

TELEDENTISTRY PROTOCOL FOR THE ELDERLY IN THE CONTEXT OF THE COVID-19 PANDEMIC THROUGH A WEB PLATFORM/MOBILE APP: APPROACH FROM THE GENERAL DENTIST.

Protocolo de teleodontología para adultos mayores en el contexto de la pandemia de COVID-19 a través de una plataforma web/aplicación móvil: abordaje desde el odontólogo general.

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ABSTRACT:

Objective: To generate teledentistry protocols for urgent and priority dental care for the elderly population through a technological web platform and mobile application in the context of the COVID-19 pandemic. **Material and Methods:** Teledentistry protocols were developed in five sequential steps: Staff training, Patient recruitment, Patient admission, Patient reception and Patient care. Reasons for admission were categorized in urgencies and priority dental treatment. **Results:** The most prevalent reasons for consultation were prosthesis mismatch (18.37%), dental pain (16.33%) and fractured teeth (14.29%). In urgencies by need for treatment: due to infection or pain (24.44%) or to avoid pulp involvement (26.67%). The rest of the care did not require immediate attention. Regarding the OHIP-14Sp survey prior to care, in which patients were consulted for problems with their teeth, mouth or prosthesis, two questions were answered per dimension, for each dimension the following values were obtained: functional limitation (71.30% and 50.44%), physical pain (68.97% and 70.18%), psychological discomfort (75.00% and 74.14%), physical disability (57.39% and 46.09%), psychological disability (37.72% and 53.91%), social disability (33.91% and 30.97%) and handicap (27.83% and 25.86%). **Conclusion:** A teledentistry protocol for urgent and priority dental care of the elderly in the context of the COVID-19 pandemic with a focus on a general dentist remotely supported specialists was a useful tool to effectively systematize the care of elderly patients, reducing risk of exposure to COVID-19 and solving dental urgencies in this population.

KEYWORDS:

COVID-19; mobile applications; treatment outcome; dental care, teledentistry; aged.

RESUMEN:

Objetivo: Generar protocolos de teleodontología para la atención odontológica urgente y prioritaria de la población adulta mayor a través de una plataforma web tecnológica y aplicación móvil en el contexto de la pandemia del COVID-19. **Material y Métodos:** Los protocolos de teleodontología se desarrollaron en cinco pasos secuenciales: capacitación del personal, reclutamiento de pacientes, admisión de pacientes, recepción de pacientes y atención al paciente. Los motivos de ingreso se categorizaron en urgencias y tratamiento odontológico prioritario. **Resultados:** Los motivos de consulta más prevalentes fueron desajuste de prótesis (18,37%), dolor dental (16,33%) y dientes fracturados (14,29%). En urgencias por necesidad de tratamiento por infección o dolor (24,44%) o para evitar afectación pulpar (26,67%). El resto de los cuidados no requirieron atención inmediata. En cuanto a la encuesta OHIP-14Sp previa a la atención, en la que se consultaba a los pacientes por problemas en sus dientes, boca o prótesis,

se respondieron dos preguntas por dimensión, para cada dimensión se obtuvieron los siguientes valores: limitación funcional (71,30% y 50,44%), dolor físico (68,97% y 70,18%), malestar psicológico (75,00% y 74,14%), discapacidad física (57,39% y 46,09%), discapacidad psicológica (37,72% y 53,91%), discapacidad social (33,91% y 30,97%) y handicap (27,83% y 25,86%). **Conclusión:** Un protocolo de teleodontología para la atención odontológica urgente y prioritaria del adulto mayor, en el contexto de la pandemia de COVID-19 con un enfoque en un odontólogo general con especialistas apoyados de forma remota, fue una herramienta útil para sistematizar de manera efectiva la atención de los pacientes adultos mayores, reduciendo el riesgo de exposición al COVID-19 y resolviendo las urgencias odontológicas en esta población.

PALABRAS CLAVE:

COVID-19; aplicaciones móviles; resultado del tratamiento; atención odontológica; teleodontología; anciano.

INTRODUCTION.

COVID-19 can affect the entire population, particularly older adults, who can develop serious complications, thus being considered a population at risk. To prevent contagion, social isolation is recommended for this population which evidently limits the number of times they can visit a dental office.¹

In addition, older adults tend have poorer oral health, due to the high prevalence of cavities, periodontal disease and tooth loss, and it is expected that in this pandemic context they will have an even greater dental health deterioration,² which could affect both their quality of life and their need for urgent dental care.

