

# Communicating Prosthetic Prescriptions from Dental Students to the Dental Laboratory: Is the Message Getting Through?

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*Abstract:* The aim of this research was to investigate the quality of written prosthetic prescriptions provided by fourth-year dental students to a commercially operated dental laboratory and to ascertain the contribution of interprofessional education to improving prescription quality. Based on guidelines established by the Medicines and Healthcare Products Regulatory Agency of the European Union (Medical Device Directive 93/42/EEC), an audit was conducted prior to and after an educational intervention was delivered by a dental technician to a dental student cohort at one Australian dental school. Prior to the intervention, thirty-nine dental prosthetic prescriptions were collected, analyzed, and audited to determine the clarity of written communication and instructions from dental student to dental technician. Following the intervention, a further forty prosthetic prescriptions were collected from the same cohort of students and were audited. The audit of the initial prescriptions showed that 85 percent (n=33) did not comply with the recommended conventions. After the intervention, the prescriptions that did not meet the guidelines had fallen to 30 percent (n=12) of the total. Improvements in prosthetic prescriptions submitted by these dental students to the commercial dental laboratory suggest there is an advantage to including a prosthetic prescription-writing module in dental school curricula.

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Effective communication is critical in the delivery of quality oral health care and treatment.<sup>1,2</sup> To have the best conceivable outcome for an oral prosthesis, it is fundamental that the dentist and dental technician collaborate effectively as a team by possessing a sound understanding of each other's roles with regard to oral prosthesis fabrication.<sup>3-6</sup> Communication between clinicians and dental technicians is dependent on prosthetic prescriptions.<sup>2,7</sup> Prosthetic prescriptions are considered to be the foundation for prosthesis or appliance fabrication; therefore, significant information must be communicated clearly and effectively between the two professionals.<sup>2,8,9</sup> Collaboration, teamwork, and communication are key competencies for all dental care professionals.<sup>10,11</sup> In regard to the prescription of oral prostheses, Leith et al. confirmed that the dentist is ultimately "responsible for the end product, and as such, requires an understanding of the fabrica-

tion requirements, including material selection and design."<sup>4</sup> The dentist or clinician thus has the primary responsibility to deliver clear and accurate prosthetic prescriptions to the dental technician.<sup>10,11</sup>

The role of the dental technician is to fabricate oral prostheses in accordance with instructions specified by the dentist on the prosthetic prescription.<sup>4,12,13</sup> The General Dental Council (GDC) in the United Kingdom defines dental technicians as "registered dental professionals who make dental devices including dentures, crowns, and bridges to a prescription from a dentist or clinical dental technician."<sup>14</sup> If these prescriptions or instructions are not adhered to or are difficult to comprehend, an unacceptable prosthesis/appliance may result, which has the potential to cause tissue damage to the patient.<sup>1,2,12</sup> Notwithstanding this, the dental technician needs to be encouraged to critique the prosthetic prescription and materials and should not feel obligated to

fabricate a prosthesis if either is unsatisfactory. If the impressions, dies, and models are inadequate or the instructions are unclear, it is the dental technician's responsibility to contact the dentist and clarify the irregularities or concerns.<sup>2,13,15</sup> The dental technician has a professional responsibility to communicate with the prescribing practitioner.<sup>6</sup> Legally, the prescribing dentist's signature must be evident on the prosthetic prescription to impart responsibility of oral prosthesis fabrication.<sup>16,17</sup> Appropriately completed prosthetic prescriptions not only contribute to the final quality of oral prostheses, but also reduce the possibility of delays or re-fabrications.<sup>2,18</sup> Furthermore, prosthetic prescriptions provide a transparent historical record pertaining to the patient's treatment and act as a method of auditing work conducted.<sup>19</sup>

