

A study of dental students' clinical knowledge acquisition and experiences in conscious sedation

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IN BRIEF

- Describes a pilot study which provides an insight into students' experiences in intravenous sedation during a clinical attachment.
- Explains that the novel use of a pre- and post-clinical attachment knowledge test demonstrated higher results after the attachment.
- Provides student feedback on teaching, clinical support and gaining hands on experience was rated highly.

Aim To evaluate final year dental students' knowledge acquisition and experiences during their intravenous sedation (IVS) clinical attachment within the sedation department at Newcastle School of Dental Sciences (NSDS). **Methods** Students attending IVS clinical attachments in the period September 2012 – April 2013 completed a novel clinical knowledge test at the beginning and end of their one week attachment; a feedback questionnaire was also completed. **Results** A total of 70 students attended the attachment. Clinical knowledge tests were completed by 71.4% (n = 50) of students. The average test result improved from 75.1% in the pre-attachment test to 92.1% in the post-attachment test. Feedback questionnaires were returned by 65.7% (n = 46) of students. All students attained clinical experience of administering sedation and treating sedated patients. 'Teaching and Clinical Support' was rated highest, with 97.8% (n = 45) rating it as excellent. Students commented that hands-on clinical experience and clinical teaching were the most valuable parts of the attachment. Patients failing to attend appointments were considered the least useful part of the attachment. **Conclusion** This pilot study provides an insight into undergraduate clinical sedation, which is often under reported in the literature. The clinical experience gained at NSDS exceeds GDC recommendations for undergraduate sedation. The clinical knowledge test results suggest that clinical knowledge may be better retained after direct clinical experience.

INTRODUCTION

Undergraduate dental education is widely regarded as a unique pedagogical procedure.¹ An ideal educational environment should enable students to attain skills and exposure to 'clinical experiences' equivalent to the environment in which they will practise after graduation.¹ Recent landmarks in dental education include: problem-based learning, outreach teaching and the increasing use of academic progress portfolios and information and communication technology.¹

Current literature reflects widespread desire for reform and change to the dental curriculum, both nationally and internationally.²⁻⁴ The GDC has recently revised the learning outcomes for undergraduates.⁵ Prior to 2008, the GDC stipulated that all students must have clinical sedation experience.⁶ Current guidance is more vague, with

an emphasis on attaining 'knowledge', rather than 'practical' experience.⁵

There is a paucity of contemporary information on clinical sedation teaching. The available information suggests significant differences between dental schools in the amount and type of clinical teaching.⁷⁻⁹ Two national surveys regarding undergraduate sedation training in the UK and Ireland have been undertaken.^{7,10} The most recent, completed in 2001, reported disparities in teaching and indicated that hands-on clinical experience was completely neglected by some dental schools.⁷ It also revealed the majority of students rated their level of teaching to be just 'satisfactory'. These findings are supported by a survey which addressed how undergraduate education prepared newly qualified dentists for their first year of general practice.¹¹ It discovered that graduates generally felt inadequately prepared in sedation.

Students may be considered the 'consumers' of dental education.¹² The 'student voice' provides insight into students' perspectives of their education and promotes interest in the learning process.¹³⁻¹⁶ It may also enhance student engagement and empower them as key stakeholders in their development.¹⁶ However, the 'student voice' is complex and it must be recognised that students are not

homogenous and vary in educational, ethnic and social backgrounds, which may contribute to differing expectations and perceptions of their education.^{17,18}

Informal practices of eliciting the 'student voice' include periodic staff-student events and everyday responsive interactions with students.¹⁶ Formal feedback of clinical teaching is primarily collated through quantitative data from Likert-type questionnaires, usually given at the commencement and/or completion of learning experiences.¹⁹ Studies have also gathered qualitative data in the form of written responses to open-ended questions.²⁰ While this technique can further convey students' views in relation to the questions asked, it may limit the opportunity for unanticipated issues to surface.¹⁹ Some studies have used semi-structured interviewing and analysis of reflective journals.^{19,21} These inquiries can provide important insights which may have been overlooked, but are often timely to complete and may include the opinions of only a small number of students.¹⁹

