to the first-day assessment, a difference of a minimum of 17.7% of students and a maximum of 40.5% of students who cleared these necessary sub-competencies on their last day assessment were observed. **[Table II]**

The other 14 sub-competencies also exhibited substantial development with the highest difference noted in 'Checks expiry date of cartridge' (44.6%). The lowest difference noted in 'Advises & interprets radiographs (when needed)' was also as high as 14.4%. **[Table III]**

TABLE I: DIFFERENCE BETWEEN SCORES ON FIRST & LAST DAY OF ROTATION

Competencies Evaluated In Final Year Students	Z Value	p-Value
Pre-Op Patient Assessment	7.466[b]	0.000 (8.2E-14)
Local Anesthesia	7.688[b]	0.000 (1.5E-14)
Extraction Technique	7.927[b]	0.000 (2E-15)
Cross-infection Control	5.017[b]	0.000 (5.2E-7)
Post-Op Management & Care	7.233[b]	0.000 (4.7E-13)
Overall Marks	7.961[b]	0.000 (2E-15)

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks

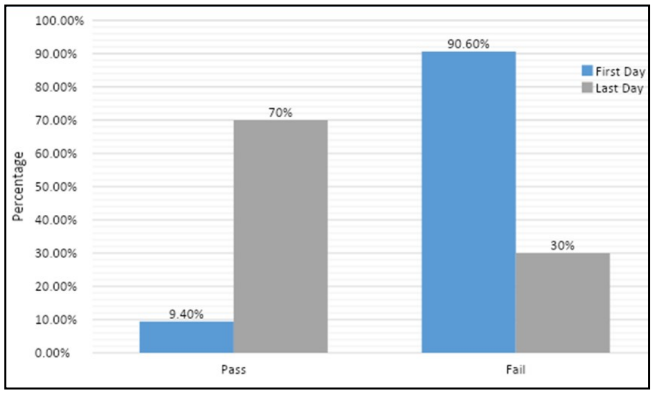
TABLE II: SCORES OF MANDATORY SUB-COMPETENCIES ON FIRST & LAST DAY OF ROTATION

MANDATORY SUBCOMPETENCIES TO CLEAR THE ASSESSMENT (ACES Rating Scale)	First Day		Last Day	
	Fail (%)	Pass (%)	Fail (%)	Pass (%)
Acquires pertinent history & identifies comorbid conditions	24.7%	75.3%	0.0%	100%
Performs pertinent clinical examination	22.4%	77.6%	2.2%	97.8%
Takes informed consent	37.7%	62.3%	8.8%	91.2%
Knows anatomical landmarks	34.1%	65.9%	6.6%	93.4%
Positions oneself properly a/c to anesthesia admin.	37.6%	62.4%	4.4%	95.6%
Appropriate loading of syringe, proper selection & entry of needle, confirms negative aspiration & deposits adequate amount of solution	30.5%	69.5%	4.4%	95.6%
Ensures correct tooth	25.8%	74.2%	5.5%	94.5%
Applies periosteal elevator properly	25.8%	74.2%	3.3%	96.7%
Judiciously uses elevators (if needed)	38.8%	61.2%	4.4%	95.6%
Grips forceps and applies force properly	31.7%	68.3%	5.5%	94.5%
Ensures proper retraction and jaw support	48.2%	51.8%	7.7%	92.3%
Luxates and delivers tooth properly	33%	67%	4.4%	95.6%
Maintained cross infection control & followed universal precautions throughout the procedure	24.7%	75.3%	5.5%	94.5%
Provides proper postoperative instructions	17.7%	82.3%	0.0%	100%

TABLE III: SCORES OF SECONDARY (NOT AUTOMATIC FAILS) SUBCOMPETENCIES ON FIRST & LAST DAY OF ROTATION

MANDATORY SUBCOMPETENCIES TO CLEAR THE ASSESSMENT (ACES Rating Scale)	First Day		Last Day	
	Fail (%)	Pass (%)	Fail (%)	Pass (%)
Greets & introduces oneself	16.40%	83.60%	1.10%	98.90%
Advises & interprets radiographs (when needed)	19.90%	80.10%	5.50%	94.50%
Develops diagnosis & justifies extraction	30.50%	69.50%	3.30%	96.70%
Ensures correct choice & dosage of Local Anesthesia	36.50%	63.50%	7.70%	92.30%
Checks expiry date of cartridge	62.30%	37.70%	17.70%	82.30%
Re-sheathing and securing of needle after injection	45.80%	54.20%	4.40%	95.60%
Confirms success of anesthesia by asking the patient about change in sensation and gingival probing	24.70%	75.30%	3.30%	96.70%
Reassures patient about pain and pressure sensations	29.50%	70.50%	3.30%	96.70%
Knows adjunctive measures in case of failure of anesthesia	50.60%	49.40%	13.30%	86.70%
Positions patient and oneself properly according to tooth to be extracted	29.40%	70.60%	4.40%	95.60%
Identifies and arranges the required armamentarium correctly	21.20%	78.80%	5.50%	94.50%
Knowledgeable about management of common complications of exodontia	44.80%	55.20%	12.30%	87.70%
Socket care and hemostasis	17.70%	82.30%	1.10%	98.90%
Prescription Writing	29.50%	70.50%	3.30%	96.70%

