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Quality of communication between dentists and dental laboratory technicians for fixed prosthodontics in Riyadh, Saudi Arabia



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Abstract The fabrication of a clinically acceptable dental prosthesis requires proper communication between the dentist and the dental technician. Prosthodontic educators have been concerned with this interaction and communication. Fixed prosthodontics laboratories revealed that the technicians are often dissatisfied with the information provided in work authorizations.

Objective: To evaluate the quality of communication between dentists and laboratory technicians via work authorizations for fixed prosthodontics in both governmental and private dental laboratories in Riyadh area from the technician's perspective.

Methods: A sample of 66 dental laboratories, including all government dental laboratories and a selected number of randomly chosen private dental laboratories from each district of Riyadh (40%), participated in the survey.

A questionnaire was developed to include questions related to the following areas of work authorization: clarity and accuracy of instructions, patient information, type of prosthesis, choice of materials, design and shade of the prosthesis and type of porcelain glaze. The questionnaire was answered in a face-to-face interview by technicians who were qualified in fixed prosthetic work. Data were analyzed through parametric tests (*T*-test and one-way ANOVA) to identify significant values ($P < 0.05$).

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Results: This survey showed a lack of communication between dentists and dental laboratories regarding the following: marginal design, pontic design, staining diagram, type of porcelain and glaze needed for the prosthesis. Significant differences were observed between the government and private dental laboratories. There was a greater lack of communication between the dentists and government laboratory technicians in Riyadh.

There was no statistically significant difference between private laboratories of different areas in Riyadh city ($P < 0.05$).

Conclusion: The quality of communication between dentists and dental technicians in Riyadh can sometimes be inadequate, and governmental laboratories have a lower level of communication.

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1. Introduction

With improvements in the public awareness and attitude toward dentistry, patients are requiring more complex and extensive treatments than before. Dental teams are facing extreme challenges in trying to satisfy the requirements of today's society (Douglass et al., 1993; Jenkins et al., 2009; Kelly et al., 2000).

The fabrication of high quality, durable dental prosthesis is considered a reflection of the skills of both the dental practitioner and dental technician, and it also requires effective communication between them through the work authorizations (Afsharzand et al., 2006a,b; Basker et al., 1988; Jenkins et al., 2009; Leeper, 1979; Lynch et al., 2005; Lynch and Allen, 2005a; Shillingburg et al., 1997). Inadequate communication of design information results in a prosthesis that has been fabricated with little reference to the important clinical or biological information, and the potential for a poorly designed prosthesis to cause tissue damage is evident (Owall et al., 2002).

An ethical obligation on the part of the dental practitioner to provide adequate design instructions to dental laboratories when fabricating any form of prosthesis has been affirmed by the EC Medical Devices Directive (1997), which requires dental practitioners to provide adequate written instructions when a prosthesis is being manufactured, as well as that dental laboratories manufacture the prosthesis according to the written specifications. Furthermore, the 'Guidelines for Crown and Bridge', published by the British Society for Restorative Dentistry (1999), clearly state that the purpose of written instructions is to communicate the precise details of all required aspects of the crown and bridgework.

Many studies have demonstrated concerns about the quality of dentist-technician communication. A survey of fixed prosthodontic laboratories revealed that technicians were often dissatisfied with the information provided in work authorizations (Aquilino and Taylor, 1984). A 2006a survey performed by Afsharzand et al. suggested that there is lack of communication about the choice of the metal alloy, type of porcelain, and choice of the margin and pontic design for the prosthesis.

Poor communication between dental practitioners and dental technicians for fixed prosthodontics was also cited in Ireland and Wales (Jenkins et al., 2009; Lynch and Allen, 2005a,b). Prosthodontic educators have been concerned with the interaction between dentists and the dental laboratory (Farah et al., 1991; Leeper, 1979). In a study conducted in

the UK, dental technicians responded that newly qualified dentists do not have an appropriate understanding of the techniques. Dental schools are still not preparing new graduates to effectively communicate with dental laboratories (Juszczyk et al., 2009). In 1990, Goodacre offered specific recommendations for dental educators to address the ramifications and responsibilities of future dental practitioners with respect to the dental laboratory. In 1994, a program was developed to improve the quality of laboratory submissions and the returned product, facilitating laboratory communication (Maxson and Nimmo, 1997). Recently, the American Dental Association (2011) issued updated guidelines to improve the relationship between the dentist and laboratory technician.

The communication between the dentist and dental laboratory through work authorizations is crucial to a properly executed prosthesis. The dental laboratories are able to observe, via work authorization forms, whether the communication is effective in allowing them to proceed with prosthesis fabrication.