The importance of student feedback is accepted as a valuable component of monitoring the quality of academic programmes.¹² However, in comparison to other health professions, relatively few studies have focused on dental student learning experiences.^{1,22,23}

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Assessment of a dental student's clinical knowledge is essential in providing feedback and motivation for continued learning, as well as ensuring patient safety.¹ Assessing clinical knowledge through written assessment is most commonly undertaken via multiple-choice items, short answer questions or structured essays.²⁴

At NSDS, final year dental students attend the sedation department for IVS clinical attachments. Under staff supervision, groups of 2-3 students administer sedation and provide dental treatment to sedated adult patients. The attachment includes an introductory seminar, eight clinical training sessions, a pre-operative assessment clinic and a seminar on medical emergencies. Prior to the attachment, students receive eight didactic lectures and a practical training session on intravenous cannulation. A study booklet covering basic principles and clinical techniques is also provided. There is no formal assessment, but progressive development of knowledge and practical skills is expected.

This pilot study was undertaken to gain insight into the development of clinical knowledge and evaluate students' feedback regarding the clinical attachment.

METHODS

This pilot study was carried out within the sedation department of NSDS. All final year dental students attending the IVS clinical attachment on the sedation department between September 2012 – April 2013 were included.

Clinical knowledge was assessed via a short written test. The questions in the test were formulated to assess knowledge of basic sedation principles and clinical techniques, as alluded to in the course learning objectives and course study booklet. Students sat the tests individually; collaboration with others was not permitted. The same test was undertaken on the first day of the placement and again on the final day. Each student was allowed ten minutes to complete the test. All test papers were marked by the same member of staff to reduce bias and the results entered on a database.

Students' evaluations of the attachment were obtained through the use of a feedback questionnaire which gathered information regarding teaching, practical experience and clinical understanding, ascertaining whether the course learning objectives were being fulfilled. Likert-type scale responses and open-ended questions were used to collect the data.²⁵ The number of sedation procedures personally completed by each student was also recorded. The questionnaires were individually and anonymously completed on the final day of the attachment.

