Reviewing Competency in Dental Education
Jane Manakil, Roy George

Abstract

The minimum requirements to practice as a competent dentist have always been under the scanner. While universities and dental boards around the world have constantly endeavored to produce and maintain a quality dentist, there have often been questions on how the respective skills are to be assessed. Presently competency-based education focuses on developing the professional skills, which are necessary for the comprehensive practice of dentistry within a community. These skills may include patient and practice management, interpersonal skills, operative and theoretical skills. Assessment of these skills often varies between assessors and may influence competency outcomes. This articles reviews the competencies and different approaches used to assess competencies in dental education prior to professional registration.

Key Words: Dental Education; Competency

Competency is described as “quality of being adequately qualified” by the American Heritage Dictionary. Galasko et al. described competencies as a series of clinical and operative skills that when put together make up a competent professional. This is often achieved by the acquisition of knowledge, development of cognitive skills, interpersonal and clinical skills. He also described the development of personal qualities as an important part of achieving competencies.(1)

In dentistry the need to evaluate the level of competence is an important step towards validating the quality of graduating dentist. The markers for the level of competencies are constantly being challenged with acquisition of new scientific knowledge, hence the need to constantly restructure the requirements needed to attain competencies. Presently new dental graduates are often required to perform invasive or non-invasive and often non-reversible surgical procedures using sophisticated materials and equipment within a shorter time frame.(2) This places significant pressure on the graduating dentists, as they are required to not only be receptive to community needs but also master the latest skills needed to adequately treat patients. (3)

Assessments of skills necessary for achieving competency in dentistry differ amongst dental boards and Universities around the world. This variability of competencies has often led to confusion on the quality and scope of practice of the graduating dentist. It is important that a graduating dentist should meet a minimum global standard. Licari recommended that competency should be approached with fixed outcomes while allowing flexible means in achieving this goal. He also suggested that mastery of a discipline or specialty may have their best way of teaching and evaluation; however the acceptance of outcomes, authentic evaluation and placing learning at a higher level than teaching in the educational process should be the ultimate aim of gaining competencies.(4)

This article aims to review the different approaches towards defining competencies in dental education and also identify assessment criteria used to evaluate them. This paper will also discuss an example of assessment of competencies related to clinical practice, using a Patient Management Software. This model can facilitate formative and summative chair side assessment of dental students in a variety of disciplines and domains as directed by the practice in the comprehensive care in dental clinic.

Competency in dental education

Competency is the ability to combine evidence based knowledge, personal attitudes, and clinical skills to undertake holistic dental care. (4, 5) Personal attributes may include creativity, ethics, aesthetics, and critical sense.(6, 7) Kramer et al. emphasized that personal attributes include a desire for patient wellbeing and to self-evaluate the effectiveness of the treatment.(8) As life-long learning becomes a crucial attribute for all modern clinicians, the ability to self-assess performance and identify future learning goals is an essential skill that needs to be developed in a modern healthcare curriculum.(9) Self-assessment, self-reflection and self-regulation can promote a deeper understanding in current knowledge.(10) The essential professional clinical skills may include a) diagnosis and treatment planning b) Preventative measures c) patient treatment and rehabilitation. Other skills that may be essential include professionalism, administrative and promotional skills. It is important that universities and dental schools help students nurture these values from a very early stage.

Achieving competency

A competency-based education needs to adopt a continuing learning based approach that includes both didactic learning, refinement of clinical skills and acquisition of new skills. The
American Dental Education Association’s Commission on Change and Innovation in Dental Education (ADEA CCI) House of Delegates categorised entry-level competencies for the New General Dentist into six domains, a) critical thinking, b) professionalism c) communication and interpersonal skills d) health promotion practice e) management and informatics f) patient care and confidence in patient care management.(2, 11) The ADEA further classified “Patient care” into a) assessment, diagnosis, and treatment planning b) establishment and maintenance of oral health.

In a similar approach, Association for Dental Education in Europe (ADEE) has defined the necessary competencies through a global consensus workshop. Several papers have been produced in this direction, with the main points being summarised in the two “profile and competencies” papers of 2005 and 2010 update. In this model, the competencies are organised in 7 domains and are described under 3 levels: “be competent at”, “have knowledge of” and “be familiar with”.(12, 13)

Irrespective of the categorisation of the competency domains it is important that an environment be provided to achieve competency. Achieving of competency may vary among different generations of learners and might also differ based on learners’ socio-economic and cultural status. Another important aspect of achieving competency is the self-confidence and learning ability.

