

## Curriculum for training module on Cone Beam Computed Tomography (CBCT) for Dental Specialists: A Need Assessment Study

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**Abstracts:** Background and Objectives: A needs assessment study is recommended as the foundation of any curriculum development process. In India, CBCT has lately gained popularity as preferred imaging modality. However, CBCT is included neither in the Under graduate nor the Post graduate dental curriculum. There is also a lack of any standardized training modules on CBCT. Hence, the overall goal of this project was to conduct the educational need assessment amongst the dental practitioners, in order to design a curriculum for training module on Cone Beam computed Tomography (CBCT). Methodology: Need assessment was done by recruiting the structured questionnaire method which included item generation by literature review and a consensus development survey amongst 50 dental specialists. This was complemented with the opinion of the experts in the field. Results & Conclusion: We developed a consensus on 14 items for inclusion in the curriculum for training the dental specialists in CBCT. The study results indicate a definite gap in knowledge of CBCT applications amongst the dental specialists. The major concern of the dental specialists is the lack of awareness regarding the appropriate and optimum use of this relatively new imaging technology. A strong perceived need of training in this field was evident amongst the dental specialists, and the same is reflected in the experts' opinion. [Aditya A NJIRM 2015; 6(3):88-93]

**Key Words:** Need assessment; Curriculum; Cone Beam Computed Tomography.

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**Introduction:** Health care education is a quite dynamic field. In a quest to keep us updated to the changes and technological advancements, our teaching-learning shall also be in sync with these changes. Health care educators have a professional and ethical obligation to meet the needs of their learners, patients and society<sup>1,2</sup>. Linking education with the needs of the society is an important prerequisite for effective education. Otherwise, it may become impossible to achieve the goals of education, and this can lead to a waste of human and financial resources<sup>1,3</sup>.

Curriculum is the foundation of any teaching-learning process. The word *curriculum* is derived from the Latin verb *currere* which means to run. It is defined as "a planned educational experience"<sup>4</sup>. There are different approaches to curriculum development proposed by researchers like HildaTaba, McGaghie et al<sup>4</sup> etc. All of them advocate the linking of education to the health care needs of the community at large. Kern proposed a 6-step approach towards curriculum development for medical education.

A needs assessment or situational analysis is typically recommended as the foundation of any

curriculum development process<sup>5</sup>. It is the process of determining the gaps between required competencies of trainees and the reality<sup>6</sup>. In other words it can also be described as a systematic process to acquire an accurate, thorough picture of the strengths and weaknesses of a learner community that can be used in response to the academic needs of all learners for improving student achievement and meeting challenging academic standards. Therefore, integrating needs assessment throughout the curriculum development process can help assure that the program does not create an either/or situation, but rather benefits both the learners and the society<sup>7,8</sup>.

The introduction of Cone Beam Computed Tomography (CBCT) represents a radical change for dental and maxillofacial radiology. The three-dimensional (3D) information appears to offer the potential of improved diagnosis for a wide range of clinical applications<sup>9</sup>. Considering the considerably lesser radiation dose, cost and space requirement as compared to conventional CT scanners, CBCT units are now considered more suitable for use in dental practices<sup>10,11</sup>. However, the information obtained from CBCT imaging requires a substantial level of expertise for interpretation. This implies

that the untrained clinician is likely to have a substantial error rate in the interpretation of CBCT images resulting in a high percentage of missed or false positive diagnoses<sup>12</sup>. The European Academy of Dental and Maxillofacial Radiology has issued guidelines for the use of this technology in European countries<sup>13</sup>. However, in many other countries like India, such guideline is lacking. In India, CBCT is included neither in the Under graduate nor the Post graduate dental curriculum. There is also a lack of any standardized training modules on CBCT in India. Though some workshops are organized sporadically but there is no standard curriculum or protocol for the same. Hence, a need is felt to design a curriculum for training of dental specialists in CBCT.