One way to solve this problem is the implementation of teledentistry protocols, which allows for remote communication between a general dentist on site and a staff of different dental and geriatrics specialists through a technological platform.³

The aim of this study is to generate teledentistry

protocols for urgent and priority dental care for the elderly population, that permit efficient remote communication (*synchronous or asynchronous*) between the general dentist working on site and specialist dentists and geriatricians, all supported by a technological web platform and mobile application in the context of the COVID-19 pandemic.

MATERIALS AND METHODS.

Teledentistry protocol for the elderly in the context of the COVID-19 pandemic

Staff training. An online training must be carried out for each member of the clinical staff (general dentist, dental assistant, medical geriatrician and dental specialists) about the use of the semi in-person technological support platform (Called TEGO, acronym from its name in Spanish). This training also includes social workers in charge of the recruitment of patients by cell phone.

Patient recruitment

The research team held coordination meetings

with family health centers, neighborhood councils, and institutions related to the welfare of the elderly, e.g. the National Service for the Elderly (SENAMA). The recruitment of patients was performed in the following cities: Antofagasta, Maipú, Talca, Temuco, Vilcún, Concepción, which are part of five different regions of the country.

The social worker telephoned people over 60 years of age who have a dental urgency and priority care that fell within any of the following inclusion criteria:

- Severe dental pain
- Recent trauma.
- Oral bleeding.
- Significant swelling of the mouth, face or neck.
- Stains or wounds that do not disappear.
- Loss or fracture of restorations or dental prostheses
- Injuries to the oral mucosa, due to dental prosthesis mismatch
- Dental treatment required prior to urgent critical medical procedures

The exclusion criteria were:

- Anticoagulant therapy
- Chronic diseases without any treatment
- Undergoing cancer treatment
- Dialysis

Subsequently, patients were registered on the TEGO platform, indicating the patient's personal details and general social and health background, and also the date, time and place of attention. The entire teledentistry workflow protocol, (Figure 1).

Patient admission

Patients were contacted by phone 24 hours prior to care to confirm the appointment, perform a COVID-19 triage survey and deliver patient recommendations. At this stage, they were also notified regarding informed consent. Missing sociodemographic data of the patient on the TEGO platform were also collected.

Surveys and questionnaires such as the OHIP-14Sp were also applied.

Patient reception

At this stage, patient data from their entry into the platform were verified, risk categorization of exposure to COVID-19 and the patient's body temperature were also recorded.

In addition, the informed consent had to be signed.

After that, the clinical record is filled on the tele-dental platform with information such as the chief complaint, general, dental and geriatric anamnesis, clinical examination, as well as photographs, X-rays and videos.

Onboard the mobile dental clinic, a variety of technological equipment was used to facilitate data collection, such as a digital intraoral camera (CS-1200, Carestream Health Inc, Rochester, USA), an oral cancer screening device (ViziLite-PRO, Zila-Pharmaceuticals, Phoenix, USA), an intraoral scanner (Medit-i500, Seoul, Republic of Korea), an extraoral scanner (Shining-3D DS-EX, Shining-3D Tech Co., Zhejiang, China), a 3D Printer (Photon-S, Anycubic, Shenzhen, China), and a diode laser (NVPRO3, Denmat, California, USA).

Patient care

A complete patient file is uploaded to the TEGO platform, which is supported by a virtual 3D phantom that includes information on hard and soft tissues of the orofacial area of the patient, such as a 3D odontogram with different tools for the customization of clinical conditions, a periodontal chart, and the location and description of eventual alterations in the oral mucosa. Based on these data, it is determined whether the dental urgency of the patient could receive care in the mobile dental clinic itself or if they had to be referred to a referral center according to the complexity of the case.

On the other hand, the platform had a team of specialist dentists and geriatricians who could provide support to the treating dentist in a synchronous or asynchronous way, as well as providing the possibility of referring patients to them directly through telecare.

After providing care to the patients, the follow-up of the urgency decisions was monitored, as well as the interconsultations generated from this attention.

RESULTS.

