

Quality of Zirconia Crowns, Following Prep-Guide, and Dentist-Technician Communication

SUMMARY

Background/Aim: Dentist-technician communication is crucial for a successful working relationship in the healthcare setting that contributes to positive health outcomes. However, the interruption of the dentist and the technician communication can harm the dental care procedure. Besides, mistakes in dental laboratories can be both expensive and time-consuming. **Materials and Methods:** This research project focused on paper-based communication in the dental laboratory setting and its impact on the quality of prosthesis of zirconium crowns. The study's findings suggested that ineffective communication between technicians and dentists resulted in poor quality of zirconium crowns. The study adopted quantitative analysis, which entails a purposive non-probabilistic sampling of dentists targeted located in Texas. Statistical measurements such as Pearson's correlation employed in determining the association between the independent and dependent variables. **Results:** The research results suggest a significant positive correlation between inter-professional communication in the dental care setting and prosthetic treatment quality. The results also underscore the effectiveness of prep guides in improving the communication between the technicians and the dentist. **Conclusions:** The researchers conclude that adherence to prep guides contributes to the quality of zirconium crowns and productive communication among dentists and technicians.

Keywords: Prep-Guide, Quality of Zirconium Crowns

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Introduction

Dental technicians confront quality concerns due to the CAD/CAM advancement in the dental industry, requiring communication between dentists and technicians. Communication in the dental field is a daunting task because dental offices comprise staff such as dental assistants, dental hygienists, and front desk staff¹. Meanwhile, the dental laboratory included technicians with different team players, including delivery staff, technical advisors, marketing, and human resources. Communication in the dental business is a critical part of enterprise because dental treatment requires teamwork. Dentists and the staff in the office must constantly communicate to provide treatment. Quality issues become more problematic as dentists and technicians fail to communicate, which impacts the dental business negative¹. Lack of communication

between the dentist and technician may be related to quality, cost, and time; thus, leading to customers' dissatisfaction². In this study, correspondence between the technician and the dentist was the focus of the research. Previous studies focused on the technicians' abilities to follow the dentist's written guidelines¹.

The study's problem is the vague association between adherence to prep-guide and challenges of quality issues, which are everyday occurrences in the dental business². The Zirconium crown quality issues resulted in customers' dissatisfaction³. Production of a crown for a patient is a costly process that, ultimately, the patient must pay for the operation². Common disqualifiers include discoloration, open margin, cracks, and inaccurate occlusion^{4,5}. Noncompliance to the prep-guide and inefficient communication between technicians and dentists are two factors that lead to Zirconium crowns failure in dental offices^{6,7}.

Zirconium crowns quality problems nearly all originate from dental offices rather than from the dental laboratories due to the lack of following the prep-guide^{6,7}.

The dental industry faces various challenges, with the primary enhancing element being poor communication⁸. A 49% of dentists change their work environment due to poor communication⁹. However, dentists' various services fail to meet the patients' specifications after the dentists send instructions to the laboratory. Thus, a clear indication of the lack of communication between the dentists and the technicians. The theoretical framework that set the foundation of this study is situated cognition theory¹⁰. Situated cognition is a learning theory that refers to learning from experience and social interactions¹⁰. For instance, learning is a social experience, and individuals can learn when interacting with others, communicating, problem-solve and share knowledge¹⁰. For example, dentists could learn how to improve zirconium crowns' quality through interaction and communication with technicians.

Previous studies suggested that dentists work with their labs for three reasons of quality, excellent communication, and reasonable pricing¹¹. About 49 percent of the dentists change their laboratory because of communication issues that stop the dentist from building a long-term relationship¹¹. From an action research perspective, it is imperative to examine the various factors that affect communication quality to initiate potential solutions to the problem¹². Quality in dental offices affects patients' satisfaction and depends on communication, responsiveness, reliability, waiting time, admission process, customer satisfaction, and technical competence¹³. Besides, the quality of cooperation between the dentist and the staff is an essential factor that affects the quality of treatment¹⁴. Quality managers have used Total Quality Management (TQM) since the 1980s. Six-sigma came later as a new tool to improve the quality at workplaces such as GE and Motorola¹⁵. Managers used TQM through the plan, do check and action to reduce the rate of the defect.

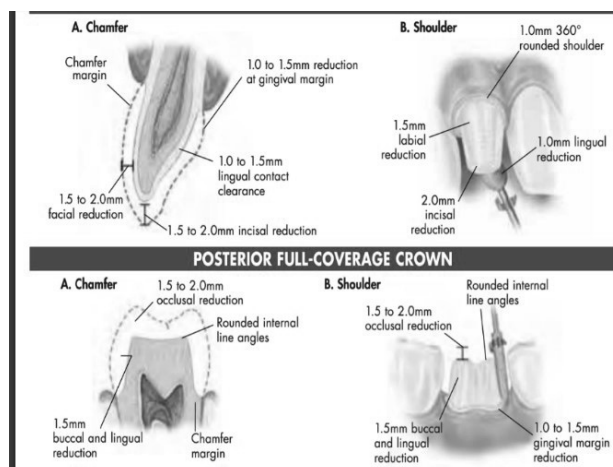


Figure 1. Prep-Guide for Metal-Free Restorations

Research Questions/Hypotheses

RQ1: What is the relationship between the adherence to prep-guide and the quality indicators of zirconium crowns?