Although dental school curricula are designed to prepare students to perform oral health procedures to a competent level of proficiency, the significance of prosthetic prescriptions and their compilation has rarely been taught in detail or featured at a timely point in the curriculum, let alone being taught by those who receive the information.<sup>9,20</sup> However, now that dental technology is a baccalaureate qualification at many universities around the world, there are greater opportunities for interprofessional education (IPE) and collaboration between the professions. IPE specifically focuses on students' learning with, from, and about each other's professional roles.<sup>21</sup> Therefore, the inclusion of IPE in relation to prosthetic prescriptions is one way dental students can develop the ability to effectively communicate with the dental technician during the preclinical and clinical years and when practicing after graduation.<sup>1,7,8</sup>

The GDC recommends that dental education require students to understand the importance of communication with other members of the oral health care team (OHCT).<sup>10</sup> Furthermore, in Europe, dental schools are expected to ensure that students are capable of "prescribing materials and technological details of prosthetic appliances within an interprofessional relationship with the dental laboratory."<sup>22</sup> In both the United Kingdom and Europe, dental students are required to have sufficient understanding of clinical preparation and laboratory processes to evaluate their own clinical cases and cases provided to, and received from, the dental technician.<sup>10</sup> Similarly, these guidelines are stipulated in the Australian Dental Council's *Professional Attributes and Competencies of the Newly Qualified Dentist*, which includes the statements that, on graduation, a dentist should be able to "com-

municate effectively with other health professionals involved in patients' care and convey written and spoken information clearly" and "select appropriate clinical, laboratory, and other diagnostic procedures and tests, understand their diagnostic reliability and validity, and interpret their results."<sup>23</sup>

Despite these specified competencies dental students should gain during their education, there are recurrent misunderstandings of the requirement to include dental laboratory techniques within predoctoral dental curricula, due to the assumption that this area of specialization will be delegated to the dental technician.<sup>7,24-27</sup> Afsharzand et al. have recommended that dental students be educated in how to effectively communicate what is required by the dental technician and how to correctly complete prosthetic prescriptions during preclinical and clinical courses.<sup>12</sup> This recommendation is supported by Stewart, who notes "the importance of correctly completing a [prosthetic] prescription needs to be highlighted at the beginning and throughout dental students' education."<sup>22</sup> However, we have not found any instances in the English-language literature in which these recommendations have been implemented.

The aim of this study was, first, to audit and evaluate the quality of communication and instructions given to a commercial dental laboratory by fourth-year dental students at the Griffith University (GU) School of Dentistry and Oral Health (SDOH), Queensland, Australia. The second aim was to investigate whether there were any benefits of an educational intervention delivered by a dental technician to improve the quality of students' prosthetic prescriptions. We hypothesized that providing an educational intervention at a time when the students need the information would result in improved quality.

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## Materials and Methods

Due to the lack of guidelines pertaining to prosthetic prescriptions in Australia, the audit used guidelines established by the Medicines and Healthcare Products Regulatory Agency (MHRA) of the European Union (Medical Device Directive 93/42/EEC).<sup>28</sup> The study included all fourth-year dental students (eighty-nine enrolled in 2012) at GU SDOH, as the fourth-year curriculum requires students to complete practical prosthetic work throughout the academic year. Every effort was made to ensure the protection of participants, and ethical issues were addressed throughout the research. In compliance

with regulations of the Griffith University Ethics Expedited Review, permission to conduct the research was obtained (GU Approval Reference No.: DOH/10/12/HREC).

In order to classify and audit the written prosthetic prescriptions, a reliable scale was sought in published research.<sup>1,2,26,27</sup> The scale included the ideal requirements established by the MHRA, which requires ten pieces of information to be present on the prosthetic prescription.<sup>28</sup> Data were also collected to identify what information was recurrently absent in order to ascertain where the students were consistently deficient. The minimum required information was the prescribing dentist's name, prescribing dentist's signature, supervisor's signature (where applicable), date of submission to the dental laboratory, try-in and/or re-try date (where applicable), finish date, required oral prosthesis or appliance, specified materials, patient tooth shade or desired denture teeth, and prosthesis design.<sup>2,28</sup>

