# COMMUNICATION BETWEEN DENTAL OFFICE AND DENTAL LABORATORY: FROM PAPER-BASED TO WEB-BASED

IBRAHEEM F ALSHIDDI, BDS, D Clin Dent (Prosthodontics)

## ABSTRACT

*Proper communication between dental office and dental laboratory leads to well-designed prosthesis, satisfied clinician, and comfortable professional relationship between clinician and dental technician. The communication occurs usually through a laboratory work authorization Form containing handwritten instructions from the clinician to the dental technician, that specify the materials to be used and the type of the prosthesis. This paper-based recording has several major drawbacks such as mis-communication between the laboratory and the clinic and lack of visual interactivity. This article discusses the current web-based application for dental office-laboratory communication, and explains system design and requirement for Web Content Management System (WCMS) that can be used for communication between dental clinic and dental laboratory. Recent improvement in internet connection, uploading and downloading data facilitates transferring data between dental office and dental laboratory. Market is now crowded with desktop applications that help to manage laboratory cases and improve online communication between dental clinic and dental laboratory. Dental office-laboratory management systems are available as a commercial WCMS and open-source WCMS. Commercial system is commonly used because it is designed and modified according to user's requirements. In addition, it is a user-friendly interface and more secure when handling payments.*

## INTRODUCTION

Proper communication between dental office and dental laboratory leads to well-designed prosthesis, satisfied clinician, and comfortable professional relationship between clinician and dental technician. The importance of the good communication has been highlighted by numerous studies.[1-5] "Communication is the key to success in cosmetic dentistry/laboratory relations".[6] The ideal situation of communication exists when the dental technician can meet the patient and the clinician personally to discuss the case. Such a meeting allows the laboratory technician to evaluate and gather information such as patient's personality, movement of the lips and esthetic demand of the patient that is unavailable from mounted casts or a written work authorization form.[7] However, not all clinicians and technicians afford this luxury, since the dental laboratory and dental office are often in separate locations. Thus, proper communication with the dental technician is considered a challenge for the success of treatment, especially in esthetically critical situa-

tions.[8,9] Laboratory case management is a teamwork that should involve good communications between not only the dentist and the dental technician, but also other staff in the dental office (e.g., dental assistant and receptionist) and dental laboratory (e.g., laboratory owner, receptionist and delivery person).

This article discusses the current web-based applications for dental office-laboratory communication, and explains system design and requirement for Web Content Management System (WCMS) that can be used for communication between dental clinic and dental laboratory.

### Paper-based Communication

The communication occurs usually through a laboratory work authorization Form containing handwritten instructions from the clinician to the dental technician that specify the materials to be used and the type of the prosthesis. In routine practice, a dentist fills the work authorization Form (Fig 1) to order a lab work from a certain dental laboratory. Then, the dental assistant and other staff arrange with the laboratory for pickup, payment and delivery. This paper-based recording imposes several major drawbacks namely miscommunication between the laboratory and the clinic and lack of visual interactivity. Time may wasted in both sides due to missing information, unreadable handwritten instructions or even tracking some of the missing lab

**Corresponding Address:** Dr. Ibraheem Alshiddi, PO Box 60169, Riyadh 11545, Kingdom of Saudi Arabia. Assistant Professor and Consultant, Department of Prosthetic Dental Sciences, College of Dentistry, King Saud University, Riyadh.
Telephone: +966 11 4677325
Fax: +966 11 4679015 E-mail: ialshiddi@ksu.edu.sa

Dr. .................................................

Date .................................................

Patient : ............................................... Sex : Male / Fem

Age : .................... Type of Face : ☐ ◯ △ Shade........................

No. Clinic

# Fixed Prosthesis

Shade Instructions Pontic
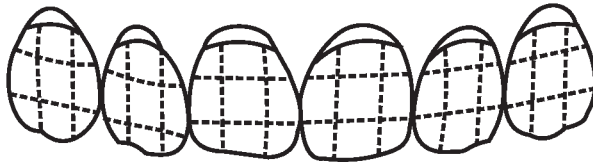
♡ ♡ ♡ ♡
☐ *☐ ☐ ☐
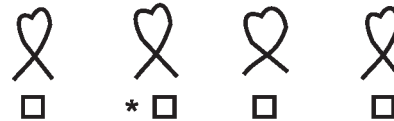
*Your choice if not indicated

BRIDGE ☐ UNITS ☐ TEETH NO .................................................