The hypotheses related to this research question are:

H1₀: There is no relationship between adherence to prep-guide and the overall quality of zirconium crowns.

H1_A: There is a relationship between adherence to prep-guide and the overall quality of zirconium crowns.

RQ2: What is the relationship between the efficiency of technician-dentist communication and the quality of zirconium crowns?

The respective null and alternative hypothesis for the question is:

H2₀: There is no relationship between technician-dentist communication efficiency and the overall quality of zirconium crowns.

H2_A: There is a relationship between prep-guide and the overall quality of zirconium crowns.

RQ3: What is the relationship between adherence to prep-guide and the efficiency of technician-dentist communication?

The respective null and alternative hypothesis are:

H3₀: There is no relationship between adherence to prep-guide and efficiency of technician-dentist communication.

H3_A: There is a relationship between adherence to prep-guide and efficiency of technician-dentist communication.

Material and Methods

This study applied the correlation research design, which is instrumental in understanding and assessing the relationship between variables¹⁶. The correlation research design was appropriate because it helped to study the relationship between the variables.

The study employed Spearman's rank-order correlation to utilize the nonparametric test to identify the association between the variables¹⁶. The method also showed the significance of the data used, ensuring the data reliability and validity.

Setting, population, sample

Texas's state was the research study location– the geographical area from which the sample population's drawing occurred. The participant recruitment process commenced by soliciting a Texas-based dental organization to liaise with the local dental practice owners for a research study. The total population size for the dentists was 8110¹⁷.

The study suggested sample size was a minimum of 134 dentists – a figure acquired after the computation of a

G-Power analysis. The goal was to assign each dentist to answer the survey, and a total of 170 dentists responded to the study. Using G*Power statistical software suggested that 134 participants based on a power of 0.95, the effect size of (0.30), and (α) error rate of (0.05)^{18,19}. The research participants provided feedback through the survey for every related treatment after using the prep guide.

Data collection and analysis procedure

The data collection exercise involved administering questionnaires to the participants—statistical measurements such as Pearson's correlation in determining the association between the variables. The survey with closed-end questions used as the instrument that the laboratories used to examine products' quality²⁰. Therefore, the quantitative method helped accomplish the research goals because the data collection method required passive interaction through the questionnaire, large population, and (SPSS) statistical package availability²¹.

The questionnaire primarily involved dichotomous questions and multiple-choice questions. The survey questions avoided nuance by constructing detailed, short questions, ensuring direct answers from the respondents. Spearman rank-order correlation method is a statistical measurement technique that calculates the intensity and direction of the association between variables or factors^{22,23}. A probability value (abbreviated as the p-value) ranges typically between 0 and 1 used to test the p-value. The p-value works in unison with test statistics known as the critical value or the alpha (denoted as α)²⁴. In a bid to measure the p-value for the hypotheses, the Chi-square test of independence implemented a statistical tool that gauged the degree of significance of a relationship between nominal variables²⁵.

Results

The research results suggested a significant positive correlation between inter-professional communication

in the dental care setting and the quality of zirconium crowns. The results also underscored the effectiveness of prep guides in improving the communication between the technicians and the dentist. The results concluded that adherence to prep guides contributes to the quality of zirconium crowns. It recommends strategies for ensuring effective communication to minimize the common mistakes in dental laboratories.

Analysis of the actual data using the SPSS software confirmed the existence of a relationship between adherence to pre-guide and overall quality of zirconium crowns; thereby, effective communication between the dentist and the technicians positively impacts the quality of the zirconium crowns. Cramer's V rule successfully enumerates the forcefulness of the relationship between the study variables.

Further analysis of actual data confirmed the relationship between technician-dentist communication efficiency and the overall quality of zirconium crowns. The prep-guides effectiveness in helping with the communication between technicians and dentists suggested the overall quality improvement of zirconium crowns. Finally, the actual data analysis disqualified the null hypothesis, which stated no relationship between adherence to prep-guide and technician-dentist communication efficiency.

Findings suggested a strong relationship between adherence to prep-guide and improved quality of anatomy, margins, and contacts. Using the prep guides indicated that the prep guide is pivotal in enhancing the quality of zirconium crowns.

For example, data from Table 1. examined the adherence to prep-guide and quality of zirconium crowns with a p-value of 0.01, significantly below the critical value at 0.05, which implied strong evidence against the null hypothesis. The phi coefficient of 0.326 with a Cramer's V of 0.231 suggested a more intense relationship between the two variables.