The classification of prescription quality was as follows: Clear=instructions were defined and adequate (0-1 errors present); Unclear=some design requirements were left to the technician (2 errors present); Poor=most responsibility was left to the technician (3-4 errors present); and None or Illegible=no or illegible instructions were supplied (5 or more errors present). Furthermore, the prosthetic prescriptions provided by the in-house commercial dental laboratory included checkbox lists to distinguish among the various pieces of information. These lists were divided into two groups: Provided Items referred to models (upper/lower), tray/s (upper/lower), and wax bite/s (upper/lower); Patient Analysis referred to gender, age, and facial features (square, tapering, or ovoid). The Provided Items group allowed the dental technician to ensure that all objects provided by the dentist could be accounted for prior to or during fabrication of the oral prosthesis. The information in the Patient Analysis group enabled the dental technician to fabricate oral prostheses that are harmonious with the patient's natural features. Although the use of a checkbox list was not essential for the audit, it provided an opportunity to record comparisons between the audits and to observe the thoroughness of the prescribing dentist in providing sufficient information to the dental technician at this location.

Once the preliminary results were collected and analyzed, an educational intervention was conducted by a registered dental technician with the dental students. The evidence-based education

session outlined the importance of prosthetic prescriptions and information sent to the laboratory. To ensure that an educational session was available to all students, two separate thirty-minute lectures were scheduled, both presenting the same information using Microsoft PowerPoint. The presentation included the theory of communication, legal responsibilities of the prescribing dentist, ideal requirements for each field of prosthetic fabrication, and examples of complications when insufficient detail is provided. Students were encouraged to ask questions during and after the lecture. An explanation of the research project and audit methods was also outlined for the students. The pre-intervention audit results were then presented to the students, showing the areas that were inadequate in prosthetic prescriptions. Each lecture finished with an interactive quiz, in which students were required to identify the information that was absent from a sample prosthetic prescription for a removable partial denture (RPD).

In addition, the commercial dental laboratory reception team was informed of the required information needed to meet ideal prosthetic prescriptions for auditing purposes. When the students presented at the laboratory to have prostheses/appliances fabricated, they were required to complete a prosthetic prescription. Once this was completed, a photocopy was made, and corrections were made on the original copy. This process allowed the staff to correct the students' prescriptions after submission of clinical cases and reiterate what was addressed during the lectures. Two months after the intervention, a second set of prosthetic prescriptions were collected and evaluated. A comparison of the two audits was conducted to determine the efficacy of the educational intervention. Descriptive statistics were used to report results, and data were analyzed with the Statistical Package for Social Sciences (SPSS), version 20.0 in relation to the aims of the study.

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## Results

### Pre-Intervention Results

At the conclusion of the first academic semester in 2012, a convenience sample of thirty-nine prosthetic prescriptions were collected from the commercial dental laboratory. Of the total, 85 percent (n=33) were non-compliant. The most commonly omitted piece of information was the prescribing dentist's signature, in 100 percent (n=39) of the prescrip-

tions. The date of completion for the required oral prosthesis was absent from 44 percent (n=17) of the prescriptions, while the try-in date was not indicated on 13 percent (n=5). The required oral prosthesis was not specified on 36 percent (n=15); removable denture designs were not included on 15 percent (n=6); and the required materials for fabrication were not designated on 28 percent (n=11). The patient's tooth shade was not included on 15 percent (n=6) of the prescriptions. Regarding use of the checkbox lists, the Provided Items were not utilized in 51 percent (n=20) of the prescriptions, and the Patient Analysis details were not included 15 percent (n=6) of the time.

The highest number of pieces of absent information observed was six; this occurred in three prescriptions. Of the audited prescriptions, 15 percent (n=6) had over half of the required information missing, and only 18 percent (n=7) of the prescriptions were clear. Twenty-eight percent (n=11) were considered to be unclear, having left some of the decision making and design responsibilities to the dental technician. Poor quality information occurred in 39 percent (n=15) of the prescriptions, and there were minimal or no instructions on 15 percent (n=6).

