Structured oral examination in pharmacology for undergraduate medical students: Factors influencing its implementation

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Introduction

The conventional oral examination (COE) or viva voce is an important format of assessment that allows probing of breadth and depth of the knowledge. Carefully constructed questions can test students in all cognitive domains. The viva is also capable

ABSTRACT

Objectives: The study aims to understand the process and factors influencing the implementation of structured oral examination (SOE) for undergraduate medical students; in comparison with conventional oral examination (COE) in pharmacology.

Methods: In a randomized, parallel group study, 123 students of pharmacology were divided into two groups, SOE (n = 63) and COE (n = 60). Students of each group were subdivided into two, and four examiners took viva voce individually. Three sets of questionnaires from autonomic nervous system were prepared, each having 15 items with increasing difficulty levels and were validated by subject experts and pretested. Ten minutes were allotted for each student for each viva. Feedback of students and faculty about the novel method was obtained.

Results: SOE yielded significantly lower marks as compared to COE. There were significant inter-examiner variations in marks awarded in SOE and COE. Other factors influencing implementation were difficulty in structuring viva, rigid time limits, lack of flexibility in knowledge content, monotony, and fatigue. The students perceived this format not different from COE but felt that it required in-depth preparation of topic. Faculty opined that SOE led to less drift from main topic and provided uniform coverage of topics in given time.

Conclusion: Conducting SOE is a resource-intensive exercise. Despite structuring, inter-examiner variability was not completely eliminated. The students' performance was depended on factors related to examiners such as teaching experience, vernacular language used, and lack of training. Orientation and training of examiners in assessment strategies is necessary. Standardization of questionnaire is necessary before the implementation of SOE for summative assessment.

KEY WORDS: Objectivity, pharmacology, reliability, structured oral examination, validity, viva voce
Currently, the SOE is relatively a new phenomenon. It may largely depend on the knowledge, attitude (offering verbal/nonverbal clues and prompting), and mood of examiners. Scores also correlate with personality scores. The process related factors are leniency, central tendency, “Halo effect,” and error of contrast. Studies have shown that scores are directly proportional to the number of words spoken by examiner and time taken by him. Another pitfall of viva voce is that unequal distribution of time, that is, initially appearing students may be asked greater number of questions but as time passes, an element of fatigue ensues in examiners, and thus students giving viva in last get much less time. The outcome of this is that award of marks is based on just 2–3 questions asked. This adds an element of uncertainty and chance. This is because different examiners use a different set of questions with varying difficulty levels.

Student related factors include gender, accent and vocabulary used, and ability to pick nonverbal cues. Candidate’s level of anxiety and test environment also determine scores. These factors make COE less reliable and valid assessment tool for criterion-reference system, where the intention is to ascertain achievement of predetermined level of knowledge. Overall, COE is much less cost-effective and more time-consuming.

Despite above limitations, oral examination has heuristic perspective. It is flexible, driven by student’s responses, and tests several aspects of clinical competence and ability to defend the decision in a given clinical situation that cannot be tested by written examinations. It can evaluate the depth of knowledge, application and analyzing capability, ethics and professionalism. It also can examine students’ communication skills. Oral examination gives immediate feedback to the student. A correlation is found between viva and written components of final summative examination in pharmacology. Similarly, a longitudinal study of oral practical examination within a medical program revealed internal consistency and reliability of oral examination identifying a positive correlation to in-training examination and faculty evaluation scores.

To overcome the limitations of this useful tool, a few modifications are suggested such as chart-stimulated reviews, models, problem-based learning, objective structuring of clinical and practical examination, targeted viva, and structured oral examination (SOE). The SOE is relatively a new phenomenon and a number of studies, conducted on small groups, have shown it to be reasonably reliable and valid, and both faculty and students show positive perception toward this examination tool. At present, little is known about the implementation of SOE in a large group of 150–250 students in a batch. Because SOE is a resource-intensive and time-consuming exercise, it is of utmost importance to understand the feasibility and process of implementation and factors which determine its implementation in large groups consisting of 150–250 students for pharmacology examination on regular basis.

The present study was designed with the primary objective to understand the process of implementation of structured viva voce examination and compare this method with the COE. Other objectives were to find the suitability of SOE in its present form, compare marks obtained and perceptions of students, and to obtain the feedback of faculty regarding this format.

**Materials and Methods**

This study was conducted on the second professional students (140 students) studying at a tertiary care hospital and medical college of North Gujarat. The topic of the oral examination was autonomic nervous system (ANS). The students were informed about the date of the examination 15 days prior to the examination. The marks obtained by the students in this study would not be counted in their formative or summative assessment. The students’ participation in the study was informed and voluntary. A written informed consent of participation and approval of Institutional Ethics Committee were obtained. The students were randomly divided into four groups (A–D), each of 35 students.