The purpose of this study is to evaluate the communication between dentists and laboratory technicians through work authorizations for fabricating fixed partial dentures (FPDs) in both government and private dental laboratories in Riyadh area.

2. Materials and methods

A questionnaire on specific areas of work authorization forms was used. The questionnaire is written in both English and Arabic, and the front page explains the purpose of the study.

The questionnaire included the type of laboratory (governmental or private), years of experience and the laboratory's location in Riyadh. The survey covered specific areas of the work authorization concerned with fixed restoration fabrication and included the following questions: the patient's age and gender, return date, type of prosthesis, choice of metal alloy, preferred marginal design, shade guide, and type of porcelain glaze. Approval to conduct the study was sought from the Ministry of Health.

Questionnaires were completed in a face-to-face interview by certified dental technicians working on fixed prosthesis fabrication in governmental and private laboratories of Riyadh area. All 13 governmental laboratories were involved in the study; a total of 30 questionnaires were collected from them ($n = 30$), and a stratified random sampling method was applied to draw a sample from the private laboratories (40% from each area). The private laboratory sample was $n = 36$

from a total of 101 registered private dental laboratories in Riyadh.

The questionnaire was pilot-tested by 14 dental laboratories (12 private and 2 government) in the eastern district of Riyadh.

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics were used to compare the level of communication between dentists and fixed prosthodontics laboratory technicians in both government and private laboratories in general as well as between private laboratories in different locations in Riyadh area. Data were statistically analyzed through parametric tests (*T-test* and one-way ANOVA) and the *P* value was set to 0.05.

The study was registered in the College of Dentistry's Research Centre, King Saud University, and ethical approval was provided (NF 2389).

3. Results

A total of 66 dental laboratories participated in this study; 30 of the dental laboratories were governmental and 36 were private. Private laboratories were located as follows: 6 in the North, 6 in the South, 12 in the East, 4 in the West, and 8 in the Middle sector of Riyadh city.

The average number of years of experience in these laboratories was 13 years. The majority of laboratories (95%) confirmed the use of work authorization forms to communicate with the dentist about fixed prosthetic work. The responses to each question and comparison between government and private laboratories are shown in Tables 1–6.

Approximately 46% of laboratories reported that over 75% of the received forms were complete and legible to provide best service (Table 1); almost 60% of laboratories reported that over 50% of dentists include the patient's age and gender with no significant difference between private and government laboratories.

Over 70% of laboratories reported that most dentists (>50%) included the required return date in their forms, which was higher in private laboratories (>75%) compared to government laboratories, and was statistically significant ($P < 0.05$) (Table 1).

Sixty-two percent of laboratories reported that dentists noted retainer teeth in more than 75% of the forms; the private laboratories that reported this had a higher percentage, which was statistically significant ($P < 0.05$) (Table 2).

The majority of laboratories (76%) stated that dentists usually include the specific type of prosthesis in over 75% of forms; 89% of the laboratories that reported this were private, while 60% were governmental, which was also statistically significant ($P < 0.05$) (Table 2).

The required metal alloy was indicated by dentists in over 75% of the received forms and reported by 60% of laboratories (Table 3). On the other hand, nearly 34% of the laboratories reported that fewer than 25% of dentists indicated the required pontic design, and no differences were found between governmental and private laboratories (Table 4).

Nearly 37% of laboratories mentioned that over 75% of dentists indicated the preferred marginal design, and most of them were from private laboratories. On the other hand, a relatively high percentage (26%) mentioned that fewer than 25% of dentists indicate the preferred marginal design; most of them are from government laboratories, and this difference was statistically significant ($P < 0.05$) (Table 3).

Over 75% of dentists indicated the shade of the restoration in the forms, which was observed in 64% of laboratories. Seventy-five percent of the private laboratories indicated this compared to 50% from the government laboratories, which was statistically significant ($P < 0.05$) (Table 4).

With respect to the staining diagram, fewer than 25% of dentists included it in their laboratory authorization form, which was reported by 32% of the participating laboratories (Table 5). More than half of laboratories agreed that over 75% of dentists specified the shade guide used. No significant differences were found between the private and government laboratories (Table 5).

Finally, approximately 35% and 32% of laboratories reported that fewer than 25% of dentists indicated the type of porcelain and needed porcelain glaze, respectively. No significant differences were detected between private and government laboratories (Table 6).

There was no significant difference between private laboratories from different areas in Riyadh city.