Environment for achieving competencies

The ‘ideal’ academic environment may be defined as the one that best prepares students for their future professional life and contributes towards their personal development, psychosomatic and social well-being. An ideal environment should place the dental students at the centre of the education process and provide material, equipment and facilities that best help them to attain competencies in a shorter period of time. Educational content should be made available to students through a variety of methods, because individual learning styles and preferences may vary considerably.

Presently, a wide variety of methods are available for delivery of educational content within universities, some of the most recent and popular being lecture captures, pod castings or electronic delivery via Learning Content Management Systems (LCMS). However students may also prefer to interact using social networking sites (face book, twitter etc.) Students are encouraged to take responsibility for their own learning, which is very critical in their professional development. This should include increased self-assessment opportunities, reflective portfolios, collaborative learning, and increased implementation of information and communication technology (ICT) applications, along with the formative assessment. The students should be able to feel more in control of their education; reducing stress and providing a positive environment, helping them to meet challenges in attaining the competency in dental profession.

Clinical exposure is a major component of dental training and education and hence it is important that students are exposed to clinical settings as early as possible. Early clinical exposure could be through assisting in dental procedures; these early involvement could enhance learning experience. It is important that clinical exposure places a greater emphasis on qualitative clinical education, community placements, and other extracurricular experiences. These experiences should also include international exchanges, importance of working as a team, collaboration with allied health and knowledge of global health issue.(14)

Universities often research the learning preferences and expectations of students as the data is of great interest to academics and administrators alike. Such data reflect the learning experience and provide an important sources of data on which funding decisions are often based.(15) Financial constraints and social demands have also impacted on students’ expectations. Skene reported that an increasing number of students juggle employment and university, hence would prefer flexible hours and availability of study materials online over LCMS or internet.(15) So it is important that Universities and other institutions provide an environment that encourages the educational activities alongside the social responsibilities encountered by a student.

Generation Y and learning methodologies

Conventional teaching methods may not always be as effective or popular, in the light of changes in social attitudes and advancing technology. Marketers and demographers have often labeled those born in the Net Savvy age as Generation Y. Providing an effective learning environment for the Gen Y may be markedly different from those offered to earlier generations. This difference could be due to the exposure of technology and the ability to access information in a shorter period of time. According to Oblinger et al. Gen Y greatly values the Internet as an access tool to enhance the learning process. Organization, clarity, and efficiency are some of the important values expected by the Gen Y students.

Teachers should be aware that this generation expects well-orchestrated and clearly explained teaching resources. The availability of resource that is compatible with newer
technology devices is also paramount in enhancing their learning experience. The teaching resources for this generation should enhance student performance and promote effective time-management skills. Accessibility of instructors or academic staff is another important expectation of this generation i.e. anytime, anywhere. This generation often prefers to assimilate information in a shorter time span utilizing any method that would help long-term retention of information. This can be facilitated by providing information that allows involvement of multiple sensory systems (visual, auditory, somatosensory). Henzi also reported that students of Gen Y rely on different communication technologies for interaction with peers both outside and within a class rooms to enhance their learning experience.(16) Achieving self confidence

Wanigasooriya stressed the importance of achieving self-confidence as an asset in enhancing the competencies, however it is important to teach a student to self-evaluate to avoid overconfidence.(17) Past studies examining medical student confidence and performance support the expectation that increased confidence is indicative of increased ability.(18) This ability to self-evaluate and achieve confidence is best provided during the undergraduate training by placements at rural or independent clinical practice. Kaufman et al. stated that Learners should be able to analyze and assess their own performance and develop new perspectives and options.(19) He added the learners should be given opportunities and support for practice, accompanied by self-assessment, and to reflect on their practice with constructive feedback from teachers and peers. Mavis suggested that Self-efficacy mediates a strong relationship between knowledge and action.(18) He however, emphasized that the requisite skills were necessary to fulfill a competent task. In his study he reported that students with higher self-efficacy were more likely to perform better in the clinical simulation. Competency based learning

Competency-based learning focuses on developing professional skills necessary to provide comprehensive patient care. These competencies should not be based on individual comparisons, but on the ability to provide adequate patient care based on global standards. In competency based learning system, instructional and behavioral objectives should be clearly defined as to guide the teacher and the learner to attain the competency expected of the learner. Competency-based education should have fixed learning outcomes and assessment criteria. It is however important that these learning outcomes and assessment criteria are constantly reviewed in line with current concepts.

