Research Article

Assessment of Tobacco Cessation Counselling Among Dental Interns Using Workplace Based Mini- Cex Assessment Tool: A Longitudinal Study

Pavithra R [1], Shivasakthy Manivasakan[2]

[1]MHPE scholar, Institute of Health Professions Education, Sri Balaji Vidyapeeth, Puducherry.
Associate Professor, Department of Public Health Dentistry , Sri Venkateswara Dental College and Hospital, Chennai, Tamilnadu.
[2]Director, Institute of Health Professions Education, Sri Balaji Vidyapeeth, Puducherry. Professor, Indira Institute of Dental Sciences, Sri Balaji Vidyapeeth, Puducherry.

*Corresponding author: Dr.R.Pavithra

ABSTRACT

Background: Dental professionals are well placed to deliver brief tobacco cessation counselling (TCC), yet evidence on dental interns' counselling competency rests largely on self-report, knowledge tests and simulated encounters. This study assessed dental interns' TCC competency during real patient encounters using an adapted Mini-Clinical Evaluation Exercise (Mini-CEX) and examined the change in competency after structured feedback.

Methods: A longitudinal workplace-based study was conducted in the Tobacco Cessation Counselling clinic of a dental teaching institution in India. A seven-domain Mini-CEX with behaviourally anchored three-level descriptors aligned to the 5 A's and 5 R's was content-validated by four experts using item-level and scale-level content validity indices. Ten dental interns were directly observed counselling a tobacco-using patient, given immediate domain-wise feedback and reassessed with a different patient one week later. Domain and total scores were compared using the Wilcoxon signed-rank test.

Results: The scale-level content validity index (S-CVI/Ave) was 0.96; six domains had an item-level index of 1.00 and counselling skills 0.75. At baseline, 68.6% of 70 domain ratings were below expectation and none was above expectation. At reassessment, no rating was below expectation and 31.4% were above expectation. Scores improved significantly in all seven domains ($p \leq 0.008$), and the median total score rose from 10 (range 7–13) to 16.5 (range 14–20) ($p = 0.002$). Gains were greatest in counselling skills and medical interviewing, whereas physical examination, communication, clinical judgment and organisation largely reached only the expected level.

Conclusion: Directly observed TCC competency of dental interns was below expectation at baseline but improved significantly after a single cycle of Mini-CEX feedback. The adapted Mini-CEX is a feasible tool for both assessing and developing this competency during internship, although integrative and interpersonal skills are likely to require repeated observed encounters.

Keywords: Mini-CEX; workplace-based assessment; tobacco cessation counselling; dental interns; feedback; content validity.

INTRODUCTION

Tobacco use remains a leading preventable cause of disease in India, where 28.6% of adults use tobacco, predominantly in smokeless forms.[1] Smokeless tobacco is closely linked with oral potentially malignant disorders and with much of India's disproportionate oral cancer burden.[2] Dentists routinely examine the oral cavity, are often the first to detect tobacco-related mucosal changes and see patients repeatedly, and behavioural counselling delivered in the dental setting significantly increases tobacco abstinence.[3] Brief counselling is structured around the "5 A's" (Ask, Advise, Assess, Assist, Arrange) and, for patients not yet ready to quit, the "5 R's" (Relevance, Risks, Rewards, Roadblocks, Repetition).[4]

Indian dental students hold favourable attitudes towards tobacco cessation counselling (TCC), yet many rarely counsel patients, perceive their training as inadequate and request more practical teaching;[5–7] practising dentists cite lack of training, time and confidence as barriers.[8] Training interventions such as the Tobacco Counseling Training Module (TCTM) have improved students' knowledge, self-confidence and skills,[9,10] but these evaluations relied on questionnaires, knowledge tests or simulations. A recent systematic review noted that objective, performance-based assessment of counselling competency remains rare.[11] Knowing about tobacco cessation and being able to counsel a real patient competently are not the same, and the latter has seldom been measured.