4. Discussion

It is important that dentists recognize their ethical and legal responsibilities. Dentists have the knowledge and authority to delegate laboratory procedures based on patients' functional and aesthetical demands. Therefore, it is the responsibility of the dentist to design the final prosthesis without seeking assistance from the technician. The responsibility of the technician is to fabricate the prosthesis as prescribed on the work authorization form (Stewart, 2011).

Communication between dentists and technicians primarily occurs using laboratory authorization forms. The forms are usually the entire basis on which the appliance is constructed. Therefore, relevant design information must be clearly and effectively transmitted from the dental clinic to the laboratory (Barsby et al., 1995).

In the present survey, 46% of laboratories indicated that work authorization forms were complete and legible to provide the best service. Twenty-one percent of the laboratories indicated that the average work authorization form contained only a minimum amount of information necessary to complete the task. This result was comparable to what was locally reported by a previous study performed in the laboratories of King Saud University, College of Dentistry, in Riyadh (Al-

Table 1 Governmental and private dental laboratory technician's response regarding completeness of work authorization forms and return date inclusion.

Question	Type of laboratory	<25%	25–50%	50–75%	>75%	<i>P</i> value
Completeness of work authorization forms	Government	6.7%	18.5%	32%	42.8%	.294
	Private	2.7%	14.2%	37%	64.1%	
	Total	4.5%	16.7%	33.3%	45.5%	
Return date inclusion	Government	10.3%	13.8%	31.0%	42.8%	.042*
	Private	2.8%	5.6%	30.6%	60.1%	
	Total	6.1%	9.1%	30.3%	53.0%	

* Significant $P < 0.05$.

Table 2 Governmental and private dental laboratory technician's response regarding indicating the retainer teeth and specifying the type of prosthesis.

Question	Type of laboratory	< 25%	25–50%	50–75%	> 75%	P value
Indicating the retainer teeth	Government	10.0%	23.3%	20.0%	46.7%	.032*
	Private	11.1%	0%	13.9%	75.0%	
	Total	10.6%	10.6%	16.7%	62.1%	
Specifying the type of prosthesis	Government	3.3%	10%	26.7%	60%	.026*
	Private	2.8%	2.8%	5.6%	88.9%	
	Total	3.0%	6.1%	15.2%	75.8%	

* Significant $P < 0.05$.**Table 3** Governmental and private dental laboratory technician's response regarding indicating the type of metal alloy and indicating the preferred marginal design.

Question	Type of laboratory	< 25%	25–50%	50–75%	> 75%	P value
Indicating the type of metal alloy	Government	13.3%	0%	30%	56.7%	.573
	Private	22.2%	2.8%	13.9%	61.1%	
	Total	18.2%	1.5%	21.2%	59.1%	
Indicating the preferred marginal design	Government	40%	13.3%	13.3%	41.7%	.048*
	Private	13.9%	19.4%	27.8%	58.3%	
	Total	25.8%	16.7%	21.2%	36.4%	

* Significant $P < 0.05$.**Table 4** Governmental and private dental laboratory technician's response regarding indicating the pontic design and inclusion of the selected shade.

Question	Type of laboratory	< 25%	25–50%	50–75%	> 75%	P value
Indicating the pontic design	Government	36.7%	3.3%	23.3%	36.7%	.684
	Private	30.6%	19.4%	22.2%	27.8%	
	Total	33.3%	12.1%	22.7%	31.8%	
Inclusion of the selected shade	Government	6.7%	16.7%	26.7%	50%	.041*
	Private	2.8%	8.3%	13.9%	75%	
	Total	4.5%	12.1%	19.7%	63.6%	

* Significant $P < 0.05$.**Table 5** Governmental and private dental laboratory technicians' response regarding inclusion of staining diagram and indicating the shade guide used.

Question	Type of laboratory	< 25%	25–50%	50–75%	> 75%	P value
Inclusion of staining diagram	Government	36.7	10%	23.3%	30%	.941
	Private	27.8%	22.2%	27.8%	22.2%	
	Total	31.8%	16.7%	25.8%	25.8%	
Indicating the shade guide used	Government	16.7%	10%	36.7%	36.7%	.132
	Private	11.1%	8.3%	16.7%	63.9%	
	Total	13.6%	9.1%	25.8%	51.5%	

AlSheikh, 2012). It also confirms an international trend of poor communication noted in the UK (Lynch and Allen, 2005a,b) and USA (Afsharzand et al., 2006a).

The choice of a metal alloy has its implications for the patient, technician and clinician in terms of the cost, allergic reaction, rigidity, castability, corrosion resistance, compatibility and personal preference. Although more than half (59%) of the laboratories reported that dentists indicate the type of

metal alloy to be used for prosthesis fabrication, nearly 20% of the laboratories reported that dentists do not. (American Dental Association, 2011; British Society for Restorative Dentistry, 1999) stated that the responsibility alloy selection relies legally and ethically on the dentist.