Yip and Smales defined different stages that a learner goes through to attain competent professional skills as a) novice b) beginner and c) competent.(20) As a Novice, the student or the learner would often mimic the instructor and this can be achieved in a simulator lab or in a clinic. At this phase the learner lacks initiative and follows commands. The second stage of learning as described by Yip and Smales is the Beginner. A Beginner displays a basic knowledge and takes some initiative in performance in a controlled situation. While a Competent learner can be described as one who exhibits depth of knowledge and appropriate professional skills to meet the required circumstances.

Undergraduate dental education should enable the learner to manage and treat a patient holistically while discipline-based education has tended to be more focused on a particular discipline often predispose students to mechanical role.(21) Guidance to the curriculum development should be based on preparing a student to holistically manage and treat a patient; this should involve assessment of the learner’s professional skills, interpersonal and research skills. The curriculum should motivate learners to acquire knowledge, enable them to self-assess and work in a team. This should reduce the focus on a teacher-dependent learning system and promote self-directed learning. As learners move beyond formal education and mature toward mastery in their professions, they should assume responsibility for directing their own professional development.(22)

Kaufman categorized curriculum as the transmission of knowledge, learning experience/process, and outcomes.(19) He stated that learners must have the opportunity to develop professional skills that directly improve or attain the expected outcome leading to patient satisfaction and improved health. These skills include asking questions, critically appraising new information, identifying their own knowledge and skill gaps, and

<table>
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<tr>
<th>Conventional methods of evaluation</th>
<th>Current methods of evaluation</th>
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<td>Paper based</td>
<td>1. ICT, online discussions, group seminars, Reflective portfolios, academic feedback</td>
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<tr>
<td>Essays, Short notes, MCQ</td>
<td>2. OSCE’s and patient case managed</td>
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<tr>
<td>Viva Voce (Oral Examination)</td>
<td>3. Peer assessment, self-reflection and patient feedback</td>
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<tr>
<td>Clinical, Practical, Patient Diagnosis</td>
<td>4. Clinical Chair side assessment, facilitated by patient management clinical software (e.g. Titanium).</td>
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<tr>
<td>Treatment Out Come</td>
<td>5. Learning Management Systems (LMS)</td>
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Table 1: Traditional and current methods of evaluation of competencies.
reflecting critically on their learning process and outcomes. The reflective learning is a process of thinking back on the actions based on the evidence, which can contribute to the development of competency. Haden perceived the need in curriculum modification to be based on interdisciplinary curricula that are organized around themes; to blend the basic science with clinical sciences.(23) They stressed the need for developing new techniques for assessing competency, and increasing collaborations with other health professions. Jago stressed the importance of maintaining the level of competence of dental graduate once they graduated rather than projecting the idea of an image of professionalism.(24)

Evaluation of competencies

Assessment represents a critical component of successful education in the skills, knowledge, effective processes, and professional values that define the competence in a professional. In dentistry the assessment of competencies is a very important step in evaluating the ability of a graduating dentist to provide quality dental care within the current world standards. General Dental Council in U.K, in its booklet “The First Five Years” of dental education breaks down competence into a series of desirable attributes such as a) knowledge b) skills c) clinical judgment and interaction d) professional development and e) team work. Competencies can be evaluated by a number of methods, traditional and current methods (table 1). The traditional method had a major drawback in that it was subjective and occasionally inflexible, while newer criteria looks objectively at assessing the student. It should however be stated that current methods of assessment also have their shortcomings, as they may be totally objective, preventing the evaluator to be subjective. Assessment validity is important to reduce the biased interpretations of test scores, and to standardize the understanding of the assessment information and its limitations. Another factor is Reliability; that represent whether the assessment is repeatable and measures consistency with minimum of errors. Albino et al. described the students practice readiness as the fundamental principle of general competency-based assessment, while discipline based evaluation of skill and knowledge looks at component competency.(25)