Counselling is a workplace-based skill that can be assessed authentically only at the "does" level of Miller's pyramid.[12] Workplace-based assessment (WPBA) offers low-cost, authentic assessment with embedded feedback and has been recommended for dental curricula.[13] The Mini-Clinical Evaluation Exercise (Mini-CEX) involves direct observation of a focused patient encounter, rating across competency domains and immediate feedback.[14] A multi-institutional study confirmed its feasibility, showed that competence could be estimated

reliably from a modest number of encounters and highlighted the embedded feedback as an educational benefit in its own right.[15] The Mini-CEX has acceptable validity and reliability across specialties.[16]
In dentistry, the Mini-CEX was well received when introduced into undergraduate education in India[17] and was useful for identifying individual learning needs in dental radiology.[18] An adaptation for dental clerkships showed acceptable construct validity and reliability,[19] a pilot in orthodontic training emphasised faculty calibration,[20] and its use in postgraduate periodontology helped identify skill gaps for targeted remediation.[21] These studies indicate that the Mini-CEX is feasible and educationally valuable across dental disciplines and training levels.
We found no published study that has used the Mini-CEX to assess dental interns' TCC competency in an actual tobacco cessation clinic, or that has combined such assessment with structured feedback and reassessment. This study therefore aimed to establish the content validity of a Mini-CEX adapted for TCC, to assess interns' baseline competency during real patient encounters and to evaluate change in competency one week after structured feedback.

MATERIALS AND METHODS

Study design, setting and ethics

A longitudinal, single-group, workplace-based assessment study was conducted over four months in the Tobacco Cessation Counselling clinic of the Department of Public Health Dentistry at a dental teaching institution in India, after approval by the Institutional Ethics Committee (IEC/SVDCH/2618). Interns gave written informed consent, and patients gave verbal consent for their encounters to be observed and scored.

Participants

Ten dental interns posted in the clinic during their compulsory rotatory internship were included by convenience sampling; interns unable to complete both assessments were excluded. Patients were current tobacco users willing to be counselled by an intern.

Assessment tool

The Mini-CEX[14,15] was adapted to TCC, with domain content aligned to the 5 A's and 5 R's.[4] The tool comprised seven domains: medical interviewing, physical examination, clinical judgment, counselling, communication, professionalism and organisation/efficiency. In place of the original nine-point scale, each domain was rated on three levels relative to the performance expected of a dental intern (1, below expectation; 2, meets expectation; 3, above expectation), each anchored to observable behavioural descriptors (Table 1). Domain scores were summed to give a total score (range 7–21).

Table 1: Domains of the adapted Mini-CEX for tobacco cessation counselling and behavioural descriptors for each performance level

Domain	1 – Below expectation	2 – Meets expectation	3 – Above expectation
1. Medical interviewing	Does not systematically enquire about tobacco use; key details missed	Obtains type, frequency, duration, quit attempts and readiness	Comprehensive, patient-centred interview including dependence, barriers and psychosocial factors
2. Physical examination	Does not review or misidentifies relevant oral findings	Identifies oral findings accurately and explains their significance	Integrates oral findings sensitively into counselling to reinforce cessation
3. Clinical judgment	Advice poorly targeted to tobacco use, readiness or barriers	Assesses readiness and selects a suitable counselling approach	Integrates all patient factors into an individualised plan and referral
4. Counselling	Little or no counselling; generic instruction to quit	Structured counselling: assessment, advice, assistance and plan	Individualised quit plan with coping, relapse prevention and follow-up
5. Communication	Directive or judgmental; limited patient participation	Clear, respectful; listens and responds to concerns	Empathic, reflective listening; supports patient autonomy

Domain	1 – Below expectation	2 – Meets expectation	3 – Above expectation
6. Professionalism	Judgmental or disrespectful; boundaries or confidentiality breached	Respectful, non-judgmental; maintains confidentiality	Exemplary, culturally sensitive; builds trust and therapeutic relationship
7. Organisation / efficiency	Poorly sequenced; essential components missed	Logical sequence; essential components completed in time	Excellent prioritisation and time management without appearing rushed