The total number of elderly patients who received care was 135, of which 87 were female (64.44%) and 48 male (35.56%), with an age ranging between 60 and 93 years (mean age 72.3 years).

The most prevalent reasons for consultation were prosthesis mismatch (18.37%), dental pain (16.33%) and fractured teeth (14.29%).

Figure 1. Teledentistry workflow protocol (TEGO platform) for the elderly in the context of the COVID-19 pandemic.

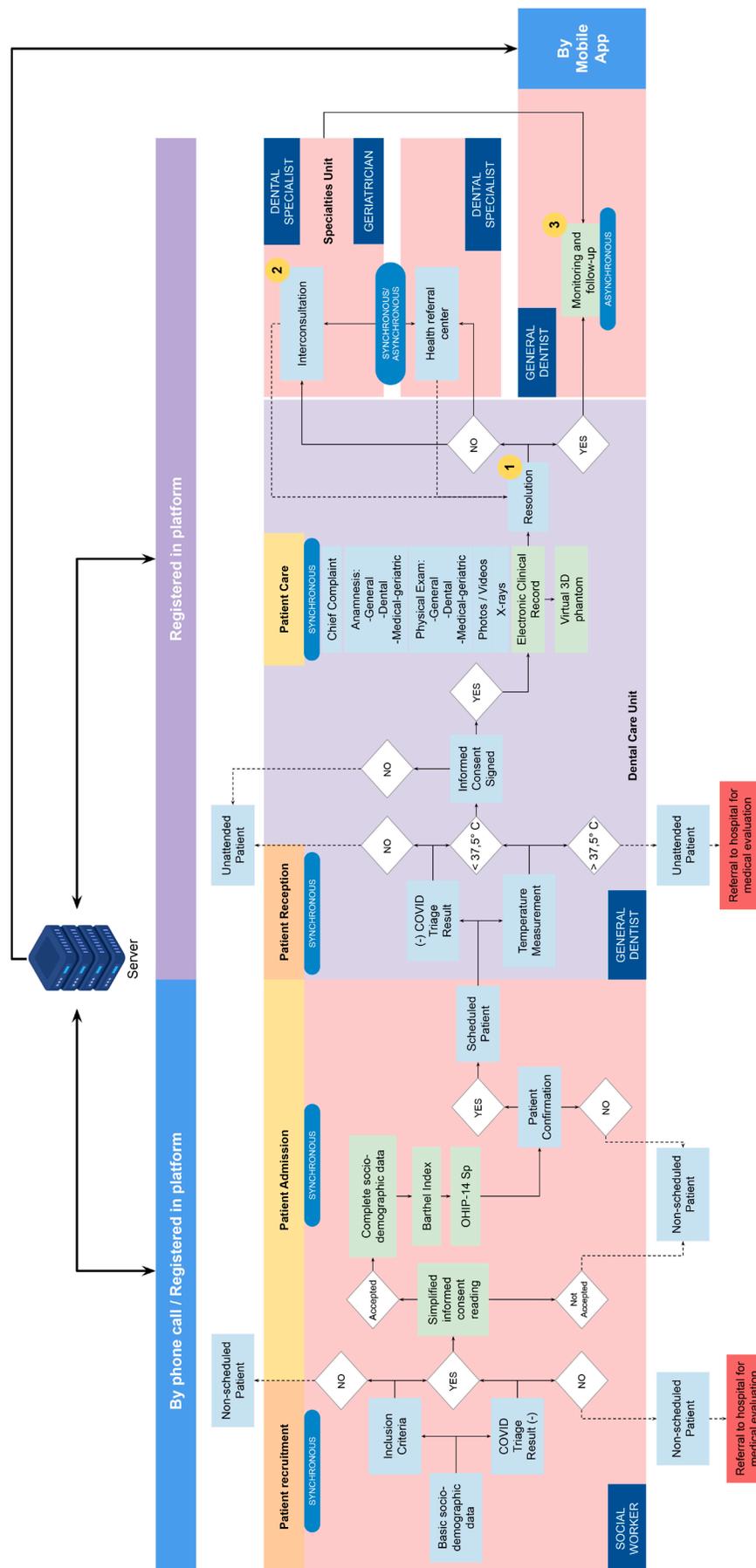


Table 1. Scores of the OHIP-14SP questions and dimensions. Values are presented as frequencies for each question with their respective percentage within brackets.

