

DENTAL PRACTICE MANAGEMENT SOFTWARE IN THE ASSESSMENT OF TREATMENT NEEDS OF EDENTULOUS PATIENTS CANDIDATE TO IMPLANT-PROSTHETIC THERAPY

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Abstract:

Contemporary dental practice brings to our attention the presence of digital equipment in a large number of dental offices, which provides enhanced ergonomics and precision in achieving the current standards in this complex field, particularly in digital imaging. By utilizing digital applications in dental offices, dentists have the opportunity to make extremely precise diagnoses while reducing therapeutic procedures through an ergonomic approach. *The purpose* of this study is to individualize the manner in which digital applications in dental medicine can contribute to the therapeutic efficiency in each clinical case, offering a synthesis of accurate patient data and performed procedures at any given time. The digital application is structured based on patient data, treatment type, treatment plans, preventive procedures, prosthetic restorations, imaging area, as well as other categories that complement a successful therapeutic management. Software applications play an especially important role in optimizing both therapeutic management and the overall clinic where the software application is implemented as a daily approach.

The data stored in software applications are extremely useful for both patients and doctors, providing a clear overview of the prevalence of procedures and materials used at any given moment. From the conducted statistical studies, we observe a prevalence of implantology and implant-prosthetic rehabilitation procedures, with a significant percentage of procedures falling within the realm of avant-garde preparations, such as augmentations using various types of Bio-oss and membranes, as well as a prevalence of sinus lift procedures for lateral areas.

Key words: digital application, software, implantology, edentulous

INTRODUCTION

The development of cutting-edge studies in the complex field of implant-prosthetic rehabilitation, based on simulation elements and clinical applications, incorporating the established correlations between specific clinical cases, implant techniques, biomaterials, and types of prosthesis, can be found in numerous digital applications. [1-5].

Contemporary dental practice brings to our attention the presence of digital equipment in a large number of dental offices, which provides enhanced ergonomics and precision in achieving the current standards in this complex field, particularly in digital imaging. By utilizing digital applications in dental offices, dentists have the opportunity to make

extremely precise diagnoses while reducing therapeutic procedures through an ergonomic approach. [7-12].

The realm of digital technologies available in a dental office encompasses a wide range of elements, from digital images to digital impressions, to digital operative dentistry, and the placement of implants assisted by robotic devices.

In this high-precision context, aesthetic restoration remains an important constant. Aesthetic elements such as shape, symmetry, proportionality, position, alignment, texture, and color must be continuously taken into account, especially for patients with heightened aesthetic demands and when the tissues surrounding the dental restorations are healthy. Tissue mimicry and the illusion of natural

appearance need to be perfect in order to achieve optimal results.

The new direction in dentistry requires a revision of biological and biomechanical norms under the impact of increasingly demanding aesthetic requirements from patients. However, aesthetic considerations should not be pursued at the expense of long-term oral health or compromise the functional efficiency of the stomatognathic system. [13-15].

A sufficient thickness and height of the alveolar bone are important for the stability of harmonious gingival margins around implants and adjacent teeth. In current practice, patients requiring implants frequently present one or more alveolar walls with insufficient height and/or thickness due to various causes of tooth loss. Attempts to place implants in sites with vestibular bone defects without augmentation procedures often lead to soft tissue recessions, exposing the implant collar and resulting in the loss of gingival margin harmony. Aesthetic failures can also be caused by improper implant placement and/or incorrect selection of implants. [16,19].

The aim of this study is to individualize the way in which dental practice management software can contribute to increasing therapeutic efficiency in each clinical case, providing a synthesis of precise patient data and performed procedures at any given moment.

MATERIALS AND METHODS.

A statistical study was conducted based on selected data from the digital application Software FornaClinic, quantifying patient-related information, treatment types, quantification of clinical entities addressed, as well as aspects of general assessment. The data were selected from the electronic records of registered patients and from subsections that provide conclusive data about each evaluated parameter.

The digital application is structured based on patient data, treatment types, treatment plans, preventive procedures, types of prosthetic restorations, imaging area, as well as other categories that complement a successful therapeutic management.