Content validation

Four experts in Public Health Dentistry independently reviewed the tool using a structured form that defined each domain by its descriptors and asked whether the domain was relevant, observable, appropriate for interns and clearly graded, and whether any behaviour was missing or redundant. Each expert's area of expertise, experience and familiarity with workplace-based assessment were recorded, and every expert rated the same explicitly defined content. Each domain was rated on a 4-point relevance scale (1, not relevant; 2, somewhat relevant; 3, quite relevant; 4, highly relevant), and each expert gave an overall recommendation. Ratings of 3 or 4 were scored as relevant, and the item-level content validity index (I-CVI) and scale-level indices by averaging (S-CVI/Ave) and universal agreement (S-CVI/UA) were calculated.[22–24] With fewer than six experts, an I-CVI of 1.00 was required for each domain,[23,25] and an S-CVI/Ave of 0.90 or more was considered excellent.[22] Descriptors were revised in the light of expert comments before use.

Assessment procedure

A calibrated faculty member from the Department of Public Health Dentistry served as assessor. Interns were briefed on the format of the Mini-CEX but not coached on the scoring criteria, to preserve authentic rather than rehearsed performance. At baseline (Encounter 1), each intern was directly observed counselling a tobacco-using patient and rated in all seven domains. Immediately afterwards, the assessor gave structured, task-focused, domain-wise feedback that used the descriptors to highlight strengths and specific areas for improvement.[14,15] One week later, each intern was reassessed (Encounter 2) with a different patient using the same proforma. Outcomes were the domain-wise and total scores at each encounter and the change between encounters.

Statistical analysis

Data were analysed using SPSS version 20. Ratings were summarised as frequencies and percentages, and scores as medians (range) and means. Because ratings were ordinal and paired differences in total score were not normally distributed (Shapiro–Wilk $p = 0.022$), encounters were compared using the Wilcoxon signed-rank test, with $p < 0.05$ considered significant.

RESULTS

Content validity

Six domains were rated quite or highly relevant by all experts (I-CVI = 1.00); counselling skills received one rating of "somewhat relevant" (I-CVI = 0.75) (Table 2). The S-CVI/Ave was 0.96 and the S-CVI/UA 0.86. Two experts judged the tool "suitable with minor/no modification" and two "highly appropriate and comprehensive"; none recommended major revision. Counselling skills, being central to TCC,[4] was retained and its descriptors were refined.

Table 2: Expert ratings and content validity indices of the adapted Mini-CEX (n = 4 experts)

Domain	Expert ratings (1–4)	Experts rating 3 or 4	I-CVI	Interpretation
Medical interviewing skills	4, 3, 4, 3	4/4	1.00	Excellent agreement
Physical examination skills	4, 3, 3, 3	4/4	1.00	Excellent agreement
Clinical judgment	4, 4, 4, 3	4/4	1.00	Excellent agreement

Domain	Expert ratings (1–4)	Experts rating 3 or 4	I-CVI	Interpretation
Counselling skills	4, 3, 4, 2	3/4	0.75	Below criterion; descriptors reviewed
Communication skills	4, 4, 3, 3	4/4	1.00	Excellent agreement
Professionalism	4, 4, 3, 3	4/4	1.00	Excellent agreement
Organisation / efficiency	4, 3, 3, 3	4/4	1.00	Excellent agreement
S-CVI/Ave			**0.96**	**High overall content validity (≥ 0.90)**
S-CVI/UA			**0.86**	**6 of 7 domains with universal agreement**

Ratings: 1 = not relevant to 4 = highly relevant. I-CVI, item-level content validity index; S-CVI/Ave and S-CVI/UA, scale-level index by averaging and universal agreement methods.