Evaluation is a continuous process of evaluating the learners learning outcomes such as attitude, motivation, acquisition of facts, comprehension, cultural appreciation, application, development of competent skills, personal and social adaptability and a sense of responsibility. Traditionally utilized evaluation methods have certain advantages and disadvantages. Essay questions are effective in determining how the student thinks logically in an analytical and synthetic construction in solving problems, at the same time can be age and experience related. This assessment can be subjective and time consuming. Short-answer questions are limited in measuring a student’s divergent or imaginative thinking, problem solving and cognitive resources.

Assessment of Short answer questions are easier, however a certain amount of subjectivity can be expected. Multiple-choice tests have the capacity to test not only knowledge and comprehension but also some higher level thinking abilities, and students enjoy this as a puzzle or fun type of exam. Viva Voce came into a process of evaluation as part of a master program in defending the dissertation. The amount of time frame and depth of content expectation should be decided between the supervisor and candidate. Downside in this assessment is limited number of questions can lead to build up of nerves in anticipation of the unknown; while too many questions may result in over-saturation with conditioned responses, can lead to prolonged evaluation with no benefit.

The assessment of skills such as communication, professionalism treatment planning, treatment undertaking, time management and research are relevant to attaining competency. The assessment should also relate to the student’s strengths and weaknesses. Assessment and corrective feedback with repetition in student performance can play a major role in the development of the educational processes. Kramer has expanded on the assessment and assessment tools describing the various methods of competency assessment, relating to the formative, summative assessment and global ratings.(8) The model for competency can be triangulated into Process, Product and Procedure.

The “Process” examined human factors including communication, diligence, organization, compassion, ethical behavior etc., while “Procedure” examined technical skills necessary to provide patient care and “Product” examined outcomes of patient care. de Monchy(26), proposed the doctor centered-patient centered Index (DP Index) as method to evaluate the Process. However it is important to note that this evaluation is often subjective. Recently some dental schools using modern patient management software have included professionalism as part of the Process that needs to be evaluated (Fig: 1).
Evaluation of technical skills (Procedure) can be assessed in a simulated lab environment or in actual clinical setting. A Novice would often be evaluated in a simulated lab environment while a student who has been described to be competent can be evaluated in a clinical setting. Evaluation of skill levels has traditionally been a subjective assessment of the examiner and is still followed widely among many dental schools across the globe. Recently however many schools are moving to a more objective method of assessment with minimum or little subjective input. Some Patient Management software allows allocation of scores for expected outcomes in student’s clinical performance (Fig 2).

The data can then be used to produce data sheets of student performance for a single day or throughout a longer period (e.g. a semester or a year) across all discipline procedures. Objective structured clinical examination (OSCE) has been a method of assessment of technical and other clinical skills and is still one of the more popular methods of assessment used by registration boards around the world. Evaluation of the patient outcomes in dentistry is based on adherence to proper infection control, pain management, and patient satisfaction, achievement of function, aesthetics and Quality of treatment outcomes. The short-term or immediate patient outcomes are easier to evaluate. Patient may be asked to grade experience on a Visual Analogue Scale (1 to 10); while long-term outcomes are more important for the dentist and patient, but are difficult to evaluate as this would require extended patient recall. In the management of e-learning there are two methods that can schedule the distribution of the material content to the learners, a learning management system (LMS) and learning content management system (LCMS). Learning management system (LMS), is a program that can aid the teacher to track the progress of individual learners, their scores on assessments, and have an overview of the progress of any cohort of learners. LCMS is software that can update the content on an e-learning website, ensures that the styles and the course content remains current without the necessity for any specialist web page editing skills.

Conclusion

Competency-based dental education is a continuous process in maintaining a degree of quality consistent with patient well-being and effective treatment management path, which the graduating dentist should achieve. The cultural and socioeconomic diversity among different communities might have an impact on the profile of the professional needed by the society. This can align the educational process during and following graduation with the needs of the profession, both in the present and the future. Hence competencies may continue to vary, however it is important that students are assessed to meet minimum global standards.
Fig 2: Titanium software - clinical performance assessment: Oral surgery
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