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# D3- Digital Documentation in Forensic Dentistry.

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**ABSTRACT-**

Documentation is a significant aspect of our clinical practice. It helps us in gathering useful patient information. Diagnosis, treatment planning and keeping track of patient prognosis in the course of treatment becomes easier with correct documentation. With the increasing pace of this trend of using technology in digitalized dentistry documentation has become even more simpler and efficient. JPEG, DICOM, PDF, PNG, TIFF, RAW, HIEF, BITS, BYTES etc. These are various terminologies that we come across in our day-to-day lives when we work with our computer files. But do we know the details of it, the differences and the applications of it in different arenas. Proper know-how of various technical terminologies and aspects of digital documentation will help us in improvising our techniques of documentation in dentistry and hence make the art of documentation even better. With the aspect of forensic odontology photography and documentation play a key role in collecting and preserving the details. Hence with this paper, we aim to look into the details of technical aspects of documentation, knowing and understanding various terminologies and their application in dentistry.

**Keywords:** Digital documentation, file formats, file size, image formats.

## Introduction

Electronic health records in dentistry are increasingly used for documentation.[1] Digital photography and maintaining records of patients on a computer is an advanced practice that is adopted by clinicians in this era of technology.[2] multiple file formats are used for various purposes and applications. It is important to understand the significance each of them holds in a particular application and situation. How and what file format to choose or go for when we need it for different purposes can affect and enhance our work of documentation. The basic concept of a file format, its advantages and disadvantages, and its applications must be known thoroughly before we go ahead using it.

Image file format, when an image is made, there are various formats into which the image can be saved, converted or transported. For example: JPEG- Joint photographic experts' group, PDF- Portable document format, PNG- Portable network graphics, TIFF- Tagged image file format, RAW- Raw image format, HEIF- High-efficiency image format, WEBP- Web Pictures, BMP- Bitmap, DICOM- Digital imaging communications in medicine.

This paper intends to highlight the importance of knowledge and application of various file formats used on the digital platform and hence improve the dental clinical practice.

## Understanding the file sizes (the bits and bytes):

Each file format that we save in our operating system has some size and occupies some space. They hold great importance in understanding the file format and their utilization.

Before we even proceed to look into the various file formats it is a must to understand an even more important aspect i.e. the sizes of any file format.

The computer plays with just two numbers i.e. 0 and 1, the binary digits.

The computer decodes all the information based on the input and output of these two digits.

A group of eight bits is known as a byte. 1 byte can represent numbers between zero (00000000) and 255 (11111111), or 28 = 256 distinct positions.

In practice, memory is measured in kilobytes (kb) or megabytes (MB). A kilobyte is not exactly, as one might expect, of 1000 bytes. Rather, the correct amount is 210 i.e. 1024 bytes.

Similarly, a megabyte is not 10002 i.e. 1, 000, 000 bytes, but instead 10242 i.e. 1, 048, 576 bytes. This is a remarkable

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difference. By the time we reach a gigabyte (i.e. 10243 bytes), the difference between the base two and base ten amounts is almost 71 megabytes.

It is important to understand the math behind the file sizes. At times we are required to restrict the file size when transporting an image through a portable system or the internet and converting the file size from higher to lower or vice versa as and when required.[3]

For example, emailing a file requires 25 MB of data as its maximum limit.

A normal RVG image file ranges from 1.5 MB to 1.9 MB.

JPEG, PDF, PNG, RAW, TIFF etc. file formats are some of the most commonly used in our day-to-day practice and hence a knowhow of the same will lead us to a better application of the same for various purposes.

There are a few common terminologies and concepts that need a better understanding before we look into the characteristics of various file formats individually.[4]

**Vector and Raster:**

The basic image formats can be broadly classified into two types:

- Vector
- Raster

(Table. 1) shows basic differences between vector and raster image file formats.

**Pixels and Resolution:**

Pixel: A pixel is a unit of information displayed on a monitor.

Resolution: Resolution is determined by the size of the unit of information representing an image.

(Table. 2) shows basic difference between pixels and resolution.

**Most commonly used file formats:**

In our day-to-day utility, the three most commonly used file formats that we come across are JPEG, PNG and PDF.5 The applications, advantages and disadvantages of these three file formats are given below in the (Table. 3)

File formats of photography:

Whenever an image is captured, it can be saved and processed further in three basic image file formats i.e. JPEG, RAW and TIFF.[6]

The basic characteristics, differences and applications of RAW, TIFF and JPEG are given below in (Table. 4)

**DICOM- Digital imaging communications in medicine:**

DICOM imaging file format is widely used and recognized as the format which enables and standardizes the various other formats from different machines and is viewed as one in the single DICOM viewing system. It is mostly used in the transmission of radiological images and medical information.[7]

Depending upon the need for documentation an image format can be chosen. A clear and well-defined image is needed when a measurement is to be taken for performing a clinical procedure. For instance, when placing an implant or an orthodontic appliance we can use a lossless image file