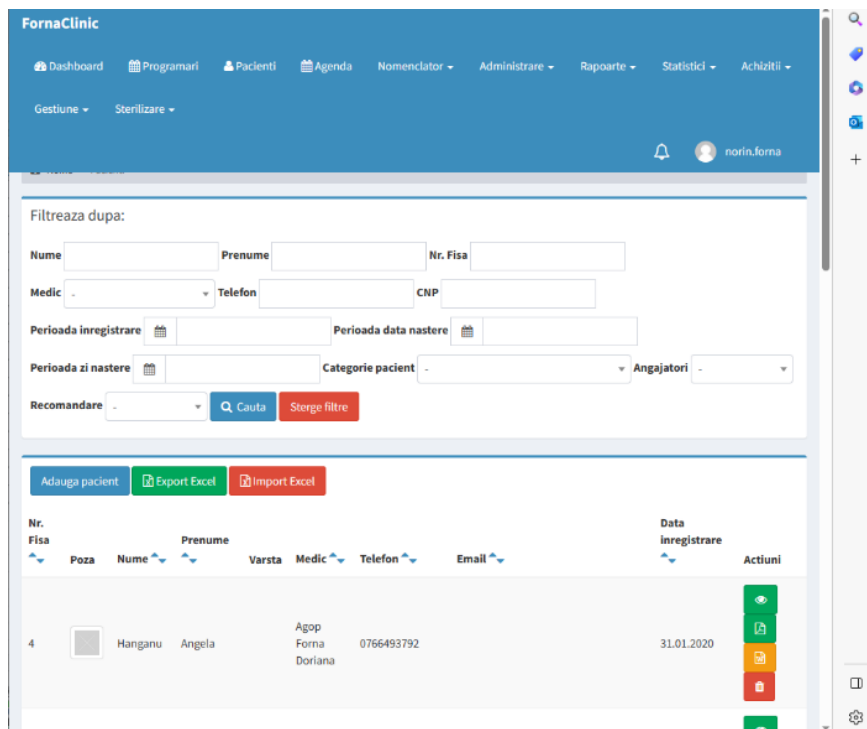


Fig. 1. Patients section: Viewing the electronic medical record of each registered patient – subsections: Patient data; Notes; Next visit; Correspondence; Schedules; Anamnesis; Recall treatments; Historic; Consultations; Treatment plans; Treatments; Prophylaxis; Laboratory work; Periodontology; Radiographs; Invoices; Receipts; Payment advances; Payment; Recipes; Documents; Custom forms; Dental subscriptions; Service subscriptions; Investigations; Operations; Services; Medical tests; Forms; Products

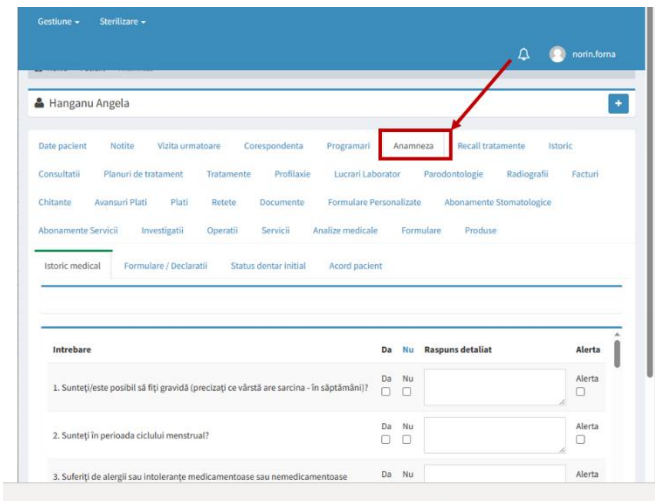


Fig. 2. Subsection "History": Relevant information is recorded by completing a standardized questionnaire with 12 categories of questions, each category containing its own list of dedicated questions; an alert tick can also be defined - in the case of patients with pathology with potential risk for the necessary dental treatment.

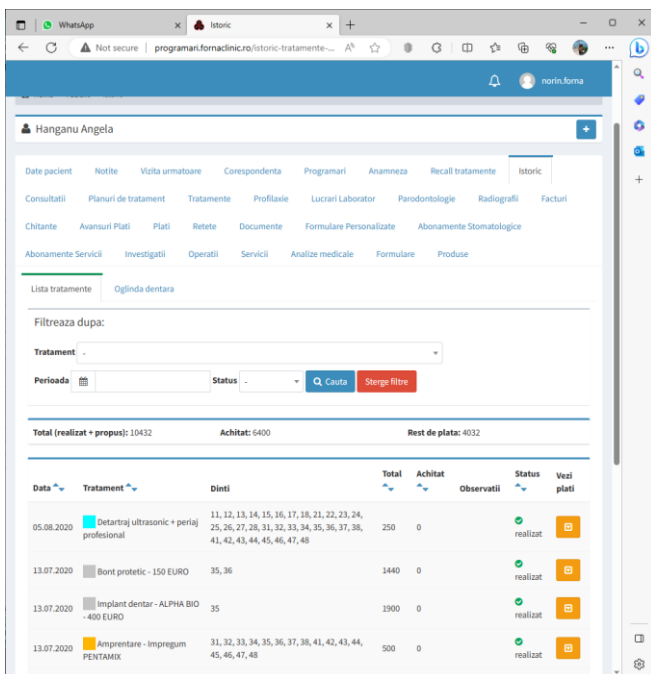


Fig. 3. Subsection "History": Enter the previously performed treatment.

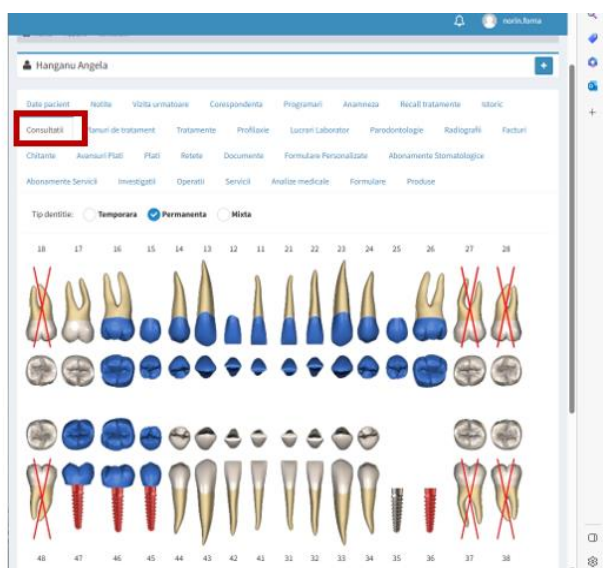


Fig. 4. Subsection "Consultations": The patient's dental mirror is marked.