Table 1. Adherence to Prep-Guide Improved Quality of Zirconium Crowns

Symmetric Measures		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Nominal by Nominal	Phi	.326			.001
	Cramer's V	.231			.001
Interval by Interval	Pearson's R	.087	.075	1.138	.257 ^c
Ordinal by Ordinal	Spearman Correlation	.093	.076	1.211	.227 ^c
N of Valid Cases		171			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Table 2. Communicational Efficiency of Technician-Dentist Improved Overall Quality of Zirconium Crowns

Symmetric Measures		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Nominal by Nominal	Phi	.315			.002
	Cramer's V	.223			.002
Interval by Interval	Pearson's R	.109	.086	1.420	.157 ^c
Ordinal by Ordinal	Spearman Correlation	.112	.084	1.468	.144 ^c
N of Valid Cases		171			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Table 3. Prep-Guide Improved Efficiency of Technician-Dentist Communication

Symmetric Measures		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Nominal by Nominal	Phi	.261			.020
	Cramer's V	.184			.020
Interval by Interval	Pearson's R	.194	.083	2.569	.011 ^c
Ordinal by Ordinal	Spearman Correlation	.193	.079	2.556	.011 ^c
N of Valid Cases		171			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Data in Table 2. suggested the efficiency of technician-dentist communication and overall quality of Zirconium crowns moderately associated—a p-value of 0.02 statistically significant to reject the null hypothesis. The data also suggested the moderate association according to Cramer's V value of 0.223 and phi coefficient value of 0.315.

Table 3. recommended that prep-guide is an effective tool for technician-dentist communication. The p-value of 0.020, the Cramer's V value 0.184, and the Phi value of 0.261 indicated significant evidence that there is a moderate association between adherence to prep-guide and the efficiency of technician-dentist communication.

Discussions

The first research question studied the relationship between the adherence to the preparation guide and the zirconium crown's quality index. The second research question delves into the relationship between technician-dentist communication efficiency and the different quality of zirconium crowns. Finally, the third research question examines the relationship between compliance with preparation guidelines and communication efficiency between technicians and dentists.

Findings related to the relationship between the quality index of zircon crowns with a phi coefficient value

of 0.326 and compliance with preliminary guidelines indicate a significant relationship between these variables. Cramer's V of 0.231 with an almost minor asymptomatic standard error confirmed the relation's formidable strength among the variables. For example, following the close relationship between preparatory guidelines can improve the quality of anatomy, margins, and contact. The prep guide's use showed that the instructions are essential to improve the quality of zirconium crowns. The p-value of 0.001 is statistically significant and provides sufficient evidence to reject the null hypothesis.

The study explored the technician-dentist communication efficiency and the Zirconium crown's different quality through the SPSS software. The findings suggested an association between technician-dentist communication efficiency and improved shade, on-time delivery, and occlusal. For example, data for the efficiency of technician-dentist communication and on-time delivery of zirconium crowns with a p-value of 0.000, significantly below the critical value at 0.05, implied strong evidence against the null hypothesis. The Cramer's V value of 0.424 with an approximate significance of 0.300 suggested a more intense relationship between the two variables. Quality of shade suggested a moderate association between the variables with a p-value of 0.008, which is statistically significant to reject the null hypothesis with moderate association according to Cramer's V value of 0.283 and phi coefficient value of 0.200. Cramer's V value 0.189 and

Phi value of 0.133 suggesting a strong relationship between the variables. Spearman's coefficient of 0.158 implies the strength of association between the two variables and decisions that negate the null hypothesis.

The third research question assessed the relationship between compliance with preparation guidelines and communication efficiency between technicians and dentists. One hundred and seventy-one dentists answered whether the preparation guide is an effective communication tool to improve zirconium quality. The study's data with a p-value of 0.000, the Cramer's V value of 0.262, and the Phi value of 0.370 suggested that there is significant evidence that there is a moderate association between adherence prep-guide and the efficiency of technician-dentist communication.

Effective communication between the technician and the dentist ensures compliance with zircon crown preparation guidelines and quality indicators. The lack of effective communication between technicians and dentists may lead to inconsistent results and poor quality zirconium crowns. Effective communication will affect patients' quality of care because it will allow patients to enter the care delivery department, thereby enhancing their safety. Cramer's V rule successfully specified the strong relationship between the study variables in which the obtained value of 0.333 significantly suggested the intensity of the relationship between the two variables.

Conclusions

In conclusion, this study has contributed immensely to the dispensation of knowledge about the critical aspect in dentistry and the field of medicine, which is effective communication. The study concludes that there is a significant relationship between the efficiency of technician-dentist communication and the quality of zirconium crowns. It also concludes that a strong relationship exists between adherence to prep-guide and efficiency of technician-dentist communication. The research also concludes that there is an existing relationship between adherence to prep-guide and the quality indicators of zirconium crowns. Besides, the adherence to prep-guide related to the efficiency of dentist technician communication. This study will be a material of reference for practitioners and researchers since it lays down all the necessary guidelines for improving effective communication and its impacts on professionalism.

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