FIGURE I: DIFFERENCE IN CLEARANCE RESULT BETWEEN FIRST & LAST DAYS



DISCUSSION

Dentistry is generally perceived as a hands-on practical study field when compared with medicine being an academic field initially. Therefore, the assessment and evaluation of the clinical hand of dental students during the undergraduate level is considered vital to use feedback as motivation for better learning along with the safety and well-being of the patient[9]. Multiple approaches have been implied for this purpose around the world, including viva voce, formative and summative assessment, Objective Structured Clinical Examination (OSCE), Structured Clinical Operative Tests (SCOT), etc [4,10]. This study introduces the use of a newly developed approach to judge the undergraduates using the ACES rating scale on their first and last day of the rotation[8].

Different clinical extraction scenarios require a varied set of clinical abilities that should all be taught to students during their rotation in the OMFS department and then evaluated accordingly[11]. One-time assessment may contribute to misleading results as it could be easily blamed on being a bad day for the students[12]. This was the reason we opted for a two-day based evaluation to minimize the bias.

We made sure that the students were well informed about the schedule and marking criteria of the assessment beforehand as the ACES rating scale was a new introduction. To get them well acquainted with the sub-competencies, and to encourage self-evaluation; a checklist of these parameters was displayed in front of all the units of the department. It was after because 15% of the students lacked awareness as reported by R. Redford et al. in his study done in the UK[13]. Majid O 2018[10] in his longitudinal comparative study introduced the new format to students via a pre/mock assessment so they were well informed before their midterm and final examination. These measures enhanced the final clinical skills which lead to better performances in their last day evaluation.

Individual feedbacks were provided to the students on spot after their assessment on both days. In addition to this, targeted teaching sessions and demonstrations were conducted during their rotation to emphasize their specific areas of lacking. It is considered an active learning process as it engages the students in cases before they undertake the extraction process which is a constructive way of building a good surgical hand and retaining the theory[13].

The overall score and the scores of the five major competencies of the ACES rating scale of the last day showed immense refinement of skills ($p < .001$) when compared to the first day. This difference is attributed to student-centered sessions and demonstrations held during the two-month rotation to address their areas of lacking as detected after the first day of rotation assessment.

Nevertheless, 9.4% of the students were able to clear their first-day assessment. This may be related to their clinical exposure in third-year rotations, internships, and individual self-study levels[14-16]. Similar findings were related to greater clinical exposure as a difference in confidence was noted among students in a survey done by Redford R 2018[13]. On the other hand, 70% of the students who managed to clear the evaluation on their last day of rotation were just not only because of their clinical exposure from the third year but also due to an increase in interactive teaching sessions and demonstrations during clinical rotations. This improvement in competency related to a greater number of teaching sessions is also reported by Moore U 2009[3] (P & lt; 0.01, r = 0.260).

Out of 28 sub-competencies, 14 were considered mandatory making them automatic fails. Amongst these mandatory sub-competencies, the highest failure rate of the first-day evaluation was detected in proper retraction and jaw support (48.2%) followed by elevator use (38.8%); taking informed consent (37.7%), and position for anesthesia administration (37.6%). In the other 14 sub-competencies, the highest failure rate of the first-day evaluation was noted in checking the expiry date of the cartridge (62.4%) followed by knowledge of anesthetic adjunctive measures in case of failure (50.6%); re-sheathing of the needle after injection (45.8%) and knowhow of managing post exodontia complications (44.8%).

Redford R 2018[13] reported a similar need for additional teaching in the use of an elevator by 89% of the students followed by the use of forceps by 35% of

the students in a dental school in the United Kingdom. This depicted that the final year students required extra emphasis on these steps during extraction demonstrations and interactive learning sessions especially the mandatory sub-competencies to avoid failure in the final assessment. These interventions targeted at the weakness detected from the first-day assessment of students led to efforts focused on areas of deficiency. This translated into significant improvements from first to last day as high as 61.2% for elevator use, 54.2% for re-sheathing of the needle after injection, and 51.8% for proper retraction and jaw support.

