**Assessment of the Perceived Clinical Capability of senior undergraduate dental students; a study of the quality of information and instructions written in prosthodontics’ laboratory forms.**

**Running Title**: Assessment of the quality of information and instructions written in Laboratory form’s for prosthodontics cases.

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**Abstract**

**Background**: Even though the legal and ethical responsibilities on dentists to prescribe and communicate information and requirements to dental technician, a number of studies exist which reveal a lack of communication. Moreover, skills and techniques that students develop during their clinical education are profoundly become attitudes.

**Aim:** The aim of this clinical cross-sectional study was to inspect and observe the quality of written prosthodontics instructions and information for both fixed and removable prosthodontics immediately at the end of each clinical session to check if they are competent in this key prosthodontics’ skill.

**Methods:** Research ethic committee approved this study. A paper-based investigation aimed to discover the nature of prescriptions and information was sought regarding the quality of written instructions. A self-structured questionnaire was constructed which included general data; year of study, age and gender of the dental student, information of the case itself: if it was Co-Cr RPD, acrylic RPD, complete denture, FPD, veneer, PFM crown, reline, repair . The clarity and correct instructions. Written instructions and the diagrams were categorized as; Satisfactory and clear, a guide, unsatisfactory and poor and none.

**Results:** 91.8% of removable prosthesis design were not drawn on the form. In fixed prosthodontics 100% missing information regarding type of metal, gingival shade and incisal shade. 87.8% of the study sample selected the overall percaline shade. only 36.5% of the whole study samples were satisfactory and clear Moreover, 37.4% were considered as guide, 22.8% were unsatisfactory and poor and 3.3% were without instructions. There was a statistical significance difference between the groups. Results showed that only 42.3% approved on the intended day for delivery with minor adjustments. 14.6% rejected and unapproved (Redo). Unexpectedly, only 9.75% of written information indicated disinfection.

**Conclusion:** This study indicates weakness in communication between senior Dental students (SDSs) and the laboratory dental technicians. SDSs are not competent in writing prosthodontics forms. Furthermore, efforts should be made to form accountable policies and guidelines for prosthodontic treatment procedures. Specific ethical and legal guidelines should be introduced to prosthodontics courses in early years. The importance of correctly completing a prescription needs to be highlighted throughout dental students’ education. New improvement in software, uploading and downloading data transferring should be considered between dental clinic and dental laboratory.

**Keywords: Prosthodontics, Fixed, removable, dental technicians, laboratory forms.**

**Introduction**

There is an ethical and legal commitment that places precise necessities on dentists to provide adequate written instructions when a prosthesis is being manufactured.

Even though the legal and ethical responsibilities on dentists to prescribe and communicate information and requirements to dental technician, a number of studies exist which reveal a lack of communication and concerns regarding the quality of the information provided by dentists.1-10 .  Prescriptions have been called “the most often used and abused form of message between the dentist and laboratory dental technician”.[1](http://www.nature.com/bdj/journal/v211/n3/full/sj.bdj.2011.623.html#B15)1

The explanations for the poor communication found in these studies were usually either financial or educational 3.

Owing to the improvements in dental patients’ alertness about their dental treatment needs, a successful dental treatment requires not only an effective but also an interactive relationship between all members of the dental team.12

On the other hand, there is consistent evidence in the dental literature showing the damaging effects of inappropriately designed Removable Dental Prosthesis (RDPs).13-17 Because of this alarm, and as an ethical obligation toward patients, there is a general agreement that dentists should provide a detailed prescription for prosthodontics work to dental laboratories when providing this dental service. The European Union introduced the ‘Medical Devices Directive,’ which places legal and ethical guidelines on dental practitioners when a prosthesis is to be manufactured.18 The British Society for the Study of Prosthetic Dentistry has similar guidelines, which clearly state that the design of the RDP is the duty and responsibility of the clinician.19 Yet nothing introduced in Saudi Arabia.

The skills and techniques that students develop during their clinical education are profoundly become attitudes. Although faculty are really leading to produce high-quality learning environment in the dental school; clinical supervisors in dental schools, are asking questions about the effectiveness of clinical teaching strategies to improve and modify current strategies.

