TECHNICAL UNIVERSITY OF CLUJ-NAPOCA

ACTA TECHNICA NAPOCENSIS

Series: Applied Mathematics, Mechanics, and Engineering
Vol. 65, Issue Special IV, December, 2022

MANAGEMENT OF TECHNICAL FLUX OF INFORMATION IN DENTAL PRACTICE

Diana PAVLOVA

Abstract: *For the management of a dental practice, multiple communication channels are needed - between dentists, dental technicians, reception, administration and other profiled medical specialists and indirect participants in patient treatment. All of them form a data transmission network. The participants in the communication network use various smart devices to receive and read the information - using conventional methods and voice commands and other data input, smart information tablets located at key places in the building. This makes the working dental process several times easier. In this study the experience gained in real practice and illustrative examples are presented.*
Key words: *Management dental practice, Software communication, data transmission network.*

1. INTRODUCTION

In the present study the main stages of the process of collecting digital data from modern dental clinics that use ICT are considered.

The concept of technical flux refers to the sequence of technical activities over time. The correctness of the technical flux exerts a decisive influence on the values of the output parameters of an industrial process. In industrial practice, instead of technical flux, the concept of "technological flux" is sometimes used when referring to the sequence of operations through which a workpiece is transformed into a finished part.

The sequence of activities in a dental office or dental practice has, in principle, many similarities with an industrial-technological flux. For this reason, it was considered interesting to analyze some activities specific to such a flux valid for activities in dental practice. The activities of computer-assisted management of information corresponding to the technical flux of dental practice will be addressed in particular.

These stages are used to optimize the management of the dental practice, which saves time and costs, increases the accuracy of information transfer, as well as improves the comprehensibility of both parties (clinic - patient). The concept refers to the overall health of people and the stage of building a strategy of dental treatment needs to contain accurate data.

The received data from the patient is digitally stored. The digital data is used and applied in an internal communication network for awareness in the various units of the clinic (doctor's offices, dental laboratory, administration, financial and accounting departments, dental photography department, X-ray rooms). Patient data is also used for research to help identify effective treatments, monitor drug safety, and generate new knowledge about the causes of disease and illness. Advances in information technology and the introduction of electronic medical records are increasing opportunities for researchers.

Some of these units are not located on the territory of the clinic but are localized in other geographical points. Some of them relating to foreign patients are used to authorize the patient's access to the Clinic. If the clinic does not have a pre-made digital profile of the patient, treatment cannot be started. These features of modern digital dentistry are of great importance for the quality functioning of the clinic.

Doctors can formulate the best treatments for their patients, personalized and tailored to each patient's medical needs. The role of dental practice software is becoming crucial in

reducing time management and process planning issues.

Dentists can improve their productivity, clinical efficiency and streamline their daily operations with the help of dental practice software. Software used in dental practices is constantly getting smarter and enables effective patient and staff scheduling, and can prove lucrative in the financial aspect of dentistry by increasing productivity and providing evidence-based documentation and essential information for insurance claims. In this review, we highlighted current trends and the future direction of smart practices [2].

In general, the functions of the software can be presented as: Automated tasks + Team analysis + Ready-made reports + Streamlined workflows.

Most software provides automatically generated reports and analyses. Their goal is to simplify and facilitate the performance management of practices and make them more profitable. They often use cloud spaces as a solution that gives access to work from a mobile application, facilitating access from anywhere, whether in the clinic or on the go [7-17].

In the present study, the gained experience in real practice and the process of creating a digital electronic file of the patient are traced. Electronic data storage and exchange moving from paper data storage to electronic patient records and electronic medical records is associated with significant cost savings and faster access to information which leads to improvements of efficiency [1]

Unnecessary searches can also be avoided if the information can be easily retrieved from the database by different users. The overview report „Communication technology and healthcare – DOI: 10.1136/eb-2018-102893” points out the great need for the application of communication technology in healthcare, looking for various good opportunities.

The purpose of this study is to present in a single material the application of modern communication software in the field of dental health care. Besides the technical aspect of the software, it provides organizational capabilities as well. In this way, a complete communication system including patients, the clinic, and all stake holders involved in the dental treatment and care process is optimized.