Distribution of performance ratings

All ten interns completed both encounters (70 domain ratings at each time point). At baseline, 48 ratings (68.6%) were below expectation, 22 (31.4%) met expectation and none exceeded it (Table 3). Performance was weakest in physical examination (all ten interns below expectation), communication and organisation/efficiency (nine each), clinical judgment (seven) and counselling (six), and relatively better in professionalism (seven meeting expectation) and medical interviewing (six). At reassessment, no rating was below expectation; 48 (68.6%) met and 22 (31.4%) exceeded expectation. Ratings above expectation were most frequent in medical interviewing and counselling (six interns each) and professionalism (five), and least frequent in clinical judgment and organisation/efficiency (two each) and communication (one). In physical examination, all interns moved from below to meets expectation, but none exceeded it.

Table 3: Domain-wise distribution of Mini-CEX ratings at Encounter 1 and Encounter 2 (n = 10)

Domain	E1 Below	E1 Meets	E1 Above	E2 Below	E2 Meets	E2 Above
Medical interviewing skills	4 (40.0)	6 (60.0)	0	0	4 (40.0)	6 (60.0)
Physical examination skills	10 (100.0)	0	0	0	10 (100.0)	0
Clinical judgment	7 (70.0)	3 (30.0)	0	0	8 (80.0)	2 (20.0)
Counselling skills	6 (60.0)	4 (40.0)	0	0	4 (40.0)	6 (60.0)
Communication skills	9 (90.0)	1 (10.0)	0	0	9 (90.0)	1 (10.0)
Professionalism	3 (30.0)	7 (70.0)	0	0	5 (50.0)	5 (50.0)
Organisation / efficiency	9 (90.0)	1 (10.0)	0	0	8 (80.0)	2 (20.0)
All domains (70 ratings)	**48 (68.6)**	**22 (31.4)**	**0**	**0**	**48 (68.6)**	**22 (31.4)**

Values are n (%). E1, Encounter 1 (baseline); E2, Encounter 2 (one week after feedback).

Comparison of scores

Scores improved significantly in all seven domains ($p \leq 0.008$) (Table 4, Figure 1). No intern scored lower at Encounter 2 in any domain; ratings were unchanged only for one intern in clinical judgment and two in professionalism. As every non-zero paired difference favoured improvement, $W = 0$ in each domain, and $p = 0.002$ is the smallest value attainable with ten pairs. The largest change was in counselling skills (median 1 to 3; mean 1.4 to 2.6), followed by medical interviewing (mean 1.6 to 2.6); professionalism, with the highest baseline

score, changed least (mean 1.7 to 2.5). The median total score rose from 10 (range 7–13) to 16.5 (range 14–20) ($p = 0.002$), a mean gain of 7.0 points. The ranges did not overlap, so every intern's total score improved.

Table 4: Domain-wise and total Mini-CEX scores at Encounter 1 and Encounter 2 (Wilcoxon signed-rank test, n = 10 pairs)

Domain	E1 median (range)	E2 median (range)	p-value
Medical interviewing skills	2 (1–2)	3 (2–3)	0.002*
Physical examination skills	1 (1–1)	2 (2–2)	0.002*
Clinical judgment	1 (1–2)	2 (2–3)	0.004*
Counselling skills	1 (1–2)	3 (2–3)	0.002*
Communication skills	1 (1–2)	2 (2–3)	0.002*
Professionalism	2 (1–2)	2.5 (2–3)	0.008*
Organisation / efficiency	1 (1–2)	2 (2–3)	0.002*
Total score (7–21)	**10 (7–13)**	**16.5 (14–20)**	**0.002***

E1, Encounter 1; E2, Encounter 2. W = 0 for every comparison. *p < 0.05.