Fifteen cards each having three questions of same difficulty level were prepared by two examiners who later conducted the structured viva (Examiners B and D). The cards were numbered from one to 15 with increasing level of difficulty. These cards were mailed to five subject experts for comments on the language, order and relevance of the questions, entirety of topic, and any other specific comments. On the basis of comments received, the final questionnaire was prepared. Any discrepancy was resolved by consensus. The final questionnaire was pretested on 10 students and questionnaire was again modified based on the student’s feedback.

On the day of the examination, proper arrangement was made so that students did not interact with each other before completion of the examination. Group A and C gave the unstructured (traditional) viva to two different examiners (Examiners A [Professor] and Examiner C [Assistant Professor]). Similarly, Groups B and D gave the structured viva to two other examiners (Examiners B and D, both Associate Professors). Ten minutes were allotted for viva of each student. After the completion of the viva, each student was asked to fill a questionnaire (four items) to know their perception. Perception of the faculty was also taken through an in-depth interview.

Descriptive statistics reported were mean, SD, frequency, and percentages. The marks obtained by the students in different viva groups were compared using unpaired t-test, one-way ANOVA, and post-hoc Tukey test. The perception of the students was also compared using Chi-square test. SPSS Statistics for Windows, Version 17.0. Chicago: SPSS Inc was used for analysis.

**Results**

There were 29 (Group A) and 31 (Group C) students who appeared in unstructured COE and 31 (Group B) and 32 (Group D) students appeared in SOE. The mean marks obtained by COE were significantly higher than those obtained by SOE (Table 1). The marks allotted by COE varied from examiner to examiner. The marks allotted by Examiner A (mean = 9.43) were significantly lower as compared to those allotted by Examiner C (mean = 19.00). Similarly, marks allotted by SOE showed a marked inter-examiner variability (mean marks of Examiner B vs. Examiner D were 15.74 and 8.12, respectively). Each set of the questionnaire had 15 questions in order of increasing difficulty. The difficulty levels were similar for both examiners (B and C) and students showed positive perception toward this examination.
and D), and this proves the internal consistency of the structured viva [Table 2 and Figure 1].

The students did not feel difficulty in responding to the structured format and over 90% students understood the questions clearly. Furthermore, the students did not feel any difference in this format of viva as compared to their previous viva examinations [Table 3].

The opinion and views expressed by the teachers who conducted viva voce examination are shown in Table 4. They reported that this format led to less drift from the main topic and provided equal coverage of topics in the limited time allotted for students’ assessment. Among the limitations, reported were difficulties in structuring viva from the entire syllabus, rigidity of time limits and knowledge content, and monotony for the teachers.

Discussion

An assessment tool must be valid, reliable, and objective. Most authors agree that structuring and preplanning viva voce leads to a better validity and reliability of viva as an assessment tool for undergraduate and postgraduate studies. The results of this study show that SOE format is acceptable to students and teachers and has internal consistency (reliability). Structured questionnaire allows allotment of marks according to a predetermined scale. Thus, marks awarded are objective, evidence-based as against overall (subjective) assessment-based award of marks in COE. There was a greater variation in mean marks allotted by two examiners in COE (9.4–19.0) as compared to those allotted in SOE (9.1–15.7). This shows that structuring the viva voce contents reduces the effect of contrasting examiner behaviors on the marks allotted (stringent vs. lenient). However, structuring the contents significantly reduced the marks obtained and this is as reported elsewhere also. Reduction in marks by structuring is not surprising because structuring exposes all students to all types of questions (from easy to tough) as against the traditional viva in which examiners preferences and chance plays role (some students are asked too many easy questions). This is corroborated by the perception of teachers who have clearly stated that SOE covers a wider breadth of syllabus as compared to conventional format. This could also in part be due to the fact that not all students respond to all questions having increasing difficulty levels.

We found that structuring in the present form does not eliminate inter-rater variability as is reported elsewhere also. Conversely, another study found perfect agreement between the marks given by two examiners in objective structured viva voce (OSVV) while the fair agreement was found between the marks given in OSVV and conventional viva. However, each student was subjected to two viva formats unlike this study on parallel groups. There can be different explanations for this discrepancy. During posttest interview of the teachers taking structured viva (Groups B and D), it was found that one of them used regional language frequently, while the other strictly adhered to the structured questionnaire. Hence, the inter-rater variability arose. The examiners of the four groups had a varied teaching experience (from 3 years to 33 years) which determined the depth and experience in evaluating students’ performance.