2. MATERIALS AND METHODS

The electronic process makes it possible to store larger amounts of medical data. This is of great importance, as the amount and complexity of health-related information and knowledge are constantly increasing and have already excluded processing part. Information is a key component of any healthcare organization. The use of specialized software CAD/CAM machines is one of the components to move to a Green Dental Practice [3]. Health Information Communication Technologies (ICT) facilitate the transition from decentralized and institutional to more global data storage.

The availability of national health records can improve processes in Health Care, as different providers have quick access to the information and, for example, duplicate research can be prevented.

The long-term goal of the European Union is to create a system through the use of ICT in which all doctors from Europe must have access to medical records from all the countries.

This will improve treatment conditions, as mobility is expected to increase patients and healthcare professionals (European Commission 2004). Without electronic records and communication technology, the processing of vast databases would be practically impossible [4].

2.1 Material

When patients arrive at the clinic, independently or with the help of an employee, they use smart devices to fill in personal data in a form of a survey. For example, "Dentaprime" dental clinic uses the patient's informed consent for intolerance to metals, medications, substances, etc. An individual profile is prepared for all patients, which may include instant blood tests.

After obtaining informed consent, deadlines for visiting the clinic are set, and the patient is notified through the use of ICT for subsequent dental health procedures (prophylaxis of oral health). After the collected data, an examination

is made and the diagnosis is established correctly, for this purpose, data collected from a computer tomography and an intra-oral scan are also used.

In order for the treatment to pass on time and correctly, a protocol is used.

Table 1.
Software used to manage digital dental practices.

Software	Free	Commercial	Country
Webflow dental	No	Yes	Hungary
ACE Dental	No	Yes	USA
DentiMax	No	Yes	USA
Denticon	No	Yes	USA
Dental Intelligence	No	Yes	USA
Curve Dental	No	Yes	USA
Dentaltap	No	Yes	Spain
Opendental software	Yes	No	USA

In the development of specific cases, specialized software is used (Table 1), contributing to the organization of storage and use of data related to dental care.

The software provides a complete practice management solution that makes everything easy: scheduling, billing, texting, patient engagement, imaging, charting, reporting/dashboards, implementation, support, training, data conversion, and more. Through them, clinicians and office staff have complete control over their practice

2.2 Methods

Through methodology, including ICT tools, communication between all participants in the treatment process, as well as the patients themselves, has been facilitated [5]. The collected data about the patient helps the doctor for future virtual consultations and meetings [6]. The specialized ICT software is used by entering the data in the required fields of the template, which in this case represents an individual profile of the patient.

The template contains information about health, insurance status, and financial data. When the template is formed by a health data operator, the stages presented in figure 1 started.

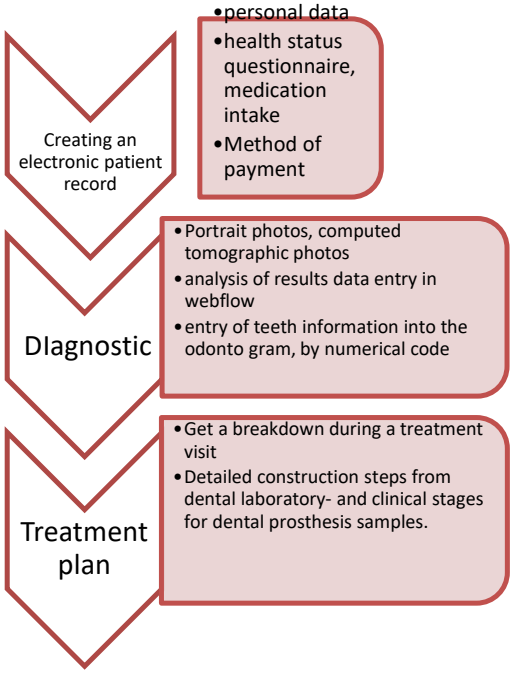

Fig. 1. Methodology for organizing the work process.

3. TECHNICAL REALIZATION

The technical implementation follows the methodology presented in figure 1 Intelligent dental practice software was used to create an electronic patient record. The featured software is Webflow[15]. Part of the data is entered personally by the patient; the rest of the information is completed from participants in the treatment.

The information may include: airport transfer, patient names, arrival and departure, length of stay, hotel location; schedule for the day distribution of patients according to doctors' schedule; laboratory note for construction order - plan of the construction in the dental chart, additional clarifications needed during the digital design of the prosthesis through dental software.