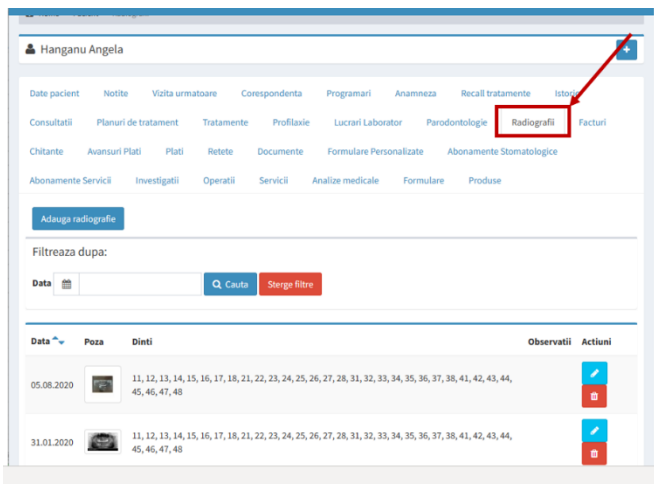


Fig.5. Subsection "X-rays": X-rays taken for the patient are stored, with the possibility of viewing them

Statistical processing was performed in SPSS 27.0.

Descriptive study: For qualitative data (whose values represent codes), frequency distributions were generated for the entire sample and compared across stratification variables using contingency tables. The determined values were graphically represented through histograms (in various forms), and for qualitative variables, Pie Charts were also used. For numerical data, standard descriptive statistics parameters were calculated (mean, standard error of the mean, standard deviation, variance, minimum and maximum values).

Analytical study: We used significance tests with a significance level of $p = 0.05$ for

Study group features

The analyzed patient sample has a relatively balanced gender distribution, with a

comparative analysis of the paired variables under investigation, both at the overall sample level and separately for subgroups. For comparing paired variables, we used the t-Student test under the assumption that the values follow a normal distribution (which was pretested using a goodness-of-fit test, such as the Kolmogorov-Smirnov test). If the values did not follow a normal distribution, we used the Wilcoxon test for paired samples for the same purpose.

To test the differences between values of a qualitative variable across different groups, we used the Chi-square test..

RESULTS AND DISCUSSIONS

slight prevalence of females (51.7% compared to 48.3%) (Fig.6).

Table I. Patients distribution - genre

Genre	N	%
F	604	51,4
M	571	48,6
Total	1175	100,0

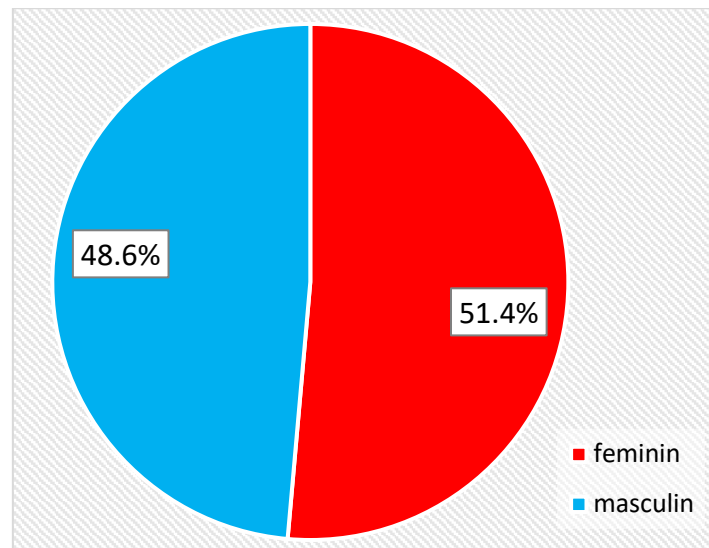


Fig.6. The distribution of patients by gender is as follows:

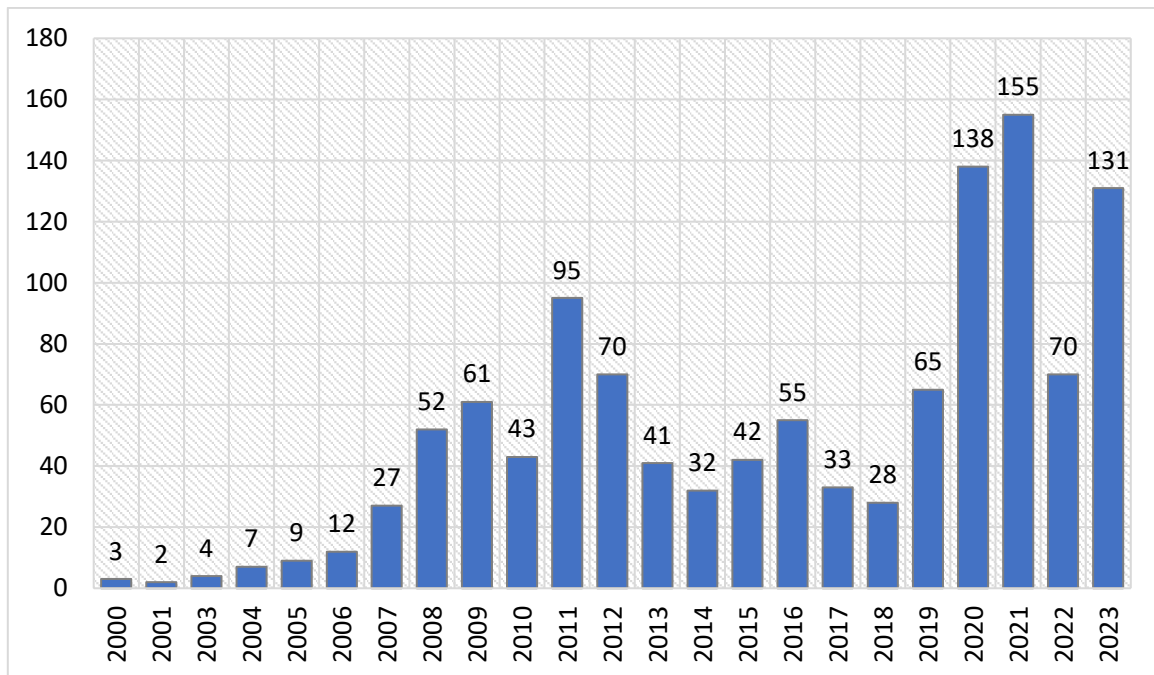


Fig. 7. Distribution of patients by year

Table II. Patients distribution – location (Romanian areas)

County	n	%
Bacau	23	3,9
Bistrita	2	0,3
Botosani	27	4,6
Brasov	2	0,3
Bucuresti	4	0,7
Buzau	1	0,2
Constanta	1	0,2

Covasna	1	0,2
Dambovita	1	0,2
Dolj	2	0,3
Galati	7	1,2
Iasi	430	72,8
Mures	1	0,2
Neamt	44	7,4
Prahova	3	0,5
Suceava	21	3,6
Vaslui	14	2,4
Vrancea	7	1,2
Total	591	100,0

There is a significant increase in the number of patients whose data has been stored in the digital application of the dental office from the year 2000 to 2023. Regarding the origin of the patients, we observe a distribution not only in the counties of Moldova but also in other areas of the country.

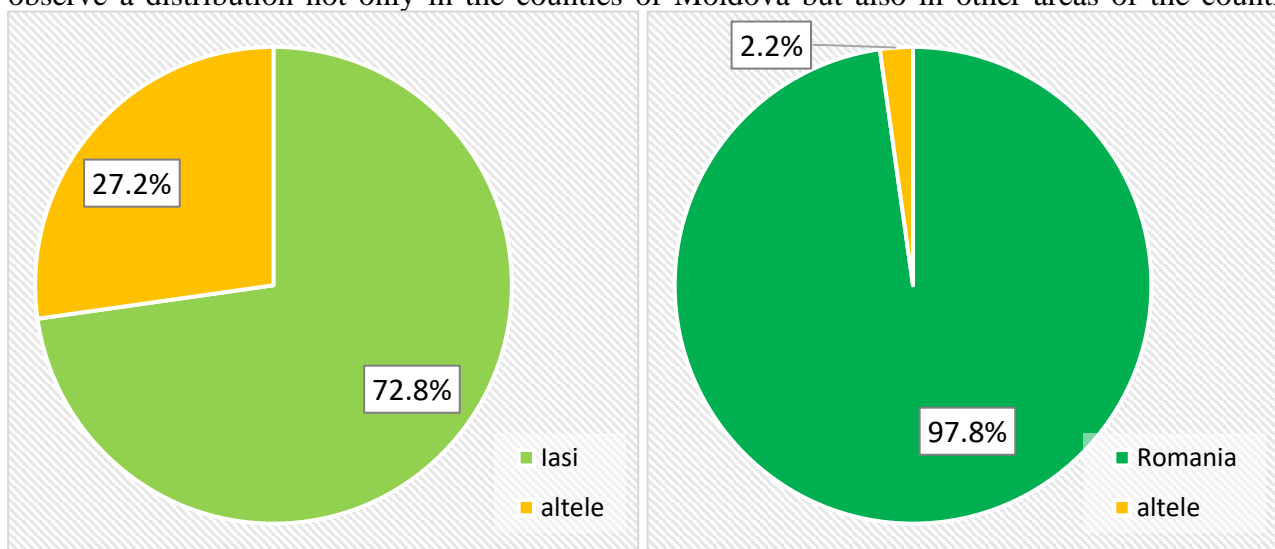


Fig. 8. Distribution of patients by area of origin

The majority of patients, 97%, originate from Romania, while a percentage of 2.2% come from other countries such as England, Australia, Canada, France, Israel, Italy, Morocco, and the Republic of Moldova. The

origin of patients is important because the patient's health behavior is somewhat influenced by the healthcare system of their respective country, which reflects in their approach to preventive oral health practices.