## Post-Intervention Results

Following the intervention, a convenience sample of forty prosthetic prescriptions were gathered and audited according to the MHRA guidelines.<sup>28</sup> Twelve (30 percent) of these prescriptions were non-compliant. Again, the most frequently absent information at 78 percent (n=31) was the prescribing dentist's signature. The required completion date for the prescribed prosthesis was not specified on 8 percent (n=3), while the try-in date was not provided on 3 percent (n=1). A total of 8 percent (n=3) of the prescriptions failed to include the type of oral prosthesis required. However, only 5 percent (n=2) did not contain a design for removable partial dentures, along with the required materials not being specified on 15 percent (n=6). The patient's tooth shade was not provided on 3 percent (n=1). The Provided Items were not specified on 53 percent (n=21), and the Patient Analysis was not completed in 40 percent (n=16).

The highest recorded number of pieces of absent information was four; this occurred in one of the collected prescriptions. Among these prescriptions, 70 percent (n=28) were considered to have clear instructions. A total of 20 percent (n=8) were deemed to be unclear, with some design responsibilities still being left to the dental technician. There was a sig-

nificant reduction in both poor (10 percent, n=4) and none or illegible (n=0) quality of communication in these prescriptions.

The results of the pre-intervention audit, showing a significant number of non-compliant prescriptions, clearly demonstrated the need for the students to be educated in prosthetic prescriptions and expectations for the prescribing dentist. After the educational sessions, there was vast improvement in meeting the majority of requirements, with the exception of dentist signature. Figure 1 and Table 1 show comparisons between the pre-intervention and post-intervention audit results.

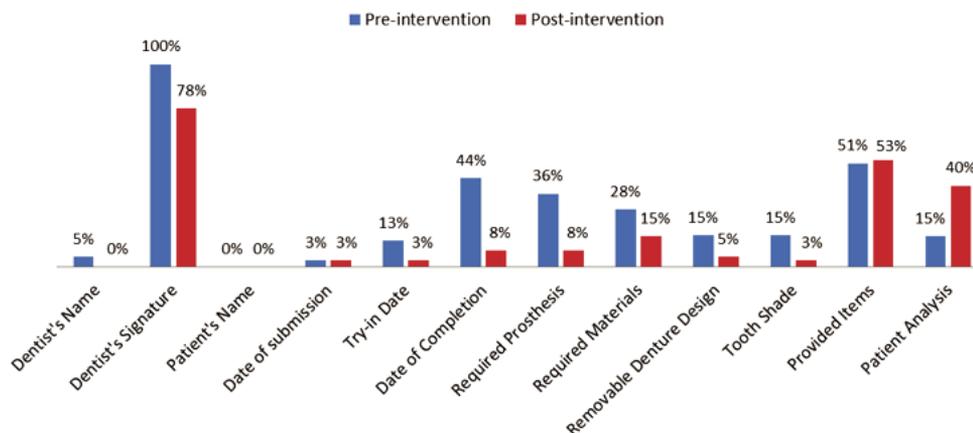
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## Discussion

Although previous researchers<sup>2,4,12</sup> have suggested the need to include prosthetic prescription writing in dental school curricula, these recommendations are apparently not being followed.<sup>10,23</sup> The results achieved in our study suggest that there are benefits to exposing dental students to their responsibilities and obligations to correctly complete prosthetic prescriptions. Not only is the stage or timing in the curriculum important, but who delivers the message. Utilizing qualified dental technicians to educate dental students also demonstrates the value of IPE in dental curricula.