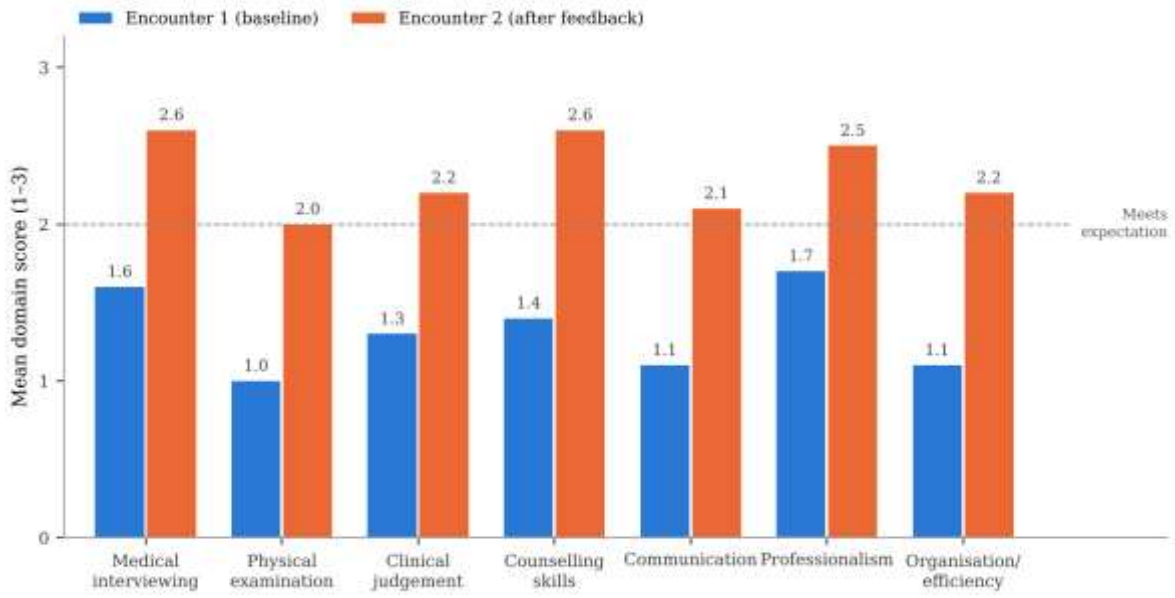


Figure 1: Mean Mini-CEX domain scores at Encounter 1 and Encounter 2 (n = 10). Dashed line, "meets expectation".

DISCUSSION

Direct observation with a content-validated, behaviourally anchored Mini-CEX showed that dental interns' baseline TCC competency was poor, with over two-thirds of domain ratings below expectation. After one cycle of structured feedback, every intern reached at least the expected level in every domain, although gains were uneven across domains.

The weak baseline is consistent with Indian surveys reporting favourable attitudes but inconsistent practice and inadequate training.[5–8] Those studies relied on self-report;[11] direct observation made the gap between attitude and performance visible, supporting the view that knowledge tests and self-rated confidence cannot substitute for observation when the competency is a clinical behaviour.[26,27] Interns performed relatively better in medical interviewing and professionalism, which are practised throughout undergraduate clinical postings. That all interns were below expectation in physical examination is unlikely to reflect an inability to examine the mouth; rather, they did not use tobacco-related oral findings within the counselling conversation, a skill the TCTM studies also found improved only with targeted training.[9,10] Poor communication and organisation suggest a

directive, advice-giving style and unstructured encounters, in which, without a framework such as the 5 A's,[4] essential components were missed. This contrasts with the patient-centred, autonomy-supportive approach underlying effective brief interventions such as motivational interviewing[28] and is consistent with the low confidence and limited clinical exposure reported among dental students.[29]

Immediate feedback is integral to the Mini-CEX[14,15] and central to the educational value of WPBA.[30] Specific, task-focused feedback delivered close to performance is among the strongest influences on learning,[31] and feedback from an authoritative source can improve physicians' clinical performance.[32] Feedback is not uniformly beneficial, however: directed at the person rather than the task, it can reduce performance.[33] Anchoring feedback to behavioural descriptors kept it task-focused and showed interns concretely what expected and above-expected performance looks like. Such feedback looks forward to the next encounter as well as back on the last, which is how assessment becomes learning.[34] An early review found little evidence that the Mini-CEX itself improves performance,[35] but a later meta-analysis reported a positive effect when it is implemented with adequate feedback.[36] Dental Mini-CEX studies have mainly established feasibility and psychometric properties;[17–21] the present study adds evidence of measurable change in observed counselling performance, complementing TCTM evaluations based on knowledge and confidence[9,10] and the view of practising dentists that hands-on training with periodic reassessment is more valuable than lectures alone.[37] The cycle of observation, feedback and repeated performance also reflects the principles of deliberate practice.[38]