ALLOY : - PRECIOUS ☐ NON PRECIOUS ☐ Zircon Crown ☐

Fixed Prostho P.F.M ☐ Full Metal ☐ Post & core ☐ Ricbmond ☐ Implant ☐

EMPRESS :- Crown ☐ Vencer ☐ Inlay-Onlay ☐ Cosmo Post ☐

TEXTURE :- SMOOTH ☐ STRTIFLED ☐

GLAZE :- GLOSSY ☐ LIGHT GLOSSY ☐

# Removable Prosthesis

UPPER ☐ LOWER ☐ UPPER & LOWER ☐

Complete Denture ☐ Partial Denture :- Mefal ☐ Acrylic ☐

Immediate Denture ☐ Teeth For Extraction.................................................

REPAIR ☐ REBASE : SOFT ☐ HARD ☐

ADDITION ☐ TEETH FOR ADDITION .................................................

# Notes : .................................................

.................................................

.................................................

Figure 1: Dental Laboratory Form for Requesting a Lab Case

work. Improper communication is one of the major challenges facing the clinician and the technician.[10,11]

According to some previous surveys, technicians were dissatisfied with the insufficient and unclear information provided on the work authorization Form.[12,13] Afsharzand et al. stated that "laboratory work authorization Forms have been called the most frequently used and abused form of communication between the dentist and the laboratory".[14] Only 26% of the surveyed laboratories indicated that their work authorizations were complete enough to perform their best service, while 46% reported that they received only the minimum information to complete the task. The survey also showed that lack of communication was a major problem in providing optimum patient services.[14] Recent studies conclude that improper communication starts from dental schools due to insufficient prescription request written by the students; and that improving and building a solid base of communication should starts by implementing correct methods of communication in dental school's curriculum and education.[15,16]

Another challenging aspects of communication is transferring the proper shade to the technician. Shade guides remain the most widely used reference point for communicating tooth color.[7,17] However, transferring the shade is more than sending a "shade number" to the technician. It should involve detailed information related to the color, surface texture, shade characteristics (e.g., enamel crack, hypocalcified areas, incisal translucency, incisal halo, etc), and other features. Drawing an outline for the tooth and dividing it to vertical and horizontal sections to prescribe the color and all shade characteristic clearly may help to improve the result of shade matching.[18] Better way to transfer the shade is by taking photographic image for the tooth to be matched and sending it to the technician. Although this photograph cannot convey exact color, it can, by providing an image of the tooth next to the selected shade tab, give adequate information to the technician about color and shade characteristics.[19]

### *Online Web-based Communication*

Communication through the internet becomes the easiest and most accessible way. People now are more dependent on the internet for banking, paying bills, and shopping.[20] Recent improvement in internet connection and uploading/downloading data facilitates transferring data between dental office and dental laboratory. In addition, new technologies such as digital shade matching and scanning impression now available in dental offices should support switching from paper-based communication to web-based communication between dental office and dental laboratory.

Web conference applications (e.g., iChat, WebEx, Go ToMeeting) may also help in providing a useful face to face communication and involving the patient in the case discussion between the clinician and the dental technician. Market now is crowded with desktop applications that help to manage laboratory cases and improve online communication between dental clinic and dental laboratory. A lot of information and clinical procedures can be transferred now through the internet. With the development of software and internet technology, there are now many software programs and effective web application that can help to improve communication, reduce time consumption and enhance security of the shared information.

### *Dental Office-Laboratory Web Content Management System (WCMS)*

Web content management system is a software that provides website authoring, collaboration, and administration tools designed to allow users with little knowledge of web programming languages or markup languages to create and manage website contents with relative ease.[21,22] The dental office-laboratory web content management system provides service to the dental clinics and laboratory located in different locations. It is used as a channel for communication between dentists and technician, dental clinic and -dental laboratory, and establishes long-term relationship and information sharing.

With office-laboratory WCMS, the medical data, pictures and patient records all can be transferred and are accessible online. Dental laboratories can track and manage lab cases and payments online. Besides, dental clinics and dentists can track the lab cases, and send messages about the status of the lab cases. Both have an account and can view their lab case history, their current balance, and pay bills online, thus reducing paperwork and time consumption in processing of lab cases. A dental laboratory can establish its own system for easy communications with dental clinics its working with.