**Table 1:** The difference between the two basic image formats

| | |
|---|---|
| ▪ Vector images are constructed through lines, curves and fills | ▪ Raster images are constructed through pixels |
| ▪ Vector uses graphic formats like PDF | ▪ Raster prefers graphic formats like GIF, JPEG, PNG etc. |
| ▪ Vectors are scalable to any size | ▪ Raster are not that scalable |
| ▪ They work best when it comes to drawings, illustrations and logos | ▪ They work best when it comes to editing photos, digital photographs |

**Table 2:** The difference between pixel and resolution

| | Pixel | Resolution |
|---|---|---|
| **Description** | A pixel is a unit of information displayed on a monitor | Resolution is determined by the size of the unit of information representing an image.<br>Resolution can be measured in 3 ways<br>• Sample per inch (Spi., Scanners)<br>• Pixel per inch (ppi, monitors)<br>• Dots per inch (dpi, printers) |
| **Increase** | Increase the number of pixels, the image size will increase | Increase the pixel resolution, the quality of image will increase |
| **Describes** | Pixels describe the amount of measurement of the screen that can display the picture | Image resolution describes the amount of detail an image holds |
| **Image** | Pixels collectively create image | Resolution describes the crispness and detail of an image |

**Table 3:** Applications, advantages and disadvantages of the three most commonly used file format

| | JPEG (Joint Photographic Experts Group) | PDF (Portable Document Format) | PNG (Portable network graphics) |
|---|---|---|---|
| | • JPEG is the most common image file format<br>• Smartphone cameras also record in JPEG format most of the time. More advanced cameras, such as DSLRs, also shoot in JPEG.<br>• Useful for displaying images on the web, sharing images, and transporting images to another location. | • PDF is used for storing, saving, and reading mostly-text based documents.<br>• It's the image format of choice for storing illustrations, magazine covers, and more for later printing.<br>• Indexable and searchable text makes it perfect for in-depth infographics or reports. | • PNG offers much better text readability than JPEG.<br>• This makes PNG a more popular choice for infographics that include both images and text. |
| **Advantages** | • If you plan to share photos across social media, make use of JPEG because it's easier to send the smaller files.<br>• Takes up less space than RAW and TIFF.<br>• Best for sharing on social media. | • Lossless scalability. | • PNG supports lossless compression, maintaining detail and contrast between colors. |
| **Disadvantages** | • Loses information during compression.<br>• Editing images in JPEG sacrifices quality. | • Cannot be included in web content, must be loaded as a separate file. | |

**Table 4:** Characteristics and basic differences between RAW, TIFF, JPEG

| RAW | TIFF | JPEG |
|---|---|---|
| Uses a compression format, saves storage space, most common format. maximum quality, highest bit depth, greater dynamic range, large files, additional processing time, requires experience and training for editing | Not compressed or processed, requires lots of storage space, favoured by professionals, good quality, large file, quicker processing than RAW, ideal for archiving and printing | Compression format, largest file sizes, more common in graphics publishing and medical imaging, maximum workflow, small files, quickest processing, reduced quality, ideal for e-mail attachments and printing, unsuitable for archiving |

| Intended use | File |
|---|---|
| Communication between colleagues | JPEG |
| Layout approval for stationery, brochures | PDF |
| Web publishing | PNG, JPEG |
| Print publishing | TIFF |
| Presentations | High quality JPEG, TIFF |
| Laser or inkjet office printing | High quality JPEG, High quality PDF, TIFF |

**Table 5:** Choice of file formats for various applications and uses

format so that no compression takes place and the details are not lost we can go for RAW, TIFF & PNG. When an image needs to be transported and there are limitations of size & storage a lossy compression file format can be used. Choice of file formats for various applications and uses is given in (Table. 5)

**Application in Dentistry:**

1) **Routine clinical records**

The practice of recording a clinical case in routine clinical practice, making radiographs, and storing and transporting them needs proper precision in choice of file formats to be used.

2) **Medicolegal cases**

Accurate data of records without manipulating or losing the details is very important in a court of law. Hence, a proper choice of documentation and its know-how is important.[8] In medicolegal cases the photographs are preserved and produced in the court in RAW image file format.[9] It is an unedited acceptable format hence preserving the integrity and authenticity of the photographic evidence.

3) **Forensic Odontology**

Photography is one of the most important aspects of forensic odontology. Each case requires a different format. Proper documentation and storage allow us to view the photos and documents directly on the computer monitor. It can also be used to print the image without losing its details. A photograph is required to be edited at times correcting the plane or angle of capture.[10]

4) **Presentations and publishing the data.**

5) **Communication with patients, fellow dental colleagues, laboratories, and insurance companies.[11]**

**Conclusion:**

By knowing the application of these image formats and understanding them we can make our documentation more efficient. We can thereby enhance the quality of image capturing, processing, storing and transporting. Hence, to grow and learn the advancements and to be in pace with it. The digital world is an ever-growing field with advancements and dentistry is no exception in adapting to the pace of it and exploring for the betterment of clinical practice not only for doctors but also the patients.

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