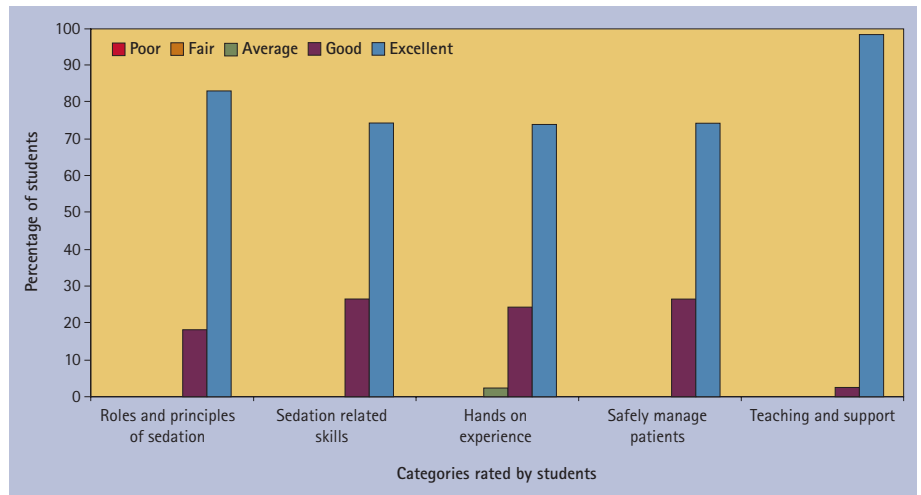


Fig. 1 Student rating of the learning objectives for the IVS clinical attachment

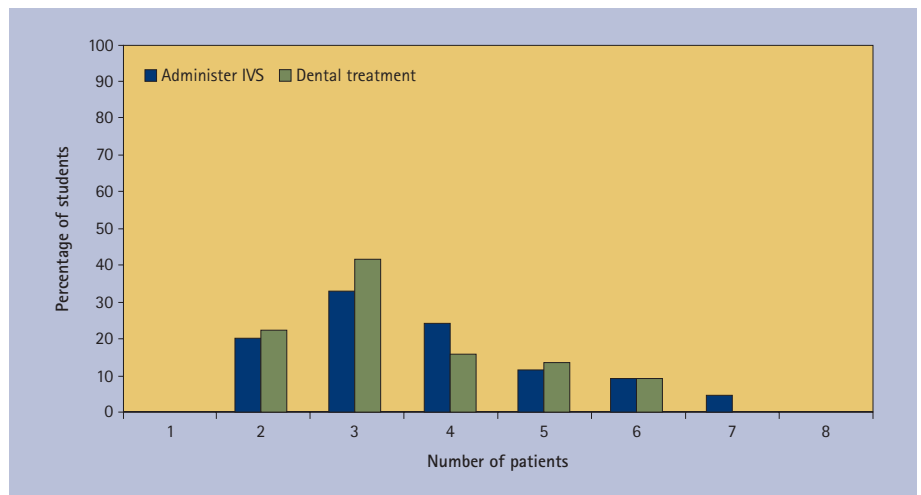


Fig. 2 Numbers of patients administered IVS and number of sedated patients treated by students during the IVS attachment

Quantitative data were transferred to an Excel spreadsheet and simple analysis carried out to identify frequencies and trends. Categorisation of the qualitative data was undertaken to allow analysis of the main themes. The categories were determined following review of all the questionnaires.

To prevent disclosure of identifiable information all feedback questionnaires were completed anonymously. Student initials were recorded on the clinical knowledge test to ensure that pre and post-attachment tests could be paired, not to permit identification. Participation in the feedback questionnaires and clinical knowledge tests was voluntary, and students were informed the assessment would have no influence upon their academic standing. The marks of the test were not given to students to prevent disclosure of this information.

RESULTS

Seventy final year students (45 female: 25 male) attended the Sedation Department for clinical attachments from September 2012 – April 2013.

STUDENT CLINICAL KNOWLEDGE TEST

Only the paired pre and post-attachment clinical knowledge tests were considered valid responses and suitable for analysis.

The pre and post-clinical knowledge tests were completed by 71.4% (n = 50) of students. The mean result for the pre-attachment clinical knowledge test was 75.1% (range 25-100%); two students achieved 100%. The post-attachment mean result was 92.9% (range 75-100%); 17 students achieved 100%.

FEEDBACK QUESTIONNAIRE

The feedback questionnaires were returned by 65.7% (n = 46) of students. All closed-ended questions were answered. However, not all students responded to the open-ended questions, in which free-text was required. All feedback questionnaires were analysed.

Students were asked to rate the clinical attachment in terms of:

- Understanding the roles and principles of conscious sedation in dentistry
- Acquiring sedation-related skills

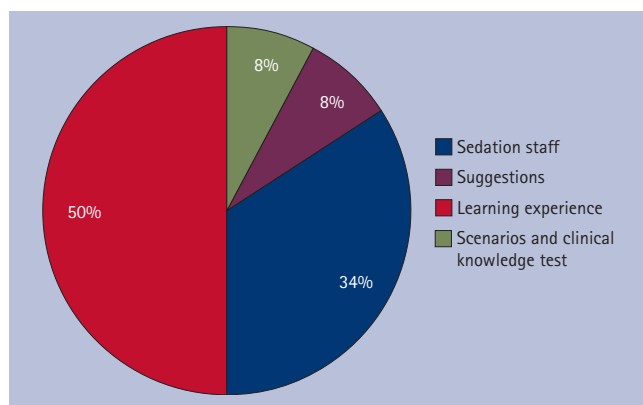


Fig. 3 Key themes of additional comments made by students regarding the IVS attachment

- Gaining hands-on experience of IVS in adults
- Safely managing a patient undergoing sedation
- Quality of teaching and support from clinical supervisors.