The largest gains, in counselling and medical interviewing, probably reflect the discrete, observable actions defined by the 5 A's and 5 R's,[4] such as assessing readiness, advising, helping with a quit plan and arranging follow-up, which interns can readily add to the next encounter once pointed out. Professionalism was already largely established and had little room to improve on a three-level scale. In contrast, physical examination, communication, clinical judgment and organisation mostly reached only the expected level. Their "above expectation" descriptors require integrative and interpersonal performance, such as weaving oral findings into individualised counselling and reflective listening, which develops through repeated practice with feedback.[38] One feedback cycle thus appears to shift procedural behaviours quickly, whereas integrative skills need repeated encounters with different patients and observers.[15,39]

Unlike the generic nine-point scale of the original Mini-CEX, the adapted tool anchored each level to observable behaviour, with strong expert support (S-CVI/Ave = 0.96). Construct-aligned scales improve the reliability of WPBA,[40] and assessors rarely use the full nine-point range.[41] The clear separation between baseline and reassessment scores suggests that the adapted tool can detect change in performance. The anchors also make feedback specific and provide a shared standard for calibration, which matters because rater variability is a recognised weakness of direct observation.[42,43] However, with almost a third of ratings at the top level after one week, the three-level scale may limit tracking of further progress.

Brief observed encounters with structured feedback can be built into the TCC internship posting at little cost, in keeping with recommendations for wider use of WPBA in dental education.[13] Used repeatedly, they can contribute to programmatic assessment of clinical competence, in which each encounter is both a learning opportunity and a data point about progress.[27] The Mini-CEX for TCC could be included in the internship logbook or portfolio and combined with structured training such as the TCTM[9,10] and with targeted teaching in patient-centred communication and the use of oral findings during counselling. Effective implementation requires faculty development in observation, rating and feedback.[30,43]

Limitations

This single-centre study of ten interns had no control group, so improvement cannot be attributed to feedback alone; familiarity with the format and concurrent learning may have contributed. The one-week interval shows short-term change, not retention.[44] The assessor gave the feedback and knew the encounter sequence, and interns' awareness of observation may have influenced performance.[45] Patients and case difficulty differed between encounters, two encounters per intern are fewer than recommended for reliable judgement,[15,39] the three-level scale offers limited discrimination at the upper end, content validation used only four experts with incomplete agreement on one domain, and patient outcomes were not measured. Future multicentre studies should include a comparison group without structured feedback, repeated encounters with reassessment after one and three months, independent or blinded raters with reporting of inter-rater reliability, and the link between interns' Mini-CEX performance and patients' quit attempts.

CONCLUSION

Directly observed TCC competency of dental interns was below the expected level in most domains despite completed undergraduate training. A single cycle of structured Mini-CEX feedback was followed by significant

improvement in every domain, greatest in the procedural components of counselling and smaller in integrative and interpersonal domains. The adapted Mini-CEX is a feasible workplace-based tool for assessing and developing TCC competency, and its repeated use is recommended during the dental internship.