The initial and probably one of the most crucial steps in developing such a curriculum is the need assessment. It will help in analyzing the current status of the knowledge, attitude and perspective of the dental practitioners towards the use of CBCT.

Hence, the overall goal of this project was to conduct the educational need assessment amongst the dental practitioners, in order to design a curriculum for training module on Cone Beam computed Tomography (CBCT). Further, the specific objectives were as following:

1. To assess the views of dental specialists on their educational needs in Cone Beam Computed Tomography.
2. To identify those Cone Beam Computed Tomography topics that should be included in a training module for Dental specialists.

#### **Material and Methods:**

Design: Need assessment was done by recruiting the structured questionnaire method, after obtaining permission from Institutional Research Board. This included item generation and a consensus development survey. This was complemented with the opinion of the experts in the field.

Participants: Representatives from different groups of stakeholders for the training module were invited to participate in this study. This included Dean of the institution, specialists and Post

graduate students from different branches of Dentistry.

A questionnaire was designed after an informal discussion with the peers and experts in the field of Oral and Maxillo-facial Radiology. An assessment of similar curricula of different training modules in some other countries was also done after appropriate literature search to complement the designing of the questionnaire<sup>14</sup>. This questionnaire was reviewed by the project guide and other staff members of the department, and based on their feedback; suitable modifications were done in the design of the questionnaire. The questionnaire was initially validated in a pilot project among five participants and certain modifications were done based on their feedback.

This questionnaire was personally handed over to 50 potential participants, which included teaching faculty at Sinhgad Dental College & Hospital, private practitioners and Post graduate students. A brief discussion regarding the questionnaire and any clarification regarding any question was also done during the meeting.

The questionnaire was a self-administrated one and included the demographic details of the participant; including their qualification, designation, specialty, whether they had a private practice and the duration of their experience.

Item generation: Based on the review of literature and few existing curricula, a total of 14 items or topics in CBCT were identified and included in the same questionnaire. This acted as the initial stage of consensus development where the participants were asked to score the importance of each item on a scale of 1 to 5 (1 being least important and 5 being most important).

A reminder was given to the participants after 1 month for the completion of questionnaire.

Feedback from experts: Five experts in the subject of Oral Medicine & Radiology, with considerable experience in the field of CBCT were approached over the e-mail to participate in the educational project. A separate questionnaire was designed for the experts; which included questions regarding their designation, general experience and

experience in the field of CBCT. Their feedback regarding need of a curriculum for CBCT training module and preferred training methods were taken. They were also asked to rate the 14 topics in CBCT on the scale of 1 to 5 with 1 being least important and 5 being most important.

A reminder was sent after 1 month over the e-mail to the experts for completing the questionnaire. All the data collected were sorted, tabulated in excel work sheets and analyzed in the view of the objectives of the project.

### Results and Discussion:

Opinion of the dental specialists: A total of 50 dental specialists were invited to participate in the educational project, out of which 45 gave their consent to participate. Out of the 45 participants, 11 had BDS degree and 34 were Post graduates (MDS). Thirty one participants were faculty at dental college as well as had their private practice where as four had only clinical practice. Ten post graduate students also participated in the study. Amongst the specialists, there were 5 Oral physicians and maxillo-facial radiologists, 6 Endodontists, 4 Orthodontists, 6 Oral surgeons, 1 Pedodontist, 9 Periodontists and 13 Prosthodontists. Hence, there were representatives from almost every clinical branch of Dentistry. There was a wide variation in the work experience of the faculty and practitioners, ranging from 4 months to 21 years.

Initial few questions in the questionnaire focused on current practice amongst the dental specialists and perceived usefulness of CBCT by them.