The responses are detailed in Figure 1.

The majority of students (95.7%, $n = 44$) rated the clinical training as 'Excellent' in comparison to other clinical courses. The remaining 4.3% ($n = 2$) rated it as 'Good'.

CLINICAL EXPERIENCE

Students stated how many cannulas they had placed. The mode was three cannulas; 78.2% ($n = 36$) of students placed three or more cannulas. Students recalled how many patients they had administered IVS and how many sedated patients they had provided with dental treatment; 80.4% ($n = 37$) of students administered IVS to three or more patients, 76.1% ($n = 35$) of students treated three or more patients (Fig. 2.)

MOST USEFUL PARTS OF THE CLINICAL ATTACHMENT

Written comments were made 97.8% ($n = 45$) of students regarding the most useful parts of the clinical attachment. Analysis of the responses identified four main themes:

- Hands-on clinical experience
- Clinical teaching
- New patient assessment clinic
- All parts of the clinical attachment were useful.

Of those students who made reference to 'Hands-on Clinical Experience', 68.4% ($n = 13$) specifically identified learning cannulation as most useful.

Additionally, 35.7% ($n = 5$) of students who commented on 'Clinical Teaching' found the clinical case scenario documents useful. The clinical case scenarios documents were completed when patients failed to attend appointments to ensure clinically time was utilised effectively. They provided students with written examples of clinical

situations and required the application of knowledge and understanding through relevant questions.

LEAST USEFUL PARTS OF IVS CLINICAL ATTACHMENT

Written comments were made by 58.7% ($n = 27$) of students regarding the least useful parts of the clinical attachment. Analysis of the responses identified five main themes:

- Patients not attending
- Cancelled clinics
- Monitoring sedated patients
- No part of the clinical attachment was not useful
- Other.

Those students ($n = 2$) which made 'Other' comments regarded the CPR seminar and the new patient assessment clinic as the least useful parts of the attachment.

It should be acknowledged that 40% ($n = 10$) of responding students could not identify any part of the attachment that was not useful.

OTHER COMMENTS

Additional comments were made by 82.6% ($n = 38$) students (Fig. 3). Analysis of responses identified four main themes:

- Sedation staff
- Learning experience
- Scenarios and clinical knowledge tests
- Suggestions to improve the clinical attachment.

Most students ($n = 19$) made comments regarding what they had learnt during the attachment. Increased understanding, knowledge and development of clinical sedation skills were frequently mentioned.

Students were appreciative of staff, with particular reference to the high level of nursing support. The words: 'excellent', 'wonderful' and 'supportive' were most commonly used to describe staff.

A small proportion of students ($n = 2$) acknowledged that the clinical scenario documents were useful, especially when

patients failed to attend appointments. One student made specific reference to the clinical knowledge tests as 'useful' and 'showed us what we had learnt'.

Students ($n = 3$) who recommended improvements suggested:

- Students to discharge patients after IVS
- The clinical attachment to be longer
- A seminar on medical emergencies.

DISCUSSION

The clinical knowledge test results improved from an average of 75.1% in the pre-attachment test to 92.1% in the post-attachment test. There is no previous work with which to compare these results, but they infer students' clinical knowledge improved following the attachment. The test results demonstrated students' answers improved most in questions directly linked to clinical experience. Questions on the level at which the oxygen saturation alarm was set, size of cannula and strength of midazolam used showed greatest improvement.

Studies suggest that hands-on clinical experience and knowledgeable supervising staff are the most important factors for dental students in their clinical training.²⁶ These factors are almost certainly interlinked to the development of clinical knowledge. Therefore, it is perhaps not surprising that clinical attachments at NSDS, which were evaluated highly for hands-on experience and clinical teaching also developed students' clinical knowledge, as demonstrated by the pre and post-attachment results.