The aim of this clinical cross-sectional study was to inspect and observe the quality of written prosthodontics instructions and information for both fixed and removable prosthodontics immediately at the end of each clinical session to check if they are competent in this key prosthodontics’ skill. The study was including senior undergraduate dental students from University Dental hospital in the city of Jeddah, Saudi Arabia.

The null hypothesis was that the senior dental students are capable to write a complete, clear and efficient instructions and information in prosthodontics laboratory forms to produce a satisfactory quality dental prosthesis in western district of Saudi Arabia.

**Method**

King Abdulaziz University dental Hospital research ethic committee (No. 056-16) approved this cross-sectional, observational study. Over a period of eight months from October 2016. A paper-based investigation aimed to discover the nature of prescriptions and information was sought regarding the quality of written instructions and the diagram of the design.

A self-structured questionnaire was constructed in comprehensive care clinics for fifth and sixth year undergraduate dental students with four parts: first part is about general data; year of study, age and gender of the dental student. Second part was about information of the case itself: if it was cobalt chromium RPD, acrylic RPD, complete denture, FPD, veneer, PFM crown, reline, repair, or not specified if they didn`t specify the case. Then third part is check lists consist of student name, patient file number, date written, supervisor name and signature, last thing was about the clarity and correct instructions. Then if the case was removable or fixed partial denture then a detailed checklists were developed for each division following the prosthodontics laboratory forms available in the clinic for the students to use by the prosthodontic department Table 1. Information was also sought relating to the ‘disinfection status’ of the supplied prosthodontics work. Written instructions and the diagrams were categorized as; Satisfactory and clear – the instructions are complete and clear. A guide – minor judgement making has been left to dental technician. Unsatisfactory and poor – some information was missing and major judgement making has been left to dental technician. None – no information, instructions and/or design have been transferred.

**Table 1: check lists if the case was removable or Fixed prosthodontics.**

|  |
| --- |
| If the case was RPD:  € study model  € Design properly and completely drawn on the lab form  € Design completely drawn on the cast  € Mold Ant. Max.  € Mold Post. Max.  € Mold Ant. Man.  € Mold Post. Man.  € Kennedy classification  € Type of opposing dentition  € Tooth number  € Clasp type  € Guide plane  € Rest  € Retention  € Bracing  € Restoration  € Internal and external finish lines  € Tissue stop  € Design approved  € Wax pattern approved  **In case of FPD**:  € study model € Crown\ bridge type  € Post type  € Special trey  € Soldering  € Type of metal  € Shade gingival  € Shade incisal  € Shade |

**Statistical Methodology**

This study was analyzed using IBM SPSS version 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). A simple descriptive statistics was used to define the characteristics of the study variables through a form of counts and percentages for the categorical and nominal variables while continuous variables are presented by mean and standard deviations. To establish a relationship between categorical variables, this study used chi-square test. While comparing two group means, an independent *t*-test was used. These tests were done with the assumption of normal distribution. Lastly, a conventional p-value <0.05 was the criteria to reject the null hypothesis.

**Results**

The majority of the sample were sixth year dental students that represent 78.9%. Female dental students produce more prosthodontics work and prosthesis since the female represents 60.2% of the study. Moreover, in 70.7% of the cases the date at which the case is required was missing and not written on the form in the specified area. Supervisor’s name and signature was missing in 22% of the cases as shown in Table 2.

**Table 2: Characteristics of the 123 Study Samples**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Demographics | | | N | Min | | Max | | | Mean | | | SD |
| Age | | | 123 | 22 | | 25 | | | 23.13 | | | .7 |
|  | | | | Count | | | | | % | | | |
| Total | | | | 123 | | | | | 100.0 | | | |
| Year Of Study | | 5th year | | 26 | | | | | 21.1 | | | |
| 6th year | | 97 | | | | | 78.9 | | | |
| Age | | 20-22 | | 25 | | | | | 20.3 | | | |
| 23-25 | | 98 | | | | | 79.7 | | | |
| Gender | | Male | | 49 | | | | | 39.8 | | | |
| Female | | 74 | | | | | 60.2 | | | |
| Case type | Cobalt chromium RPD | | | | | | 26 | | | | 21.1 | |
| Acrylic RPD | | | | | | 13 | | | | 10.6 | |
| Complete denture | | | | | | 22 | | | | 17.9 | |
| Fixed partial denture | | | | | | 5 | | | | 4.1 | |
| PFM crown | | | | | | 57 | | | | 46.3 | |
| Case group | Removable partial denture | | | | | | 61 | | | | 49.6 | |
| Fix dentures | | | | | | 62 | | | | 50.4 | |
| Student Name | | | | | Present | | | 123 | | 100.0 | | |
| Patient file number | | | | | Absent | | | 1 | | .8 | | |
| Present | | | 122 | | 99.2 | | |
| Date at which the prosthodontics work required | | | | | Absent | | | 87 | | 70.7 | | |
| Present | | | 36 | | 29.3 | | |
| Supervisor name and signature | | | | | Absent | | | 27 | | 22.0 | | |
| Present | | | 96 | | 78.0 | | |