Thirty-two of the participants (71%) said that they advised CBCT in less than 25% of the cases. Six participants (13%) advised CBCT in 25-49% of their cases. There were 7 specialists who said that they never advise CBCT for any of their cases, and in fact two of them were Oral Radiologists. Literature shows that CBCT has a wide application in the field of dentistry. However, majority of our participants either advised CBCT in less than one-fourth of their cases or did not advise CBCT at all. This may represent a conundrum amongst the dental specialists regarding applications of CBCT. One of the questions presented a list of potential uses of CBCT imaging in Dentistry where the participants

were asked to indicate how useful they felt CBCT was for these different purposes. Many said that they were not sure about the usefulness of CBCT for these purposes which resulted in a relatively lower response to this question. Only a few (11) dental specialists actually were aware of the CBCT machine used at their referral centre and only 4 were aware of the software used for viewing the images. The responses to the above questions emphasized the absence of complete and accurate information regarding CBCT, as it is a recent advancement in the field of oral radiology. The optimum use of any technology is possible only when there is an understanding of the technical nuisances related to it. This low awareness could be attributed to lack of formal training in CBCT as evident by the fact that only 6 (13%) of our participants had undergone any such training. Even 75% of the Oral & maxillo-facial radiologists did not have any training in CBCT. All of the participants felt that there is a lack of standardized training program in CBCT in India and that there is a need to develop a training module with standardized curriculum on CBCT for the dental specialists. There was only one participant who said that there is no need for such special training but more information regarding CBCT shall be included in the existing dental curriculum.

The above findings indicate that there is a general need felt by the dental specialists to have a structured, detail and formal training in CBCT.

The participants were also asked to rate the topics that they felt shall be included in the curriculum for the training module on CBCT. These topics were selected by the author after literature search and review of existing curricula in CBCT training modules and recommendation by EAMFR and North Carolina Association of Dentists<sup>14,15</sup>. Following ratings were given by the participants to the various topics:

**Table 1: Rating of topics in CBCT by dental specialists**

| Topic  | Rating by no. Of participants |    |    |    |    |    |
|--|-------------------------------|----|----|----|----|----|
|  | 1*                            | 2* | 3* | 4* | 5* | NR |
| Introduction & Basics of CBCT                              | 0                             | 0  | 2  | 15 | 27 | 1  |
| Case selection for CBCT                                    | 0                             | 0  | 6  | 14 | 24 | 1  |
| Sectional anatomy in CBCT                                  | 0                             | 1  | 4  | 10 | 30 | 0  |
| Radiation Protection                                       | 0                             | 3  | 9  | 16 | 12 | 4  |
| Imaging guidelines   | 0                             | 0  | 4  | 18 | 20 | 3  |
| Reading and interpreting CBCT images                       | 0                             | 0  | 0  | 10 | 34 | 1  |
| Errors and artefacts in CBCT imaging                       | 0                             | 0  | 0  | 18 | 24 | 3  |
| Applications of CBCT in various branches of Dentistry:     |                               |    |    |    |    |    |
| a. Oral Pathology  | 2                             | 1  | 4  | 14 | 17 | 7  |
| b. Oral Surgery  | 0                             | 0  | 2  | 9  | 29 | 5  |
| c. Orthodontics  | 0                             | 2  | 9  | 14 | 12 | 8  |
| d. Endodontics   | 1                             | 1  | 9  | 18 | 13 | 3  |
| e. Prosthodontics & Implantology                           | 0                             | 0  | 1  | 8  | 32 | 5  |
| f. Periodontics  | 0                             | 1  | 5  | 18 | 15 | 6  |
| g. Application of various softwares in reading CBCT images | 0                             | 1  | 5  | 11 | 19 | 15 |

\* 1= not important, 2=slightly important, 3= moderately important, 4= important, 5=extremely important , NR=no response

One of the participants suggested inclusion of study of working on different models and brands of CBCT machines and respective soft wares in the curriculum.

Majority (36) of the participants were of consensus that the training module shall be a combination of lecture series, demonstration and hands-on. One-third of the participants (15) opined that the duration of this training module shall be 3 days. One of the participants, who was a oral radiologist suggested that the training duration shall be of more than 7 days. Most of the participants agreed that an assessment shall be done at the end of the training module.