Feedback from students rated all aspects of the clinical attachment highly overall, with 'Teaching and Clinical Support' rated highest. This is encouraging as it is acknowledged effective teaching is essential for student learning in dentistry.²³ The results are supported by the most recent General Dental Council (GDC) report which highlighted the commitment and attitude of teaching staff as exceptional at NSDS.²⁷ Factors contributing to the high level of satisfaction with 'Teaching and Clinical Support' were inferred by student comments which suggested supportive staff and clinical case scenarios documents were particularly useful. The higher marks in the post-attachment clinical knowledge tests compared to the pre-attachment tests also imply effective teaching and student learning.

The clinical attachments were enhanced by supplementary teaching through clinical case scenario documents. Students often completed the scenarios when patients failed to attend appointments. It is suggested dental students fear wasted clinical time as missing out on clinical development²⁶ and these documents provided opportunities

for application of relevant clinical knowledge and understanding in the absence of actual patients.

Students most frequently reported that gaining clinical experience was the most useful part of the clinical attachment. Learning cannulation received most positive feedback. These comments are not unexpected as cannulation is a new skill, quite different from intra-oral dental procedures, so may have carried a great sense of personal achievement.

On average, students administered IVS and performed dental treatment on three patients with the placement of three cannulas. These results do not achieve the Dental Sedation Teachers Group (DSTG) recommendations of 20 cases for undergraduates.²⁸ However, this target figure may be ambitious and has never been attained in other previous undergraduate studies.^{7,9} In the absence of a realistic 'ideal' figure for the amount of undergraduate clinical experience required and the GDC's recommendations for 'knowledge' rather than 'clinical experience' in sedation, it may be viewed that students' sedation experience at NSDS is more than adequate. Indeed evidence suggests not every dental school provides undergraduates clinical experience.^{7,9} It must also be remembered that postgraduate training in conscious sedation is mandatory and in an era of changing and expanding dental curricula the necessity for extensive undergraduate sedation clinical experience is perhaps reduced.^{3,29}

LIMITATIONS

The feedback questionnaire response rates were comparable to previous studies on undergraduate university course experiences.³⁰ However, it must be recognised that the year group size was relatively small, in comparison to other undergraduate degrees, and a higher response rate may have reduced potential bias.³¹ The lower than expected response rate may be attributed to; student absences, cancelled clinics, students failing to return/staff failing to collect the questionnaires, and new clinical staff members starting during the data collection period, who may initially not have been aware of the study.

A lack of previous work in clinical sedation makes comparisons difficult and is compounded by the fact that the GDC's guidance on undergraduate sedation teaching has significantly changed over time.⁶ Additionally, the DSTG's recommendations on the amount of clinical cases may be unrealistic and therefore no 'ideal' target figures exist.²⁸

The written free text responses may have identified general perceptions regarding the clinical attachments, but it is acknowledged

that students' comments were brief and susceptible to subjective analysis in their interpretation.

It is also accepted that using the same questions on the pre and post-attachment clinical knowledge tests may have led students to research and memorise answers. Therefore, the test may have reflected power of memory rather than development of clinical knowledge. Some students achieved 100% on the pre-attachment test and could not further develop their clinical knowledge; thus the assessment could not demonstrate improved clinical knowledge for all students. Additionally a written test may not always fully represent clinical knowledge, and other assessment formats may be more applicable for example, OSCE type assessments.²⁴

CONCLUSION

The novel use of a pre and post-attachment clinical knowledge tests demonstrated higher results after the clinical attachments. In general, questions relating to clinical procedures were most improved and perhaps suggest clinical knowledge is better retained after direct clinical experience.

Overall, students rated the clinical training very highly; they particularly valued teaching and clinical support received and valued gaining hands on clinical experience, especially learning cannulation.

All students attained clinical experience in IVS. On average they administered sedation and treated three sedated patients. Although this figure falls short of the number recommended by DSTG it may be considered to be adequate with reference to the GDC's current guidance for undergraduates.^{5,28}

Future work is proposed to expand this preliminary study to further explore teaching methods in relation to the development of knowledge and clinical skills and how they correlate with students' views. This information may help to develop and enhance the student learning experience.

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