The basic idea of WCMS is to get organized and find a logical, consistent and easy way to place content on the web.[23] It allows non-technical users to create, edit, manage and control a large, dynamic collection of web material (HTML documents, images and video). WCMS involves a lifecycle starting from creation to destruction of content. The lifecycle includes reviewing the content before publishing it and it may include archiving before destroying. WCMS helps in keeping the site more consistent, ease the navigation, and most important it aids in controlling and tracking the content.[24]

### Commercial vs Open-Source WCMS

Dental office-laboratory management systems are available as a commercial WCMS and open-source WCMS. The commercial WCMS is a website that is developed and owned by an individual or a company, and users may pay a licensing fee. While open-source WCMS is a website that is available to the public free of charge and have their own community of contributors, consisting of web developers from all over the world who create and share plug-ins (software add-ons) for the software.[25,26]

Several commercial WCMSs are available on the international market in various formats. They are designed to work as needed by most of the dental laboratories, and can be modified as per the laboratory requirements.[27] They are faster to implement and associates a certain degree of safety as opposed to open-source facilities. Moreover, they offer more support and stronger training documentation than open-sources.[28] However, most of the available commercial WCMS products are costly and may not be affordable for small dental laboratories. Open source WCMSs, on the other hand, offer low cost alternative to commercial solutions. It is suitable for small to medium dental laboratories. Besides, Troubleshooting is made easier because of the technical support and online community. However, potential concern regarding the open-source solutions is the security. As the source code is available for public, attackers can use the source code to identify vulnerabilities. Thus, these systems raise significant security issues.[29] The most common examples for open source WCMS are; Joomla, Drupal and WordPress. Each system depends on required functions, technical expertise and budget.[30-33] For example; for simple and inexpert users, WordPress could be the best choice because of user-friendly and easy customization. However, it has limited content management capabilities and is not a very secures system. For complex and highly customized site that requires scalability and complex content organization, Drupal might be the best choice. It can handle hundreds of thousands of pages of content, and it is stable even when serving thousands of users simultaneously. The disadvantages of Drupal are the difficulty in handling for regular use, and lack of themes that may require a designer to make the website looks attractive. For something in between that has an easier learning curve, Joomla may be the answer. It is relatively easy to use and has strong content management capabilities. However, it requires some learning process to become familiar with its working.

Both commercial and open-source systems have their advantages and disadvantages. It depends on the requirements of the system. However, commercial WCMS is commonly used because it is designed and modified according to user's requirements; it is also user-friendly interface and more secure when handling payments. Therefore, it is important to know the requirements that should be considered when selecting commercial WCMS for dental clinic-laboratory communication.

### Main Requirements for Dental Clinic-Laboratory WCMS

Dental clinic-laboratory WCMS must be designed specifically to match the need and interest of the users. The core of any WCMS is the content; it is patient's lab case that is being sent from the dental clinic to the dental laboratory to be processed. The full content lifecycle involves; content creation, content editing, content approval and content publishing; which together constitute the core component of the WCMS.[34-36]

Dentists need to have the following provisions during various stages of lab case processing.

**Lab Case Creation:** Dentists should have the ability to log-in using their account into the system and submit their cases on-line using an electronic form, and then create a new lab case with basic editing method. The system should provide the ability to upload images in the content, choosing the available technician of his/her preference and add extra comments if required.

**Lab Case Editing:** Editing stage should involve the ability to preview, modify or delete data. Submitting is the last step after completing all required editing stage. Approximate pricing should be calculated after filling the form, delivery due date is indicated.

**Approval Process:** The system should have the ability to accept or reject the submitted lab case during the approval process. This process should be completed by authorized person(s), with log-in users. The approval process should also have the ability to notify the dental clinic (within the system) with the status of the lab work. The system should also provide the dentist with ability to track the case for approval status.

**Case Publishing:** The editorial content can be published after passing the approval process. The system should provide the ability to cancel, republish or edit the content. Also, it should have the ability to manage and update the unpublished contents.

### SUMMARY

Improving communication between dental office and dental laboratory will save time, effort and, improve the quality of the final product (the prosthesis). Switching towards paperless dental office is highly recommended,

and may become mandatory when establishing a new dental clinic in some countries. Selecting the right web content management system by understanding the individual requirements and the design of the software will significantly improve the communication and will ensure long term relationships between dental offices and dental laboratories.

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