Hence, it was quite apparent from the analysis of the survey that most of the dental do agree that CBCT has potential as an advanced imaging technique. They also feel a need of training module in basics of CBCT imaging as there is a perceived lack of the same at the under graduate as well as the post graduate level.

Experts' opinion: Five experts in the field of Oral Radiology who also have significant expertise in CBCT imaging were approached to participate in the project and present their valuable feed-back.

The work experience of these experts ranged from 2.5 years to 30 years. They are also known to significant work experience in the field of CBCT. All of them either owned or worked in a CBCT centre, and three of them also had a formal training in CBCT. All of them had conducted training workshops in CBCT earlier, either in the form of demonstrations, lectures or hands-on. Three of the experts strongly agreed where as two of them agreed that there is a need to develop a training module with standardized curriculum on CBCT for the dental specialist. Following is the summary of the rating of topics done by the experts:

Table 2 shows the rating of topics in CBCT by experts. Some additional topics suggested by the experts were implant radiology, TMJ assessment, incidental findings on CBCT, ENT applications, follow-up imaging protocols, post-operative imaging, multi-modality studies. Similar to the opinion of the dental specialists, experts agreed that the training module shall be a combination of lecture series, demonstration and hands-on. They had varied opinion regarding duration of the training module. One expert opined that training shall be for 2 days, one opined that it shall be of 4 days where as three suggested that there shall be an additional discussion and on-line training of 20 days to one month after a contact session of 4 -5 days.

**Table2: Rating of topics by experts**

| Topic   | *Rating |   |    |      |      |
|---|---------|---|----|------|------|
|   | 1       | 2 | 3  | 4    | 5    |
| a.Introduction & Basics of CBCT                           |         |   |    | +    | ++++ |
| b.Case selection for CBCT                                 |         | + |    | +    | +++  |
| c. Sectional anatomy in CBCT                              |         |   |    | ++   | +++  |
| d. Radiation Protection                                   |         |   |    | ++   | +++  |
| e.Imaging guidelines                                      |         |   |    | ++++ | +    |
| f.Reading and interpreting CBCT images                    |         |   |    | ++   | +++  |
| g.Errors and artefacts in CBCT imaging                    |         |   |    | +++  | ++   |
| Applications of CBCT in various branches of Dentistry:    |         |   |    |      |      |
| a. Oral Pathology   |         | + |    | +    | ++   |
| b. Oral Surgery   |         |   |    | +    | ++++ |
| c. Orthodontics   |         |   | +  | +++  | +    |
| d. Endodontics  |         |   | +  | ++   | ++   |
| e. Prosthodontics & Implantology                          |         |   | +  |      | ++++ |
| f. Periodontics   |         |   | ++ | +    | ++   |
| g.Application of various softwares in reading CBCT images |         |   | ++ |      | ++   |

+ = no. of experts, \* 1= not important, 2=slightly important, 3= moderately important, 4= important, 5=extremely important

Hence the experts' opinion emphasized the need of a training module in CBCT for the dental specialists with a well-developed and structured curriculum.

**Conclusion:** CBCT is a relatively advanced imaging technique with a profound potential in the field of dentistry. This fact is now being realized and accepted by the dental specialists. To the best of the author's knowledge, this is the first study done to analyze the need of curriculum for training module on Cone Beam Computed Tomography for Dental Specialists in India. The study results indicate that there is a definite gap in knowledge of CBCT applications amongst the dental specialists. The dental specialists themselves feel that there is a lack of awareness as well as training in this field,

and strongly perceive a need for a well-structured training module for the same. Even the experts in the field of oral radiology strongly agree that a curriculum must be developed for training module in CBCT. Introduction of training in CBCT at under graduate as well as post graduate level shall ensure that dental specialists use this technique in an efficient way to improve the accuracy and reliability of oral and maxillo-facial diagnosis, treatment planning and outcomes.

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