Data is kept for each visit of the patient, the treatment performed, diagnostic work, methods of payment, and final treatment contracts**.** The medical status of the patient correct and detailed information available at any time for examination by the attending physician.

The following figures present work plans for the individual; doctor's departments, dental laboratory, receptions, etc. (Fig. 2-7).

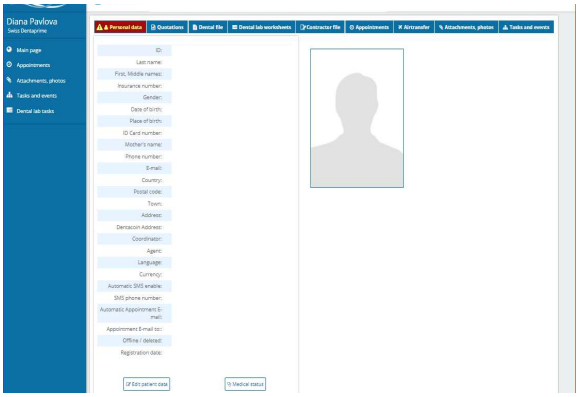

Fig. 2. Patient file, personal data, photo.

Fig. 3. Plan for laboratory processes - makes it possible to track a specific stage of construction production, whether a digital footprint was obtained (first step); the laboratory production protocol is displayed; who is engaged in a moment with the patient in real time.

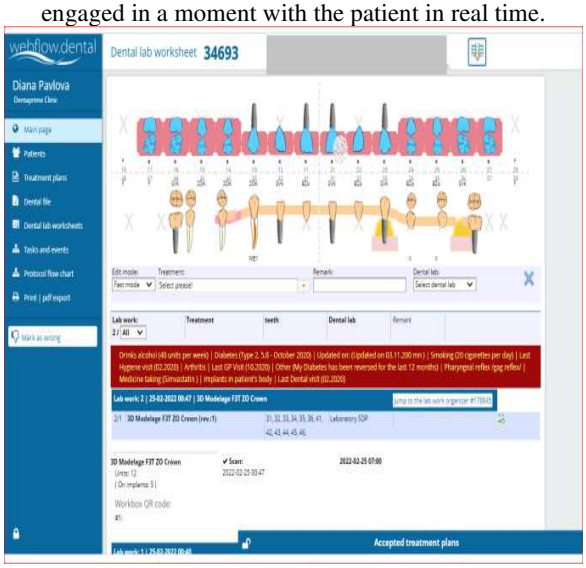

Fig. 4. Laboratory note - Check list form for communication between doctor and dental technician. A dental chart, a complete record of the patient's aesthetic and anatomical features, requirements for the construction, color, and shape of the teeth.

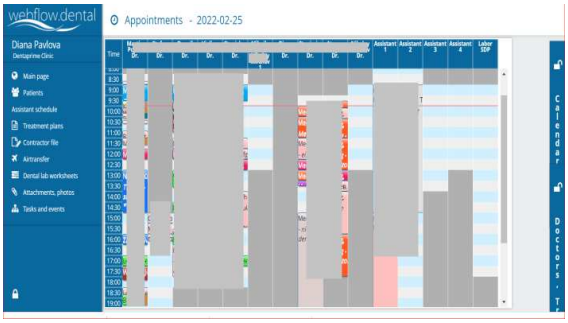

Fig. 5. The daily distribution of patients according to doctors' schedule.

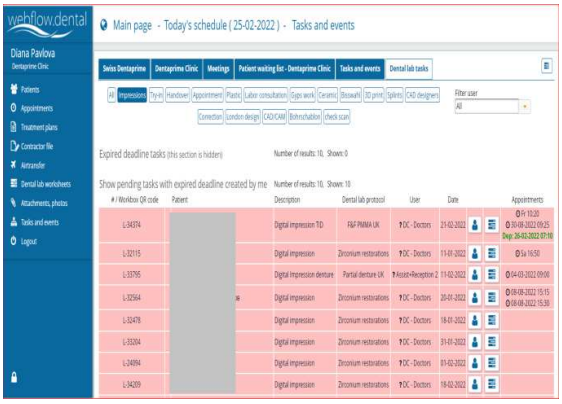

Fig. 6. Description of patient visits.