Unexpectedly 91.8% of removable prosthesis design were not drawn on the form, 95.1% were not drawn on the cast and just left to the technicians’ imagination and experience. Senior dental students failed to communicate type of the opposing dentition, clasps type, the location of rests, retention, bracing and tissue stops as shown in Table 3.

**Table 3: checklist in case of removable prosthodontics**

|  |  |  |  |
| --- | --- | --- | --- |
| If the case was RPD | | Count | % |
| Total | | 123 | 100.0 |
| Design properly drawn on lab form | **Absent** | **56** | **91.8** |
| Present | 5 | 8.2 |
| Design drawn on cast | **Absent** | **58** | **95.1** |
| Present | 3 | 4.9 |
| Kennedy classification | **Absent** | **58** | **95.1** |
| Present | 3 | 4.9 |
| Type of Opposing Dentition | **Absent** | **60** | **98.4** |
| Present | 1 | 1.6 |
| Tooth Number | **Absent** | **56** | **91.8** |
| Present | 5 | 8.2 |
| Clasp Type | **Absent** | **58** | **95.1** |
| Present | 3 | 4.9 |
| Guide Plane | **Absent** | **60** | **98.4** |
| Present | 1 | 1.6 |
| Rest | **Absent** | **60** | **98.4** |
| Present | 1 | 1.6 |
| Retention | **Absent** | **60** | **98.4** |
| Present | 1 | 1.6 |
| Bracing | **Absent** | **60** | **98.4** |
| Present | 1 | 1.6 |
| Restoration | **Absent** | **61** | **100.0** |
| Finish Line | **Absent** | **60** | **98.4** |
| Present | 1 | 1.6 |
| Tissue Stop | **Absent** | **61** | **100.0** |
| Design Approved | **Absent** | **60** | **98.4** |
| Present | 1 | 1.6 |
| Wax Pattern Approved | **Absent** | **60** | **98.4** |
| Present | 1 | 1.6 |

Regarding instructions for fixed prosthodontics 100% missing information regarding type of metal, gingival shade and incisal shade. However, 87.8% of the study sample selected the overall percaline shade as shown in Table 4

**Table 4: Checklist results for fixed prosthodontics**

|  |  |  |
| --- | --- | --- |
| In case of FPD | | % |
| Total | | 100.0 |
| Crown Bridge Type | Absent | 54.5 |
| Present | 45.5 |
| Soldering | Absent | 100.0 |
| Type of Metal | Absent | 100.0 |
| Gingival Shade | Absent | 100.0 |
| Incisal Shade | Absent | 100.0 |
| Shade | Absent | 12.2 |
| Present | 87.8 |

The results showed that younger students produce more removable prosthodontics work while older dental students produce more fixed prosthodontics cases; this was statistically significant (p 0.012) in comprehensive care clinics course as shown in Figure 1.

Figure 1: Type of the [rosthodontics work and age of the dental students.

Regarding the quality of the written instructions; only 36.5% of the whole study samples were satisfactory and clear Moreover, 37.4% were considered as guide, 22.8% were unsatisfactory and poor and 3.3% were without instructions. There was a statistical significance difference between the groups as shown in Table 5.