### Table 1:

| Viva group                  | Examiner | Number of students | Marks (mean±SD) | n (%) receiving | <50% marks | >50% marks |
|-----------------------------|----------|--------------------|-----------------|----------------|------------|------------|
| Unstructured (conventional-COE) | A        | 29                 | 9.43±2.84       | 29 (100)       | 0 (0)      |            |
|                             | C        | 31                 | 19.00±3.89**    | 6 (19)         | 25 (81)    |            |
|                             | Total    | 60                 | 14.45±5.90      | 35             | 25 (81)    |            |
| Structured (SOE)            | B        | 31                 | 15.74±6.20      | 22 (71)        | 9 (29)     |            |
|                             | D        | 32                 | 8.12±3.27*      | 32 (100)       | 0 (0)      |            |
|                             | Total    | 63                 | 11.87±6.22*     | 54             | 9 (29)     |            |

*P<0.001 (structured vs. unstructured-total marks), **P<0.001 (Group C vs. Group A-marks), *P<0.001 (Group B vs. Group D-marks) (Unpaired t-test, one-way ANOVA, and post-hoc Tukey test). SD=Standard deviation, COE=Conventional oral examination, SOE=Structured oral examination

### Table 2:

| Structured viva | Number of students who responded to questions with increasing difficulty levels |
|-----------------|--------------------------------------------------------------------------------|
| Question number 1-5 | Question number 6-10 | Question number 11-15 |
| Examiner-B (n=31) | 31 | 20 | 13 |
| Examiner-D (n=32) | 31 | 28 | 10 |

*χ²=1.77 (P>0.05). SOE=Structured oral examination

### Figure 1: Relationship between total marks obtained by students and difficulty level of questions in structured oral examination by Examiners B and D
Limitations of SOE

Implementing SOE on large scale\[15,24\] [19,20]\[13\]

We feel that assessment of knowledge and understanding and responding to the questions. However, most of the students felt that this format required greater preparation than the conventional viva format. Teachers opine that SOE prevents inter-rater variability and improves reliability (agreement in allotted marks between two examiners). In a targeted viva, Rangarajan et al. engaged each student for about 25 min and thus only 5–6 students were examined in a day. We found that arbitrary limit of 10 min is not sufficient because students would not reach till question 14 and 15. One remedy is to reduce the number of items in the questionnaire to 10 and other is to increase the time allotted to the student. Conversely, increasing the number of question increases inter-examiner reliability.\[22\] We feel that assessment of students’ competence for certification (pass/fail) would require the development of questionnaire, which includes items from various systems. Therefore, reducing the number of items in the questionnaire may become counterproductive! As shown in Table 5, increasing time duration from 10 to 15 min would result in continued work for 8–12 h a day! If one examiner examines half of the students by structured viva format (say 15 only) and the other the remaining, then time duration can be increased from 10 to 15 min. The entire exercise could be tiring for examiner and stressful to the examinees. At present, little is known about the impact of these modifications on the scores obtained.

The limitation of the present study is that it involved a single batch of students who were examined on ANS only. More work is required to be done on several batches of students to ascertain a number of questions from the entire syllabus and exact time duration to successfully implement the structured viva format for final university examinations.

Conclusion

Present work suggests that structured viva voice examination is a feasible method of assessment and students feel no difficulty to this format. Teachers opine that SOE prevents deviations from the main topic. However, its conduct is a resource-intensive exercise and requires preplanning. There are factors, which influence the performance of students and

### Table 3:

Students’ feedback on SOE and COE (unstructured)

| Questions                                      | Group A (n=29) | Group B (n=31) | Group C (n=31) | Group D (n=32) | Significance test ($\chi^2$) |
|------------------------------------------------|----------------|----------------|----------------|----------------|-----------------------------|
| Did you understand the questions clearly?      | Yes 27, No 2   | Yes 31, No 0   | Yes 30, No 1   | Yes 29, No 3   | P=0.23                      |
| Was the time given sufficient?                 | Yes 28, No 1   | Yes 28, No 3   | Yes 28, No 3   | Yes 25, No 7   | P=0.12                      |
| Did the viva deviate from the topic?           | Yes 5, No 24   | Yes 7, No 24   | Yes 3, No 28   | Yes 5, No 27   | P=0.59                      |
| Was the viva different from your previous viva examinations? | Yes 10, No 19 | Yes 12, No 19  | Yes 15, No 16  | Yes 14, No 18  | P=0.69                      |

