Teledentistry and Artificial Intelligence:
An innovative treatment option for elderly patients

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01 Specific Aim

The aim of this literature review is to identify articles that assess the feasibility of Teledentistry in elderly patients and explore the idea of the use of Artificial Intelligence within the field of Teledentistry.

02 Method

The literature search was performed in several databases such as PubMed, ScienceDirect, and Scopus. The following MeSH terms were defined for the search: "Teledentistry", "Elderly", "Geriatrics", "Gerontology", "Artificial Intelligence", and "Geriatric Dentistry", combining them with the word "AND" with different Boolean operators. The search was limited to research studies, case reports, and reviews. The language used within the performed search was English. No year limit was applied.

Criteria of Inclusion
• Case reports
• Investigative Studies
• Reviews

Criteria of Exclusion
• Meta-analysis
• Studies without access to the full text
• Studies about Pediatric Dentistry

Background:

Teledentistry is the exchange of clinical data and images across remote geographical distances for dental consultations, treatment planning being cost reduced and easily accessible (1). With remote monitoring got also introduced the idea of making use of Artificial Intelligence within the field of Teledentistry and combining both. Dental Monitoring provided such a solution, being the world's first software SaaS (Software as a Service) for the monitorization of orthodontic patients using aligners and remote dental treatment (2). As the world's population grows rapidly, so does the number of elderly people. Being a more vulnerable population group, they are at high risk of developing dental problems and diseases, which affect their quality of life (3). Overall, the COVID-19 pandemic has brought new light to Teledentistry (4).

03 Findings

A search strategy was used in the investigation process of the articles, which was as to indicate in Figure 1 (Fig.1):

I. Identification:
Different MeSH combinations were entered into the search engine of the different databases. In PubMed the Mesh terms "Teledentistry" AND "Elderly" detected a total of 33, "Artificial Intelligence" AND "Gerontology" detected 43 results and "Artificial Intelligence" AND "Dentistry" detected 93 results. In Scopus, "Teledentistry" AND "Elderly" led to a total of 7 articles, the term "Teledentistry" to 140 articles, and the terms "Artificial Intelligence" AND "Dentistry" to 69 articles. In ScienceDirect the terms used were "Teledentistry" AND "Elderly" leading to 28 results, "Teledentistry" AND "Geriatrics" showed 4 articles. A total of 445 titles (including duplicate articles due to existence in more than one database) were counted and analyzed.

II. Revision:
After initial identification, the studies that met the inclusion criteria were downloaded. 10 useful articles were found in PubMed, 9 in Science Direct, and 6 in Scopus. After reading the abstracts, eligibility was determined.

III. Eligibility:
All 25 articles were read in full, and the inclusion criteria were checked.

IV. Inclusion:
24 articles were found to be suitable for the literature review, focusing on Teledentistry with highlighting the aging population or talking about Artificial Intelligence in the field of Dentistry.
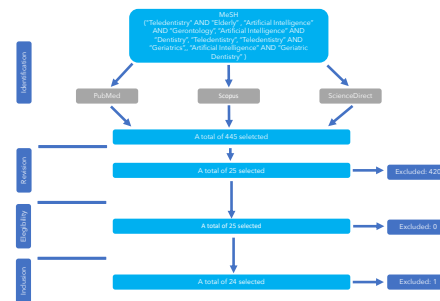

Fig.1: Search Algorithm

04 Discussion

Teledentistry is an innovative concept in modern dentistry despite some challenges. One of those challenges is time. This could mean more time for a practitioner to conduct a live teleconsultation (5). Patients in rural areas reported a high level of satisfaction with Teledentistry according to Fricton and Chen's University of Minnesota Teledentistry Project (5). In a study conducted during the COVID- 19 pandemic and published in 2021, 89% of people reported overall satisfaction with the use of teledentistry, showing no significant difference between people by the age of 25-34 to over 65y old ones (Fig. 2) (6). Teledentistry can be seen as a natural process of society becoming more digitalized and breaking down existing barriers to accessing health care.

In elderly homes, almost 65% of residents suffer from oral diseases and have trouble accessing treatment if needed (7). Artificial Intelligence is on the rise, also within the field of dentistry. The idea behind it is that a machine is capable to learn, take a decision and within this solve a problem objectively. Machine learning predicts outputs based on a dataset, which the machine can learn from to resolve problems without leaving human input outside (8). Based on a standardized evaluation of clinical situations, AI-based Dental Monitoring Software promises high accuracy and objective monitoring in the monitoring of different oral conditions and treatments, also focusing on the elderly who often battle with multifactorial diseases (2). The AI will analyze data and send instructions to the team, in this case to the caregiver in an elderly home (2). Another important consideration when treating elderly patients where AI could be of major impact is the concept of machine learning as helping practitioners to understand better multifactorial diseases. AI can keep automated track of a patient's history including its current medication and health condition and based on these important factors recommend to the practitioner certain protocols (9). Clearly, the field of AI in dentistry needs to be explored further and brought closer to the practice. The study "Role of Robots and Artificial Intelligence in Oral Health and Preventive Dentistry - Knowledge, Perception, and Attitude of Dentists" in 2021 studied 570 dentists, and it came out that most dentists lack knowledge about AI in dentistry (10).
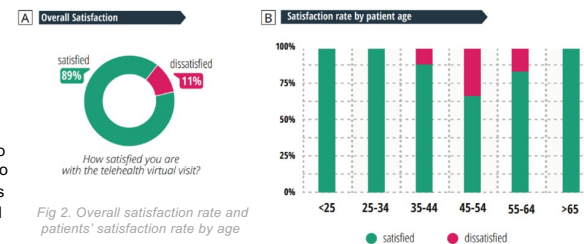

Fig 2. Overall satisfaction rate and patients' satisfaction rate by age