Table III. Patients distribution – Treatment needs

Categorie pacient	N	%
Pacienți cu regim normal	971	82,6
Pacienți cu regim special:	204	17,4
- Pacient ATESTAT implantologie	169	14,4
- Pacient ATESTAT sinus lifting	3	,3
- Pacient cu implanturi	14	1,2
- Pacient cu sinus lifting	1	,1

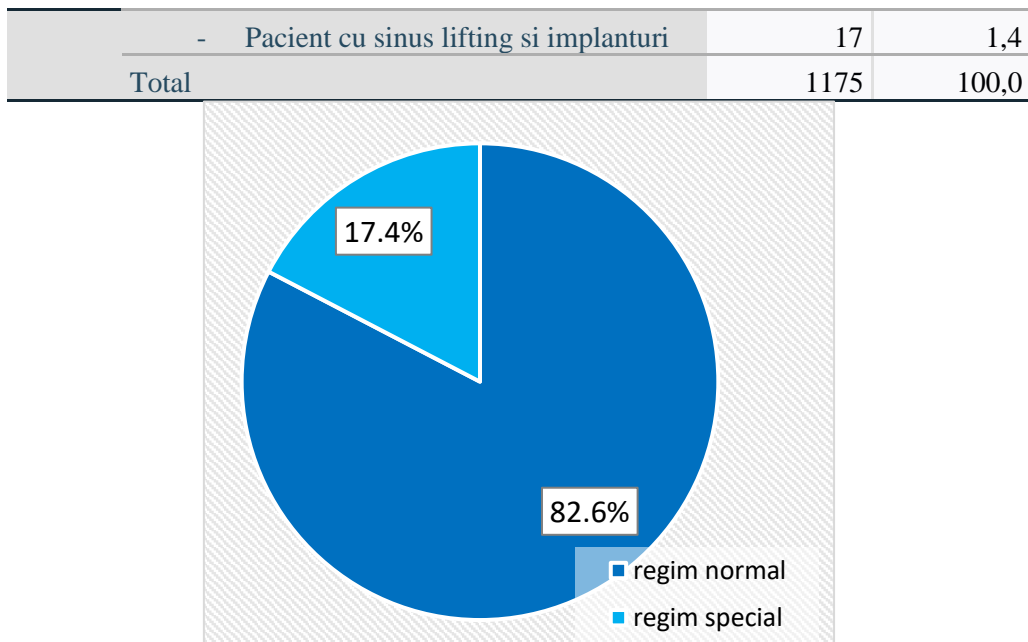


Fig. 9. Aspects of the distribution of patient categories (related to treatment regime)

Regarding the affiliation of patients who have visited the clinic in the last five years, two categories stand out: patients with a regular regime, accounting for 82.6%, and patients with a special regime, accounting for 17.4%. The special regime category includes patients

from the implantology certification program, where advanced procedures such as sinus lift and implants are performed. This category also includes patients who participate on a voluntary basis, contributing to both their own treatment and the educational aspects of the clinic.

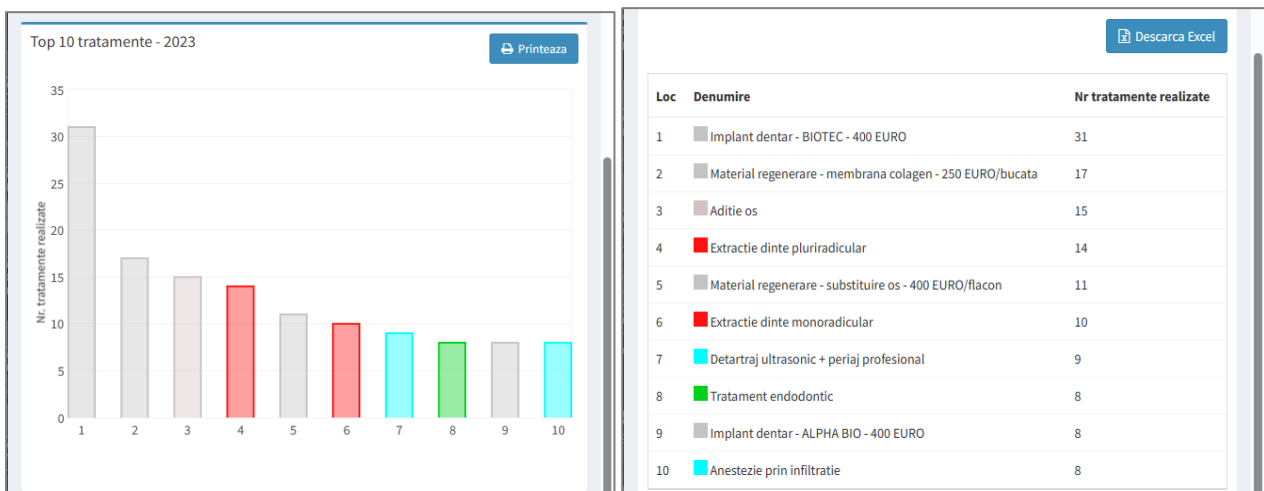


Fig.10.a-b. Top 10 treatments, reported in the last 5 years



Fig.11.a-d. Distribution of the therapeutic procedures carried out in the Clinic in the last 5 years