Our results showed that the prescribing dentist's signature was the most frequently absent piece of information during both the pre- and post-intervention audits. This could be ascribed to the students' not realizing their legal responsibilities. However, as the prosthetic prescriptions provided by the commercial dental laboratory did not contain a section for a signature, this absence would also have been a contributing factor by not prompting the students to include this item. In a litigious society, lawsuits may occur in situations in which a patient's oral health status deteriorates as a result of a poorly designed RPD. By signing a prosthetic prescription, the dentist is acknowledging that all necessary information has been provided to the dental technician to ensure a positive patient outcome. Stewart proposed that if dental students were encouraged to recognize their legal obligations by signing their prosthetic prescriptions, they would develop good practice while in school that would help them avoid bad habits after they graduated.<sup>2</sup>

As the leader of the OHCT, the dental student or dentist must ensure an understanding of the



**Figure 1. Difference in pre-intervention and post-intervention percentages of missing information from prosthetic prescriptions, by percentage of total prescriptions in each stage of study**

**Table 1. Overall instruction quality of written prosthetic prescriptions, by number and percentage of total before and after educational intervention**

Instruction Quality	Pre-Intervention	Post-Intervention
Clear	7 (18%)	28 (70%)
Unclear	11 (28%)	8 (20%)
Poor	15 (39%)	4 (10%)
None or illegible	6 (15%)	0

various processes and stages, including choice of materials, in the fabrication of oral prostheses.<sup>4,20</sup> Through awareness of these variables, the dentist can positively influence the timely fabrication of an oral prosthesis or appliance with minimal disruption to the patient.<sup>2,16</sup> During the preliminary audit in our study, we observed that a majority of the required finish dates were incorrectly placed in the try-in date section of the prescription, in particular with prescriptions for RPDs. This could be due to the students' unfamiliarity with the technical stages in the fabrication of RPDs. The finish date was completed correctly in the post-intervention results—perhaps as a result of the requirement for students to complete the majority of their own prosthetic work. This process exposes them to the various technical steps, advancing their familiarity and experience with the treatment planning and consultation stages. Moreover, although previous studies have reported a decline in dental prosthetic education in dental school curricula,<sup>2,20,24</sup> the improvement in prescription results in our study

shows a significant benefit to students in gaining a greater appreciation of the dental technician's role and time constraints in prosthesis fabrication.

The prosthesis design was not provided in a significant number of prescriptions examined in this study. The dental students need to understand that this requirement is essential to avoid the need to provide the absent information later and ensure that the oral prosthesis can be fabricated in a suitable timeframe. A possible cause of missing information may be due to the prescribing dentist having designed the prosthesis directly onto the supplied model cast only, as these prescriptions were for RPDs. Despite that, dentists should transfer the details of components from the model cast; the design is also required on the prosthetic prescription to provide a historical record as model casts are rarely retained on conclusion of treatment.<sup>3,19</sup> Dental students need to remember that it is the dentist's responsibility to survey and design the oral prosthesis on the model cast prior to dispatching it to the dental technician.<sup>3,27</sup>

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## Conclusion

This study found that, even within a close working environment such as a dental school, the quality of written prosthetic prescriptions can be inadequate. Acting on recommendations from previous studies, the research team developed an educational intervention highlighting the importance of prosthetic prescriptions, and the results showed that it improved students' prescription-writing. Although the number of prescriptions was modest, we suggest similar results would emerge in other dental schools. An interjurisdictional study would be likely to confirm these findings. However, it would be beneficial to act on what is already recommended in the various dental professionals' guidelines and utilize IPE to develop a prescription-writing module in all dental school curricula. Improvements in prosthetic prescriptions submitted by our dental students to the commercial dental laboratory proved that a simple intervention was able to improve communication between the two groups.

Both professions need to value and appreciate their individual roles and responsibilities to safeguard a positive patient care outcome. The dentist must ensure that sufficient instructions are supplied and effectively communicated. The dental technician must confirm that all required information has been supplied and follow the instructions provided by the dentist accordingly. With the use of an IPE learning environment, these roles and responsibilities can be ingrained into all dental and dental technology students, resulting in improved patient care and a harmonious working relationship.

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