DECLARATIONS

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REFERENCES

1. International Institute for Population Sciences (IIPS), Ministry of Health and Family Welfare, Government of India, World Health Organization. Global Adult Tobacco Survey GATS 2 India 2016–17. New Delhi: Ministry of Health and Family Welfare; 2017.
2. Nagar A, Singh V. Tobacco, taxation, and cancer: combating India's oral cancer epidemic. Indian J Community Med. 2026;51(2):437–9.
3. Carr AB, Ebbert J. Interventions for tobacco cessation in the dental setting. Cochrane Database Syst Rev. 2012;(6):CD005084.
4. Fiore MC, Jaén CR, Baker TB, et al. Treating Tobacco Use and Dependence: 2008 Update. Clinical Practice Guideline. Rockville (MD): U.S. Department of Health and Human Services, Public Health Service; 2008.
5. Murugaboopathy V, Ankola AV, Hebbal M, Sharma R. Indian dental students' attitudes and practices regarding tobacco cessation counseling. J Dent Educ. 2013;77(4):510–7.
6. Balappanavar AY, Sardana V, Gupta P. Nationwide survey of fifth-year dental students' perceptions about tobacco prevention, control, and curriculum in India. J Dent Educ. 2013;77(10):1384–93.
7. Vashi D, Talreja PS, Rathod V, Thorat V. Knowledge and attitude of dental students of Navi Mumbai on tobacco cessation counseling: a cross-sectional study. Educ Health (Abingdon). 2021;34(2):80–3.
8. Singla A, Patthi B, Singh K, Jain S, Vashishtha V, Kundu H, et al. Tobacco cessation counselling practices and attitude among the dentist and the dental auxiliaries of urban and rural areas of Modinagar, India. J Clin Diagn Res. 2014;8(9):ZC15–8.
9. Chandrashekar BR, Chacko TV, Anand KM, Suvetha K, Jaishankar HP, Suma S. Enhancing identification and counseling skills of dental undergraduate students using a customized Tobacco Counseling Training Module (TCTM) – a piloting of the process using ADDIE framework. Indian J Cancer. 2020;57(3):296–310.
10. Chandrashekar BR, Chacko TV, Jayashankar HP, Suma S, Anand KM, Kannappan S. Effectiveness of tobacco counseling training module (TCTM) in enhancing the knowledge, attitude, ability to identify oral manifestations, self-confidence, and skills (KAASS) in tobacco counseling among undergraduate dental students – an interventional study. Indian J Cancer. 2024;61(2):230–7.
11. Jiang X, Li C, Zhou L, Qiu X, Wang W, Cao W, et al. The learning outcomes of smoking cessation education and training for dental students: a systematic review. Int Dent J. 2025;75(5):100896.
12. Khan N, Kinra E, Verma N, Singh G, Kondhalkar S, Karande V, Kashwani R. Awareness and Attitude toward Cervical Cancer and HPV Vaccination among Female Medical Students. International Journal of Pharmacy Research & Technology (IJPRT). 2025 Sep 9;15(2):1771-7.
13. Uma E. Workplace-based assessment: a valuable tool in undergraduate dental education. Int J Appl Basic Med Res. 2020;10(4):223–5.
14. Norcini JJ, Blank LL, Arnold GK, Kimball HR. The mini-CEX (clinical evaluation exercise): a preliminary investigation. Ann Intern Med. 1995;123(10):795–9.
15. Norcini JJ, Blank LL, Duffy FD, Fortna GS. The mini-CEX: a method for assessing clinical skills. Ann Intern Med. 2003;138(6):476–81.
16. Al Ansari A, Ali SK, Donnon T. The construct and criterion validity of the mini-CEX: a meta-analysis of the published research. Acad Med. 2013;88(3):413–20.
17. Behere R. Introduction of Mini-CEX in undergraduate dental education in India. Educ Health (Abingdon). 2014;27(3):262–8.
18. Bock A, Peters F, Elvers D, Wittenborn J, Kniha K, Gerressen M, et al. Introduction of mini-clinical evaluation exercise in teaching dental radiology – a pilot study. Eur J Dent Educ. 2020;24(4):695–705.
19. Katara A, Waghmare M, Kadakia N, Samson S, Minhas R. A case series of treatment of oral mucosal lesions using diode lasers. Scientific Dental Journal. 2021 Jan 1;5(1):47-51.
20. Al-Jewair T, Kumar S. Review and application of the Mini-Clinical Evaluation Exercise (Mini-CEX) in advanced orthodontic education: a pilot study. J Dent Educ. 2019;83(11):1332–8.