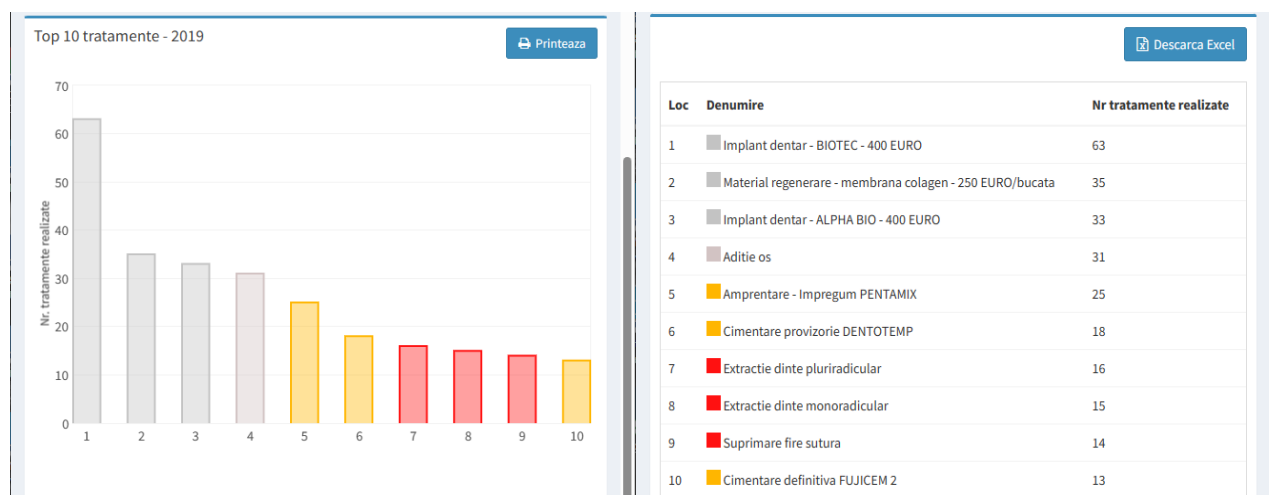


Fig.11.e-f. Distribution of the therapeutic procedures carried out in the Clinic in the last 5 years

Regarding the types of treatments conducted in the last five years, there is a prevalence of advanced procedures such as dental implant placement. Within this category, the application of Biotec implants had the highest prevalence in 2020, followed by 2022, with significant values also observed in 2019 and 2021. The values for the current year are relatively lower, considering that the year is still ongoing.

From the category of procedures related to implant-prosthetic rehabilitation, the application of bone augmentation using various regenerative materials stands out. The highest number of procedures was recorded in 2021, followed by 2022, with similar values also observed in 2019. The same type of procedure is present in the current year but in a smaller proportion, as the year is still ongoing.

Procedures related to dental alveolar surgery, such as cystectomy, numbered 15 in 2022, according to the alveolar surgery registry. Regularization of the alveolar ridge was performed in 23 procedures in 2021. Extractions of single-rooted teeth were prevalent in 2022.

In terms of implant-prosthetic procedures, the application of Alfa Bio implants is notable, with a quantifiable percentage for 2023. A significant number of

implants of this type prevailed in 2022 and 2019. Different types of impressions were used, with a prevalence of automatic mixing impressions.

"Reports" section presents a varied range of reports, also oriented mainly towards the economic efficiency of the clinic (Receipts, Daily receipts, Forecast of receipts, Payment of doctors, Patient invoices), but also towards the actual medical activity carried out in the clinic (Analysis of treatment plans, Patient treatments, Patient works) and for the administration of the activity (Patient appointments, Patient notes report, Patient task notes report, Treatment recall report, Medical analysis report, Tablet orders).

In order to generate a report on the treatments performed in the clinic, the following specifications can be provided: the patients for whom the report is desired, the doctor for whom the reporting is intended, the specific treatments to be tracked, and the reporting period. The treatments can be categorized and identified using specific color codes for simplicity. The categories include:

- Consultation
- General Dentistry / Prophylaxis
- Cariology
- Endodontics

- Surgery
- Implantology
- Laser Therapy
- Periodontology
- Esthetics
- Fixed Prosthodontics - Tooth
- Removable Dentures
- Fixed Prosthodontics - Implant
- Prosthodontics
- Orthodontics and Dentofacial Orthopedics

Regarding the clinical entities addressed in the clinic, there is a prevalence of implantology procedures, accounting for 19.3% of the total treatments. Fixed prosthodontics on implants follows with a percentage of 10.6%, and prosthetics on natural teeth with a percentage of 7.1%. It is important to mention the presence of laser therapy procedures, which offer advanced therapies that provide precision and comfort for the patients.