**Table 5: Quality of written instructions**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | | **Total** | Quality of written prescription | | | | p-value |
| Satisfactory and clear | Guide | Unsatisfactory and poor | No instruction |
| Total | | **123(100.0%)** | 45(36.5%) | 46(37.4%) | 28(22.8%) | 4(3.3%) | - |
| Case type | Cobalt chromium RPD | **26(21.0%)** | 2(7.7%) | 7(26.9%) | 13(50.0%) | 4(15.4%) | <0.001a |
| Acrylic RPD | **13(10.6%)** | 3(23.1%) | 7(53.8%) | 3(23.1%) | 0(0.0%) |
| Complete denture | **22(17.9%)** | 9(40.9) | 11(50.0%) | 2(9.1%) | 0(0.0%) |
| Fixed partial denture | **5(4.1%)** | 3(60.0%) | 2(40.0%) | 0(0.0%) | 0(0.0%) |
| PFM crown | **57(46.3%)** | 28(49.1%) | 19(33.3%) | 10(17.5%) | 0(0.0%) |
| a-significant using Chi-Square Test @ <0.05 level. | | | | | | | |

Results showed that only 42.3% approved on the intended day for delivery with minor adjustments. 43.1% approved after major adjustment and delayed delivery as a consequences. Regrettably, 14.6% rejected and unapproved (Redo)as shown in Table 6.

**Table 6: The outcome (quality of the prosthesis) based on approval for delivery to patients**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variables | | **Total** | Outcome ( quality of the prosthesis) | | | p-value |
| Approved with minor adjustment | Approved after major adjustment and resent to lab | Unapproved  (Redo) |
| Total | | **123(100.0%)** | 52(42.3%) | 53(43.1%) | 18(14.6%) | - |
| Case type | Cobalt chromium RPD | **26(21.1%)** | 5(19.2%) | 13(50.0%) | 8(30.8%) | 0.072 |
| Acrylic RPD | **13(10.6%)** | 4(30.8%) | 7(53.8%) | 2(15.4%) |
| Complete denture | **22(17.9%)** | 11(50.0%) | 10(45.5%) | 1(4.5%) |
| Fixed partial denture | **5(4.1%)** | 2(40.0%) | 3(60.0%) | 0(0.0%) |
| PFM crown | **57(46.3%)** | 30(52.6%) | 20(35.1%) | 7(12.3%) |

|  |
| --- |
| **Outcome ( quality of the prosthesis)** |

**Based on approval from the clinical supervisors for delivery in case of removable prosthodontics and approval for cementation in case of fixed prosthodontics.**

For removable prosthodontics 32.8% of the cases approved for delivery with just minor adjustments on the same day, 49.2% approved after major adjustments and rescheduled delivery appointment. Finally, 18% were unapproved (redo). However, in fixed prosthodontics 51.6%of the cases approved for cementation with just minor adjustments on the same day, 37.1% approved after major adjustments and rescheduled try in appointment. Finally, 11.3% were unapproved (redo) as shown in Table 7.

**Table 7: type of approval in removable and fixed prosthodontics cases.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | | **Total** | **Outcome ( quality of the prosthesis)** | | | **p-value** |
| **Approved with minor adjustment** | **Approved after major adjustment and resent to lab** | **Unapproved (Redo)** |
| Total | | 123(100.0%) | 52(42.3%) | 53(43.1%) | 18(14.6%) | - |
| Type of prostheis | Removable Prosthesis [( Co-Cr) RPD, Acrylic RPD, Complete denture] | 61(49.6%) | 20(32.8%) | 30(49.2%) | 11(18.0%) | 0.102 |
| Fixed Prosthesis [Fixed partial denture, PFM crowns] | 62(50.4%) | 32(51.6%) | 23(37.1%) | 7(11.3%) |

Unexpectedly, only 9.75% (n = 12) of written instructions indicated disinfection of the prosthodontics work.