21. Bahadur R, Kashwani R, Sawhney H, Kumar S, Gupta G. Platelet rich fibrin integration in impacted third molar extraction sockets for bony regeneration: a case report. J Dent Probl. 2024;6(1):46-51.
22. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Res Nurs Health. 2006;29(5):489–97.
23. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. Res Nurs Health. 2007;30(4):459–67.
24. Yusoff MSB. ABC of content validation and content validity index calculation. Educ Med J. 2019;11(2):49–54.
25. Lynn MR. Determination and quantification of content validity. Nurs Res. 1986;35(6):382–5.
26. Kogan JR, Holmboe ES, Hauer KE. Tools for direct observation and assessment of clinical skills of medical trainees: a systematic review. JAMA. 2009;302(12):1316–26.
27. van der Vleuten CPM, Schuwirth LWT. Assessing professional competence: from methods to programmes. Med Educ. 2005;39(3):309–17.
28. Rollnick S, Butler CC, Kinnersley P, Gregory J, Mash B. Motivational interviewing. BMJ. 2010;340:c1900.
29. O'Donnell JA, Hamilton MK, Markovic N, Close J. Overcoming barriers to tobacco cessation counselling in dental students. Oral Health Prev Dent. 2010;8(2):117–24.
30. Norcini J, Burch V. Workplace-based assessment as an educational tool: AMEE Guide No. 31. Med Teach. 2007;29(9):855–71.
31. Hattie J, Timperley H. The power of feedback. Rev Educ Res. 2007;77(1):81–112.
32. Veloski J, Boex JR, Grasberger MJ, Evans A, Wolfson DB. Systematic review of the literature on assessment, feedback and physicians' clinical performance: BEME Guide No. 7. Med Teach. 2006;28(2):117–28.
33. Kluger AN, DeNisi A. The effects of feedback interventions on performance: a historical review, a meta-analysis, and a preliminary feedback intervention theory. Psychol Bull. 1996;119(2):254–84.
34. Katara AA, Minhas R, Kumar A, Dasgupta S. A case report on the excision of irritational fibroma using the diode laser. Journal of Dental Research and Review. 2020 Jan;7(1):24-6.
35. Miller A, Archer J. Impact of workplace based assessment on doctors' education and performance: a systematic review. BMJ. 2010;341:c5064.
36. Sahoo A, Kumari A, Gill S, Parihar AS, Dhull KS, Jena D. Efficacy of Green Tea Catechins as an Adjunct to Scaling and Root Planing in Chronic Periodontitis: A Systematic Review and Meta-analysis. World Journal of Dentistry. 2026 Jun 26;17(6):581-7.
37. Jain PR, DeLemos A. Training dentists in tobacco cessation counselling in Manila, Philippines: a mixed-methods study with implications for practice and education. BMJ Public Health. 2026;4(2):e004460.
38. Ericsson KA. Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. Acad Med. 2004;79(10 Suppl):S70–81.
39. Pelgrim EAM, Kramer AWM, Mokkink HGA, van den Elsen L, Grol RPTM, van der Vleuten CPM. In-training assessment using direct observation of single-patient encounters: a literature review. Adv Health Sci Educ Theory Pract. 2011;16(1):131–42.
40. Crossley J, Johnson G, Booth J, Wade W. Good questions, good answers: construct alignment improves the performance of workplace-based assessment scales. Med Educ. 2011;45(6):560–9.
41. Cook DA, Beckman TJ. Does scale length matter? A comparison of nine- versus five-point rating scales for the mini-CEX. Adv Health Sci Educ Theory Pract. 2009;14(5):655–64.
42. Gingerich A, Kogan J, Yeates P, Govaerts M, Holmboe E. Seeing the 'black box' differently: assessor cognition from three research perspectives. Med Educ. 2014;48(11):1055–68.
43. Holmboe ES, Hawkins RE, Huot SJ. Effects of training in direct observation of medical residents' clinical competence: a randomized trial. Ann Intern Med. 2004;140(11):874–81.
44. Arthur W Jr, Bennett W Jr, Stanush PL, McNelly TL. Factors that influence skill decay and retention: a quantitative review and analysis. Hum Perform. 1998;11(1):57–101.
45. McCambridge J, Witton J, Elbourne DR. Systematic review of the Hawthorne effect: new concepts are needed to study research participation effects. J Clin Epidemiol. 2014;67(3):267–77.