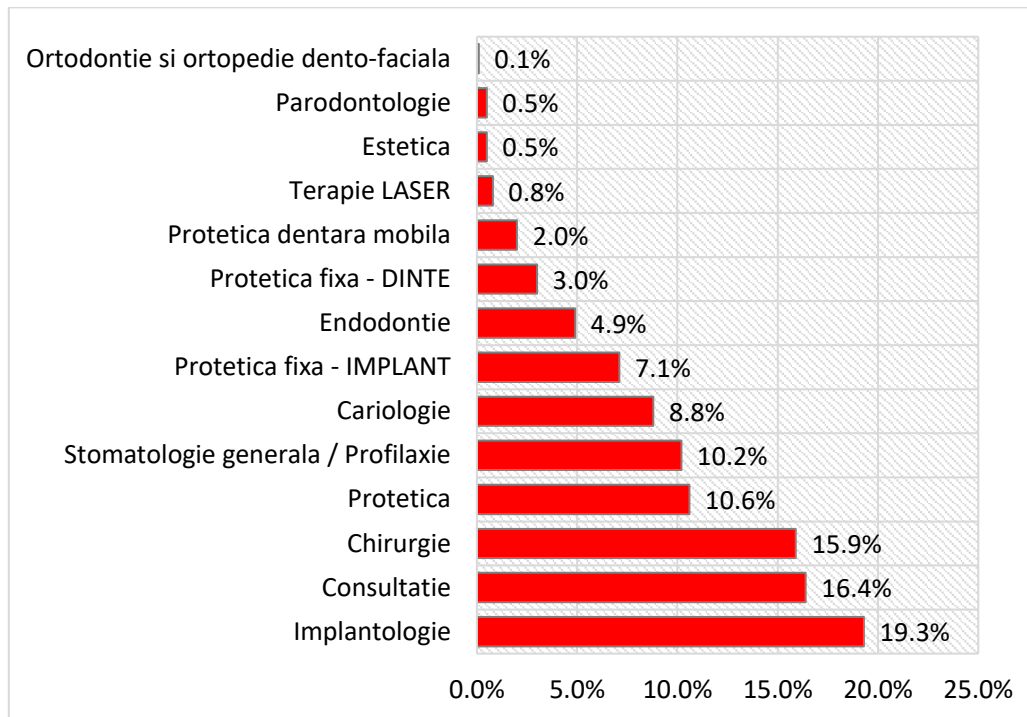


Fig.12. Categories of treatments for edentulous patients candidate to implant-prosthetic therapy

Regarding implantology procedures, there is a prevalence of Biotec dental implants, known for their high degree of biocompatibility, followed by Nova dental implants. Noris implants are also used in a significant proportion, along with a considerable number of Alpha Bio dental implants. Pre-implantation procedures such as sinus lift were performed with a significant number of cases, often combined with bone regeneration materials and collagen membranes.

In terms of surgical procedures, a significant number of root extractions were performed, followed by decapitations, cystectomies, bone grafting procedures, and the use of Jason membranes. Odontectomies of wisdom teeth and impacted canines were also performed in quantifiable proportions.

In terms of prosthetic field preparation, bone exostosis modeling, alveolar ridge regularization, and vestibuloplasties were performed in a significant number of cases.

Categories of treatment for edentulous patients candidate to implant-prosthetic

therapies are exposed in Tables IV-XVI. Regarding fixed prosthodontics procedures, there is a significant number of impressions taken using Impregum, a high-precision material, with the auto-mixing technique using the Pentamix equipment. Additionally, there is a notable number of cementations using various types of cements. In terms of removable dentures, there is a prevalence of partial acrylic dentures, followed by complete acrylic dentures. Representative cases also include completely acrylic dentures screw-retained on implants and removable partial dentures with skeletal frameworks. Regarding fixed prosthodontics, a wide range of procedures are observed, including provisional prostheses, ceramic crowns on metal frameworks, ceramic crowns on zirconia frameworks, and all-ceramic crowns. Additionally, the use of bruxism splints is notable, as they play a crucial role in managing the negative effects of bruxism on the longevity of fixed prostheses. A significant number of procedures are involved in fixed prosthodontics on implants, which correlates with the number of implants placed. There is a notable prevalence of ceramic crowns on metal frameworks on implants, ceramic crowns on zirconia frameworks on

implants, and all-zirconia crowns on implants. Additionally, quantifiable proportions are observed for temporary crowns using prefabricated resin materials. Similarly, there is a significant number of procedures in general dentistry, with a notable prevalence of laser therapies. Among these, important procedures include laser biostimulation, laser decontamination, laser excision of epulis, and laser frenectomy. These high-precision procedures ensure rapid healing and provide patients with a high level of comfort. In the field of conservative dentistry, there is a prevalence of medium-sized physiognomic restorations in permanent teeth, followed by deep physiognomic restorations in permanent teeth. Other notable categories of procedures include restorations reinforced with intracanal posts and remineralization therapies.

Equally noteworthy are the procedures in endodontics and periodontology, which are essential in any comprehensive oral rehabilitation and esthetic treatment. Endodontic therapies, performed under the microscope or using rotary techniques, are prevalent. They are followed by significant procedures in the field of gingivectomies and open-field periodontal curettage.

Table IV. Implant and implant-related procedures

Tratament	N	%
Bont protetic	9	5,5
Implant dentar - ALPHA BIO	23	13,9
Implant dentar - BIOTEC	61	37,0
Implant dentar - MEGAGEN	1	,6
Implant dentar - NOVA	18	10,9
Implant dentar - PERIOTYPE	1	,6
Implant dentar - TRATE	1	,6
Implant dentar MSDI	5	3,0
Implant dentar NORIS	16	9,7
Implant dentar NOVA	3	1,8
Implant dentar SURCAM	1	,6

Indepartare implant	9	5,5
Lifting sinusal - CADRANUL I	7	4,2
Lifting sinusal - CADRANUL II	3	1,8
Material regenerare - membrana colagen	2	1,2
Material regenerare - substituire os	2	1,2
Proba Pattern Resin	2	1,2
Toaleta plagii + control postinterventie	1	,6
Total	165	100,0

Table V. Pre- and pro-implant surgical procedures

Tratament	N	%
Aditie os	7	5,1
Cerabone	3	2,2
Chistectomie	1	,7
Chiuretaj alveolar	1	,7
Decapisonare bisturiu	25	18,4
Decapisonare freza	4	2,9
Extractie alveoloplastica	1	,7
Extractie cu separatie / complicata	1	,7
Extractie dentitie temporara	1	,7
Extractie dinte monoradicular	25	18,4
Extractie dinte pluriradicular	27	19,9
Extractie molar de minte (partial erupt)	5	3,7
Extractie rest radicular	2	1,5
Membrana Jason	4	2,9
Odontectomie molar de minte / canin inclus	5	3,7
Plastia modelanta a exostozelor osoase	1	,7
Regularizare creasta alveolara	2	1,5
Rezectie apicala dinte monoradicular (fara obturatie radiculara)	4	2,9
Rezectie apicala dinte pluriradicular(fara obturatie radiculara)	1	,7
Suprimare fire sutura	14	10,3
Sutura	1	,7
Vestibuloplastie	1	,7
Total	136	100,0