Proper pontic design is more important for clean ability and good tissue health than the choice of material. Thirty-four percent of laboratories reported that dentists do not

Table 6 Governmental and private dental laboratory technicians' response regarding selecting the type of porcelain and choosing the type of porcelain glaze.

Question	Type of laboratory	< 25%	25–50%	50–75%	> 75%	P value
Selecting the type of porcelain	Government	30%	23.3%	23.3%	23.3%	.499
	Private	38.9%	0%	22.2%	38.9%	
	Total	34.8%	10.6%	22.7%	31.8%	
Choosing the type of porcelain glaze	Government	33.3%	16.7%	16.7%	33.3%	.780
	Private	30.6%	16.7%	33.3%	19.4%	
	Total	31.8%	16.7%	25.8%	25.8%	

include the required pontic design, leaving the choice to the technician. Although dental technicians are important and valuable members of the oral health provider team, they are not trained to diagnose or manage the patient (Jenkins et al., 2009).

Thirty-five percent of Riyadh dentists do not specify the type of porcelain for the prosthesis. Omitting this information could be due to inadequate technical knowledge from a lack of awareness of the available materials or the assumption that laboratory will use standard materials (Stewart, 2011).

Including a staining diagram in the work authorization forms will help in the production of a restoration that matches the characteristics of the patient's teeth. Thirty-two percent of participating laboratories received forms without a staining diagram. However, more than half of laboratories agreed that dentists specified the shade guide.

The final step in a restoration fabrication is surface treatment, which is performed by one of the following methods: autoglaze, overglaze, or polishing. Thirty-two percent of the laboratories showed that dentists do not indicate the type of glaze, which might be because of autoglazing being the most widely used technique for porcelain glazing rather than the two other methods.

A significant difference was found between government and private dental laboratories in including the following details: required return date, teeth used as a retainer, specific type of prosthesis, preferred marginal design and shade of the restoration. The higher percentage in private laboratories could be due to financial implications or the lack of an in-office laboratory, which makes the dentist write a precise form for better communication. Moreover, the design of the authorization form in some private laboratories is more detailed and has different choices than the blank order forms. In a study performed in Wales, written instructions in private institutions were more legible than those in the government (Jenkins et al., 2009).

There was no significant difference between private laboratories from different areas in Riyadh city. This is likely to be the result of the exchange of cases across districts and lack of independence.

The problem of inadequate communication between the clinician and laboratory was first highlighted nearly 40 years ago (Owall, 1974). Possible reasons that were previously reported in the literature include a lack of adequate educational exposure (Leeper, 1979) or inadequate financial remuneration (Carrotte et al., 1993). However, the role of financial considerations seems less likely considering previous work that compared the quality of prescriptions completed under a range of financial remunerative schemes found that

the quality (or lack of quality) was comparable (Jenkins et al., 2009; Lynch and Allen, 2006). Another reason for this poor communication might be due to dentists relying on the technician to choose certain aspects of the prosthesis.

Christensen, in (2009), suggested the following to improve dentist-technician integration and communication:

1. Attending continuing education courses together.
2. Holding private meetings.
3. Increasing the quality and scope of communication in laboratory orders.
4. Making postoperative telephone calls to technicians.
5. Incorporating technicians into dental practices or buildings.
6. Joining study clubs or dental organizations that include both dentists and technicians.
7. Promoting integrated education of dental and laboratory technology students.

This study has limitations, for example, the survey was answered by one technician from each laboratory, which might increase the possibility of personal bias. However, increasing the number of surveys in each laboratory was not possible because those laboratories only had one technician working in fixed prosthodontics. Another limitation was the lack of objectivity in answering the questionnaire because it depends on the subjective perspective of the technician.

5. Conclusions

The quality of communication between dentists and dental technicians in Riyadh can be considered inadequate with the government laboratories having a lower level of communication compared to private laboratories.

The following recommendation is essential to improve the level of communication:

1. Dental students should be educated early in their preclinical courses and later in their clinical years about proper work authorization form writing. Additionally, they should understand their legal and ethical obligations as dentists.
2. Dental technicians have to understand their role in prosthesis fabrication and be able to refuse work authorization forms that lack standard information regarding prosthesis fabrication.

Standard guidelines for the required information in the work authorization form should be established and generalized in all governmental and private laboratories in Riyadh to improve the quality of service.

Conflict of interest

The authors have no conflicts of interest to declare.

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