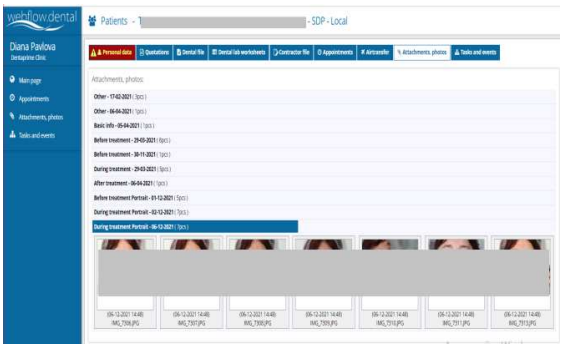

Fig. 7 Photographic material showing complete information about the treatment - before during and after it, with the possibility of attaching additional data about the patient in the form of other types of file formats, x-ray images, jpeg, and pdf.

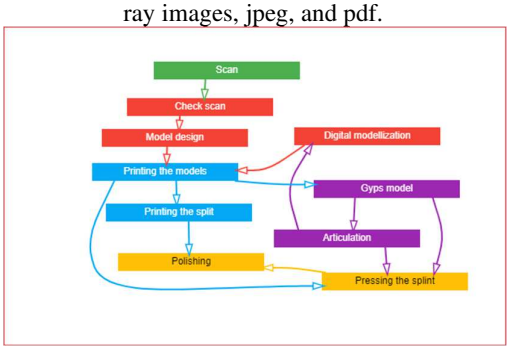

Fig. 8 Diagram of the sequence of actions, Flow chart for splint.

4. RESULTS

The results of the study show that the application of communication software saves time, improves the accuracy of transmission and completion of information and processes by many participants in the channel. It also affects intra-organizational communication and improves the organization of production processes. Information from the Database and different combinations of treatments and planning, lead to improvements in communication techniques and information transfer to contribute to predictable and successful patient recoveries with possible traceability of post-treatment complications. It is an information system in the dental office. Information management includes the storage and use of information increased by direct work with patients in the dental office, includes organizing work and organizing a visit, and functions of the dental practice.

Communication includes using e-mail, searching the Internet, promoting practices using web technologies, searching databases for drugs, doses, and interactions, then teaching, practicing, and practicing procedures in virtual reality, etc. Clinical practice and research are complemented by new technologies such as digital imaging devices based on X-ray or intraoral cameras.[18]

Communication software includes reminder systems for both patient and physician. Settings can be specified for appointment reminders, appointments for examination, medication push notifications and other reminders to improve patient health. Notification can be via email or text message on the phone. Dental practice software enables the organization of different categories of information that is used by specialists with different competencies. Their application in dental practice increases the efficiency and quality of the offered dental treatment.

5. CONCLUSION

Software management has the ability to maintain and systematize different groups of information, according to their user's requests. It can be visual or textual.

The visualization may show aesthetic and functional problems in the patient's oral cavity, implicitly for the patient (and sometimes for the doctor and the dental technician). The created database helps the training of the specialists, the communication between the medical (treating doctors, dental technicians, dental assistants, radiologists, and other specialists) and non-medical departments (administration, reception, etc.). Another aspect that is important is the comprehensiveness of the data, which would be directly related to the legal and insurance issues that arise regarding the treatment.

Using the software can give us an conception of a general concept of production: preliminary data on the type and organization ofproduction, the concept of the technology, organizational and functional schemes, type of process and characteristics of the flows.

For example, each participant on the line during production can mark the beginning and end of his activity, and thus an analysis can be made for the time required to carry out the relevant activity. Data from the dental practice management software can be extracted in the form of tables of daily, weekly, monthly basis, etc. may include time indicators, quantitative indicators, financial indicators concerning the produced constructions or healed teeth.

The completeness of the information gives a clear and comprehensive visual information showing the effectiveness of the processes and the built structures, and would eliminate the problems that may arise after a properly conducted treatment.

6. ACKNOWLEDGMENT

Scientific research, the results of which are presented in a publication, were carried out within the framework of TU-Varna's scientific research activity, specifically financed by the state budget.Researching the possibilities of digital and additive technologies in dental practice. 2022 Order No. 293 of 12.05.2022.