COE=Conventional oral examination, SOE=Structured oral examination

### Table 4:

Opinion of examiners (n=4) regarding SOE and COE (unstructured)

| Merits of SOE                                      | Limitations of SOE                                      |
|---------------------------------------------------|--------------------------------------------------------|
| No “halo effect”                                   | Implementing SOE on large scale (e.g., summative assessment) is difficult |
| Less chances of the effect                         | Taking SOE is more monotonous for examiners than conventional format |
| liking for a particular topic                      | It has a rigid time framework                           |
| Topic coverage is more                             | In-depth assessment may be difficult                    |
| Viva is not driven by                               | in a given time of 10 min                              |
| students’ answering                                | More resource intensive                                |
| Fixed time duration (equal opportunity)            |                                                        |

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![Image of Table 3 and Table 4]

![Image of Table 5]

However, it is a realistic, practical situation, prevailing in most of the Departments of Pharmacology. No examiner was properly trained in this method of assessment. Training by organizing workshops and developing orientation manuals, is important for increasing effectiveness of examination.\[19,20\] Development of ability in examiners to ask relevant questions in unambiguous words so that almost similar answer comes from all students that increases validity further. This aspect of faculty development is being realized to be important nowadays.\[21\] Inter-rater reliability can further be enhanced by the use of grading or scoring system.\[22,23\]

The perception of the students to this form of viva is found to be encouraging.\[15,24\] In this study, students did not perceive any threat of a new format of examination and perceived structured format similar to conventional viva with respect to understanding and responding to the questions. However, most students felt that this format required greater preparation than conventional viva.

Availability of time and human resources are important determinants of the feasibility of an effective evaluation tool. At least four examiners are needed to conduct university practical examination and viva voce for 100 undergraduates and one more for every increase in 50 students. It is customary in conventional format to divide total subject into two parts according to theory paper-I and II. One of the examiners takes viva from part-I and the other from part-II. However, often, time becomes a big constraint [Table 3]. What should be the appropriate time duration for structured viva voce in pharmacology? This is important because ultimately 150–250 students would be required to be examined. In one study,\[24\] authors fixed time duration of 10–15 min for 10 items questionnaire in physiology with items having increasing difficulty levels. Six examiners were involved in taking viva each assessing 6–7 students only. In another study, 8 min were assigned for 8-item structured questionnaire during formative assessment in biochemistry.\[15\] Two examiners sat together for conducting structured viva. Increasing number of examiners may not be a practical proposition because of professional time needed, although it reduces inter-rater variability and improves reliability (agreement in allotted marks between two examiners). In a targeted viva, Rangarajan et al. engaged each student for about 25 min and thus only 5–6 students were examined in a day. We found that arbitrary limit of 10 min is not sufficient because students would not reach till question 14 and 15. One remedy is to reduce the number of items in the questionnaire to 10 and other is to increase the time allotted to the student. Conversely, increasing the number of question increases inter-examiner reliability.\[22\] We feel that assessment of students’ competence for certification (pass/fail) would require the development of questionnaire, which includes items from various systems. Therefore, reducing the number of items in the questionnaire may become counterproductive! As shown in Table 5, increasing time duration from 10 to 15 min would result in continued work for 8–12 h a day! If one examiner examines half of the students by structured viva format (say 15 only) and the other the remaining, then time duration can be increased from 10 to 15 min. The entire exercise could be tiring for examiner and stressful to the examinees. At present, little is known about the impact of these modifications on the scores obtained.

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Table 5:
Relationship between duration of viva, number of examiners required, and total duration required for proper conduct of SOE

| Time allotted per student (batch) | Duration of SOE |  |
|-----------------------------------|-----------------|---|
| Time 10 min                       | 25 h (total)    |  |
| 5 days                            | 3 days          |  |
| Two examiners**                   | 8.3 h/day/examiner | 8.3 h/day/examiner* |
| Two examiners                     | 25 students/examiner | 25 students/examiner |
| Two examiners as a group          | 30 students     | 50 students |
| Two examiners**                   | 12.5 h/day/examiner | 12.5 h/day* |
| Two examiners as a group          | 25 students/examiner | 25 students/examiner |
| Two examiners**                   | 30 students     | 50 students |
| Time 15 min                       | 37.5 h (total)  |  |
| 5 days                            | 3 days          |  |
| Two examiners**                   | 12.5 h/day/examiner | 12.5 h/day* |
| Two examiners                     | 25 students/examiner | 25 students/examiner |
| Two examiners as a group          | 50 students     | 50 students |

*Not a practical proposition, **Each examiner examines half of the students. SOE=Structured oral examination

introduce an element of inter-rater variability. These factors are the length of teaching experience, vernacular used, and lack of training of teachers. There is a need of training of examiners, development of scoring system, and ascertaining time duration of viva voce examination before SOE can be implemented as a part of fulfillment of university requirement for the summative assessment of student’s performance.

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Conflicts of Interest
There are no conflicts of interest.

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