Despite these targeted interactive sessions and demonstrations, 8.8% of the final year students still lacked in taking informed consent which was noted as the primary reason they failed to clear the assessment on the last day of rotation even with good overall scores. From the other 14 sub-competencies, the highest failure rate of the last day evaluation was noted in checking the cartridge's expiry date (17.8%) making it one of the commonest causes of failure of students. These were not considered automatic fails but still raise questions regarding the emphasis and sufficient additional teaching provided for them.

Contrastingly, a study by Macluskey M 2004[17] in the United Kingdom using SCOT for the assessment of undergrad students reported cross-infection control as the commonest cause for failure (35%). After that, incorrect/inappropriate instrumentation (20%); inappropriate/incorrect local anesthetic technique (18%); patient (LA) /operator position (17%); poor patient management (10%) ranked the list of common cause of failures.

The ACES rating scale, explains the clinical skills competency tasks precisely which makes it easier for the examiner to evaluate basic requirements necessary for the future clinician regarding exodontia procedures. However, no new approach comes without its limitations. Despite the efforts to familiarize both the students and the staff, inter-examiner reliability varied since the scale was a new introduction and was relatively different from the end-of-rotation viva undertaken previously in the department.

Another limitation is the possible avoidance of the personal bias of the examiners. Although, efforts were made to avoid this, and students were randomly assigned to the examiners. It was still difficult to neglect the 'halo effect' by which higher or lesser marks are given to students based on their during-the-rotation interaction with the examiner leading to likeness or dislikeness. As suggested by Elledge R 2018[18] in his review, this could be addressed to some extent by taking the mean of scores by multiple examiners for a single student. However, it is a time-consuming alternative keeping in mind the high flow of patients in the department and the need for supervision for patient safety.

Clinical posting in the OMFS department alone is not sufficient for learning operative skills; the role of internships in different hospitals and outreach programs needs to be further explored in enhancing the skills of students. As Mabongo M 2015[19] concluded that enhanced surgical exposure and training at the undergraduate level translates into improved public dental care. Additionally, research using peer assessment locally should be considered as it provides a significant opportunity for students to act as a 'teacher' and makes them capable of understanding assessment criteria well. Further research can be done in this field in similar environments by comparing peer assessment with faculty assessments to validate the scale from both sides.

CONCLUSION

The ACES rating scale provided a standardized formative scoring scale in comparison to usual OPD assessment approaches to identify core clinical skills. This was due to the targeted interactive sessions and demonstrations that helped them utilize the experience of the abundant senior faculty at hand. This induction of the ACES rating scale in an interactive environment proved to be a promising approach giving a deep insight into the student's capabilities and additional emphasis required to steer them towards independent practice.

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AUTHOR CONTRIBUTIONS

Baig A: conception and design of this work and revised it critically for important intellectual content
Yousuf F: Acquisition of data and supervised the statistical analysis did literature search, interpretation the results, drafted the manuscript and finalized it
Khan MR: Acquisition of data and supervised the statistical analysis, did literature search, interpreted the results, drafted the manuscript and finalized it
Khan HK: Acquisition of data and supervised the statistical analysis did literature search, interpretation the results, drafted the manuscript and finalized it
Ali A: Conception and design of this work
Chawhan S: Acquisition of data and supervised the tests.

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AUTHOR AFFILIATION:

Dr. Arfa Baig *(Corresponding Author)*
Senior Registrar
Department of Oral and Maxillofacial Surgery
Dr. Ishrat ul Ebad Khan Institute of Oral Health Sciences
Dow University of Health Sciences, Karachi, Sindh-Pakistan.
Email: arfa_awan@live.com

Dr. Faiza Yousuf
House Officer
Dr. Ishrat ul Ebad Khan Institute of Oral Health Sciences
Dow University of Health Sciences, Karachi, Sindh-Pakistan.

Dr. Mehshaar Raheel Khan
House Officer
Dr. Ishrat ul Ebad Khan Institute of Oral Health Sciences
Dow University of Health Sciences, Karachi, Sindh-Pakistan.

Dr. Hiba Khalid Khan
House Officer
Dr. Ishrat ul Ebad Khan Institute of Oral Health Sciences
Dow University of Health Sciences, Karachi, Sindh-Pakistan.

Dr. Anwar Ali
Professor, Department of Oral and Maxillofacial Surgery
Dr. Ishrat ul Ebad Khan Institute of Oral Health Sciences
Dow University of Health Sciences, Karachi, Sindh-Pakistan.

Dr. Shoaib Chawhan
Senior Lecturer
Department of Oral and Maxillofacial Surgery
Dr. Ishrat ul Ebad Khan Institute of Oral Health Sciences
Dow University of Health Sciences, Karachi, Sindh-Pakistan.