Table VI. General prosthetic procedures

Tratament	N	%
Ablatie coroana metalo-ceramica	2	2,2
Amprentare - alginat	7	7,7

Amprentare - Impregum PENTAMIX	24	26,4
Amprentare - Zeta	8	8,8
Cimentare definitiva FUJICEM 2	22	24,2
Cimentare definitiva RELYX U200	7	7,7
Cimentare provizorie DENTOTEMP	14	15,4
Cimentare provizorie PREVISION	1	1,1
Proba schelet	6	6,6
Total	91	100,0

Table VII. Prosthetic procedures- removable partial dentures

Tratament	N	%
Adaptare proteza - rebazare	4	23,5
Masca Kemenny (maxim 3 elemente)	1	5,9
Proteza acrilica partiala	6	35,3
Proteza acrilica totala	3	17,6
Proteza acrilica totala insurubata pe implante	2	11,8
Proteza scheletizata (in functie de sistemul de mentinere)	1	5,9
Total	17	100,0

Table VIII. Prosthetic procedures- fixed partial dentures

Tratament	N	%
Coroana acrilica provizorie (masca Scutan) - DINTE	5	19,2
Coroana ceramica pe schelet din zirconiu - DINTE	1	3,8
Coroana ceramica pe schelet metalic - DINTE	12	46,2
Coroana integral ceramica - DINTE	1	3,8
Gutiera bruxism	5	19,2
Pivot metalic turnat	2	7,7
Total	26	100,0

Table IX. Implant-supported crowns

Tratament	N	%
Coroana acrilica provizorie (masca Scutan) - IMPLANT	14	23,0
Coroana ceramica pe schelet din zirconiu - IMPLANT	4	6,6
Coroana ceramica pe schelet metalic - IMPLANT	41	67,2
Coroana integral zirconiu - IMPLANT	2	3,3
Total	61	100,0

Table X. General dentistry- Prophylaxis procedures

Tratament	N	%
Anestezie de contact (pentru detartraj ultrasonic)	1	1,1
Anestezie prin infiltratie	11	12,6
Detartraj ultrasonic	1	1,1
Detartraj ultrasonic + periaj profesional	45	51,7

Periaj profesional	1	1,1
Sedinta completa igienizare (detartraj, periaj profesional, prophyjet)	28	32,2
Total	87	100,0

Table XI. Laser-assisted procedures

Tratament	N	%
Albire LASER	1	14,3
Biostimulare LASER	1	14,3
Decapisonare LASER	2	28,6
Excizie Epulis LASER	1	14,3
Frenectomie LASER	2	28,6
Total	7	100,0

Table XII. Restorative dentistry procedures (Cariology)

Tratament	N	%
Obturatie armata cu pin parapulpar, dentatus	7	9,3
Obturatie fizionomica dinte frontal definitiva	5	6,7
Obturatie fizionomica medie dinte definitiv	34	45,3
Obturatie fizionomica profunda dinte definitiv	18	24,0
Obturatie fizionomica superficiala dinte definitiv	8	10,7
Obturatie provizorie	2	2,7
Tratament remineralizare / eroziuni / white spots	1	1,3
Total	75	100,0

Table XIII. Endodontics therapy

Tratament	N	%
Drenaj endodontic	2	4,8
Reconstituire bont cu pivot fibra de sticla	6	14,3
Reconstituire coronară	3	7,1
Retratament endodontic dinte pluriradicular cu instrumentar rotativ	1	2,4
Sedinta intermediara in tratamentul endodontic (CaOH + glassionomer)	1	2,4
Tratament endodontic	15	35,7
Tratament endodontic dinte monoradicular cu instrumentar rotativ	2	4,8
Tratament endodontic dinte pluriradicular cu instrumentar rotativ	9	21,4
Tratament endodontic la microscop, molar	3	7,1
Total	42	100,0

Table XIV. Esthetics procedures

Tratament	N	%
Albire Phillips ZOOM	2	50,0
Gutiera albire + gel	2	50,0

Total	4	100,0
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Table XV. Periodontal procedures

Tratament	N	%
Chiuretaj parodontal in camp deschis	1	25,0
Gingivectomie	3	75,0
Total	4	100,0

CONCLUSIONS

- Software applications play a crucial role in achieving optimal management both in therapeutic aspects and at the clinic level where the software application is implemented as a daily approach.
- The data stored in software applications are extremely useful for both patients and healthcare professionals, providing a clear overview of the prevalence of procedures and materials used at any given moment.
- From conducted statistical studies, there is a notable prevalence of implantology and implant-prosthetic rehabilitation procedures. A significant percentage of procedures fall within the realm of advanced preparations, such as

augmentation with various types of bio-oss and membranes, as well as the prevalence of lateral sinus lift procedures.

- In terms of prosthodontics procedures, there is a prevalence of ceramic crowns on metal frameworks, followed by ceramic restorations on zirconia infrastructure. Implant-supported prostheses are present in a quantifiable proportion. It is important to note the prevalence of laser therapies, which not only demonstrate advanced aspects but also offer precision and enhanced patient comfort, ultimately leading to an improved quality of life.

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