7. REFERENCES

[1] Surdilovic, D., Ille, T., D'Souza, J. *Artificial Intelligence and Dental Practice Management.* European Journal of Artificial Intelligence and Machine Learning, 1(3), 11-4, 2022, https://doi.org/10.24018/ejai.2022.1.3.8

[2] Sachdeva, A., Sharma, A., Bhateja, S., Arora, G. *Green Dentistry: A Review*. Journal of Dentistry and Oral Biology, 3(6), 1144, 2018,

[3] Haider, Draiman. *Green today for a safer tomorrow: A short communication on practising eco-friendly dentistry*. International Journal of Dental Science and Innovative Research, 4(6), 140-142, 2021

[4] Paula, R. *Information and Communications Technology in Health Care*. Master's thesis. Aalto University, 2010, http://epub.lib .aalto.fi/en/ethesis/pdf/12398/hse_ethesis_12 398.pdf (Acces October 2022).

[5] Dovramadjiev, T., Pavlov, D., Radeva, J. *Information and Communication Technology Application in Healthcare with Computer-Aided Design of Immediate Partial Dentures* In book*:* Advances in Human Factors and Ergonomics in Healthcare and Medical Devices. AHFE 2021. Lecture Notes in Networks and Systems, vol 263. Springer, Cham, 2021, https://doi.org/10.1007/978-3-030-80744-3_26

[6] Marya, A., Venugopal, A., Karobari, M.I., Messina, P., Scardina, G.A., Subramanian, A.K. *The Exponential Rise of Teledentistry and Patient-Oriented Protective Measures in Southeast Asian Dental Clinics: Concerns, Benefits, and Challenges*. International Jorunal of Dentistry, 2021, 9963329, https://doi.org/10.1155/2021/9963329

[7] Islam, M.R.R., Islam, R., Ferdous, S., Watanabe, C., Yamauti, M., Alam, M.K., Sano, H. *Teledentistry as an Effective Tool for the Communication Improvement between Dentists and Patients: An Overview.* Healthcare, 10(8), 1586, 2022, https://doi. org/10.3390/healthcare10081586

[8] Hung, M., Lipsky, M.S., Phuatrakoon, T.N., Nguyen, M., Licari, F.W., Unni, E.J. *Teledentistry Implementation During the COVID-19 Pandemic: Scoping Review.* Interactive Jorunal of Medical Research, 11(2), e39955, 2022, https://doi.org /10.2196/39955

[9] Kui, A., Popescu, C., Labuneț, A., Almășan, O., Petruțiu, A., Păcurar, M., Buduru, S. *Is Teledentistry a Method for Optimizing Dental Practice, Even in the Post-Pandemic Period? An Integrative Review.* International Journal of Environmental Research and Public Health, 19(13), 7609, 2022, https://doi. org/10.3390/ijerph19137609

[10] *ACE dental*, Acces june 2022 https://www.ace-dental.com/

[11] *Dentimax*, Acces june https://dentimax.com/

[12] *Planet dds*, Acces june 2022 https://www.pla netdds.com/

[13] *Dental Inteligent*, Acces june 2022 https://www.dentalintel.com/

[14] *Dentaltap*, Acces june 2022 https://dentaltap.com/bg/dental-cloud-software/

[15] *Webflow*, Acces October 2022 https://webflow.dental/

[16] *Curve dental Acces* October 2022 https://www.curvedental.com/

[17] *Open dental software* Acces October 2022 https://www.opendental.com/

[18] Masic F. *Information systems in dentistry*. Acta Inform Med. 2012 Mar;20(1):47-55. doi: 10.5455/aim.2012.20.47-55. PMID: 23322955; PMCID: PMC3545321.

MANAGEMENTUL FLUXULUI TEHNIC AL INFORMAȚIILOR ÎN PRACTICA DENTARĂ

Pentru gestionarea unui cabinet stomatologic, sunt necesare mai multe canale de comunicare - între stomatologi, tehnicieni dentari, recepție, administrație și alți specialiști medicali și participanți indirecți la tratamentul pacientului. Toate acestea formează o rețea de transmitere a datelor. Participanții la rețeaua de comunicații utilizează diverse dispozitive inteligente pentru a primi și citi informațiile - folosind metode convenționale, comenzi vocale și alte modalități de introducere a datelor, tablete inteligente de informare situate în punctele cheie din clădire. Acest lucru face funcționarea procesului stomatologic mult mai ușoară. În acest studiu, sunt prezentate experiența dobândită în practica reală și câteva exemple ilustrative

Diana PAVLOVA, PhD, Technical University of Varna, Departments of Communication Engineering and Technologies, and Industrial Design, E-mail: diana.yordanova.pavlova@gmail.com