|  |
| --- |
| **Discussion**  Dental students are expected to develop many skills in prosthodntics with all its laboratory techniques. Despite the progress in dental education in Saudi Arabia with the multinational clinicians and supervisors who came from different schools from all around the world; the results of this study were disappointing. Poor communication addressed many years ago and it is unacceptable that it is still present these days. Results showed shortage in following the correct approach to write and fill the prosthodontics laboratory form as required and as taught since only 36.5% of the whole study sample considered satisfactory and clear in senior dental students clinics. This is the first study conducted in Saudi Arabia from the clinic with dental students and following up the cases to observe the outcome of the prosthesis until the day of delivery and or cementation, therefore limited data are available to compare with our results.  Female dental students produce more prosthodontics work and prosthesis as the female in the study was 60.2 % since female seek higher grades more than male and they are considering getting bonus by doing more difficult and complex cases.  Many studies in diverse parts in the world described the poor transferring of prosthodontics data between dentists and dental technicians(7)(5)(3)(6)  Moreover, in 70.7% of the cases the date at which the case is needed was missing and not written on the form in the specified area. Supervisor’s and signature was missing in 22% of the sample. Unexpectedly 87% of removable prosthesis design is mot drawn on the form and just left to the technicians’ imagination and experience. In addition, 86.2% of the cases sent without design drawn on the casts. . In removable prosthodontics the absent data was almost all the information regarding the design itself, the teeth or the restoration type. This might be due to the difficulty of designing**.** In 89.4% of the cases student did not mention the type of the opposing dentition. In 87.8% of the cases, students did not specify the type of the clasps and in 89.4%, they did not mention the location of rests, retention, bracing and tissue stops. Regarding instructions for fixed prosthodontics 100% missing information regarding type of metal, gingival shade and incisal shade. However, 87.8% of the study sample selected the overall percaline shade |

In United Arab Emirates, Reem Haj-Ali and her group concluded that the responsibility of RPD design appeared to be largely delegated to dental technician 20

From all RPD cases examined in this study, only one single case found to be completed with all the information about the RPD and the design was completely drawn on the lab form. Because the design is mostly ignored and left to the technician, the number of remakes will increase, as it was shown in our results. Our results were nearly similar to Stewart in 2011 which was 18% of prosthodontics forms were poor and in our results were 22.8%.21 In addition, the patients may complain from periodontal diseases and difficulty in function as a result of ignoring the important details by the dentist. Another way to make the students complete prescriptions is to make it simple and includes a lot of guides and model example for removable and fixed prosthodontics cases.

More focus should be given to the correct and complete way in writing a laboratory prescription paper by training. Courses to the undergraduate students by the prosthodontists and by dental technicians are important to improve dentist-technician interaction and communication. Dickie et al. mentioned in their audit that they found better prescriptions and completed forms after providing education about this issue, including an examination questions on prescription writing in undergraduate objective structured clinical examination (OSCE) well make the students more competent22

Additional worrying finding from this study relates to the disinfection approach of the students of the prosthodontics items delivered to the dental laboratory. In only 9.75 %of the cases were technicians informed clearly about the disinfection status that is similar to the finding reported in 2012 which surveyed dental laboratories in Riyadh, Saudi Arabia 23. An inadequately disinfected appliances or dental casts can cause the spread of infections to all dental team. It is important in educational dental environment to have a consistent and standardized instructions and feedback from the clinical supervisors to overcome confusion and dependence on others. Finally, the prescription has to be 100% com­pliant before initiation the requested prosthodontics appliance 21. The null hypothesis that the senior dental students are capable to write a complete, clear and efficient instructions and information in prosthodontics laboratory forms to produce a satisfactory quality dental prosthesis in western district of Saudi Arabia was rejected.

**Conclusion:**

The information provided in this study indicates weakness in communication between the students and the laboratory dental technicians. Students must have proper understanding to the prosthesis they make. Further training is important and should be added as modules in prosthodontics curriculum to the undergraduate dental students in senior years as they forget some of the basics of writing the forms.

Furthermore, efforts should be made to form accountable policies and guidelines for prosthodontic treatment procedures. Specific ethical and legal guidelines should be introduced to prosthodontics courses in early years. The importance of correctly completing a prescription needs to be highlighted at the begin­ning and throughout dental students’ education. Likewise,

the planning of faculty development programs for clinical supervisors, mainly the new

comers of faculty who will take part in teaching will help to achieve improvements in this aspect.

Finally, new improvement in internet connection, uploading and downloading data facilitates transferring data between dental clinic to dental laboratory and it could be made with restrictions and allowed to submit it only if all the vital fields completed according to the type of the prosthesis selected.

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