DIMENSION	n	NEVER	RARELY	OCCASIONALLY	FREQUENTLY	ALWAYS
Functional Limitation						
Breathe stale	115	24 (20.87)	9 (7.83)	29 (25.22)	34 (29.57)	19 (16.52)
Digestion worse	113	44 (38.94)	12 (10.62)	33 (29.20)	15 (13.27)	9 (7.96)
Physical Pain						
Sensitive teeth	116	32 (27.59)	4 (3.45)	27 (23.28)	25 (21.55)	28 (24.14)
Dental Pain	114	24 (21.05)	10 (8.77)	23 (20.18)	36 (31.58)	21 (18.42)
Psychological discomfort						
Dental problems made you miserable	112	20 (17.86)	8 (7.14)	20 (17.86)	28 (25.00)	36 (32.14)
Felt uncomfortable about the appearance	116	18 (15.52)	12 (10.34)	20 (17.24)	27 (23.28)	39 (33.62)
Physical Disability						
Speech unclear	115	37 (32.17)	14 (12.17)	30 (26.09)	24 (20.87)	12 (10.43)
Others miss understood	115	43 (37.39)	19 (16.52)	31 (26.96)	15 (13.04)	7 (6.09)
Psychological Disability						
Sleep interrupted	114	55 (48.25)	16 (14.04)	23 (20.18)	13 (11.40)	7 (6.14)
Upset	115	40 (34.78)	13 (11.30)	26 (22.61)	26 (22.61)	10 (8.70)
Social Disability						
Less tolerant of others	115	57 (49.57)	19 (16.52)	23 (20.00)	14 (12.17)	2 (1.74)
Difficulty doing jobs	113	68 (60.18)	10 (8.85)	21 (18.58)	8 (7.08)	6 (5.31)
Handicap						
Unable function	115	69 (60.00)	14 (12.17)	21 (18.26)	7 (6.09)	4 (3.48)
Unable to work	116	73 (62.93)	13 (11.21)	19 (16.38)	5 (4.31)	6 (5.17)

Regarding gender, the most prevalent reason for consultation in men was dental prosthesis mismatch (16.07%) and dental pain for women (21.98%).

Later, when categorizing urgencies by the need for treatment, the vast majority required immediate attention, either due to infection or pain (24.44%) or to avoid pulp involvement (26.67%).

The rest of the care did not require immediate attention, but a need for replacement of restorations or prostheses (42.22%) and to a lesser extent, only a supragingival scaling or even no need for treatment at all (6.66%). Regarding the OHIP-14Sp survey prior to care, it was answered by 116 patients (85.93%), in which they were consulted for their problems with teeth, mouth or prosthesis. For the dimension of functional limitation, 71.30% and 50.44% of the patients reported that their breath and digestion had deteriorated at some time or more, respectively.

For physical pain, 68.97% and 70.18% have felt sensitive teeth or had dental pain at one time or more, respectively.

Regarding psychological discomfort, 75.00% and 74.14% have felt totally unhappy due to dental problems and indicated dissatisfaction with the appearance of their teeth, mouth or prosthesis at one time or more, respectively.

Regarding physical disability, 57.39% and 46.09% of the patients have reported at some time or more, being unclear in the way of speaking and being misunderstood with some words by others, respectively.

For psychological disability, 37.72% and 53.91% had presented interrupted sleep at a certain time or more or had been upset/irritated, respectively. In relation to social disability, 33.91% and 30.97% had been less tolerant of their partner or family at a

certain time or more and had presented difficulties in their work, respectively. Finally, regarding the handicap, 27.83% and 25.86% at a certain time or more had been totally unable to function and work at their full capacity, respectively, (Table 1).

DISCUSSION.

In this pilot study, dental emergencies were solved and priority care for the elderly was provided. The former included a group of oral and maxillofacial pathologies of sudden onset and of multiple etiologies, which were manifested mainly by acute pain and caused a spontaneous demand for attention.⁴ The latter, for their part, were considered by different Chilean scientific societies of dental specialties.

One study published at the beginning of the pandemic described that the number of dental urgency visits decreased, the proportion of dental and oral infections increased, and those of dental and non-urgent trauma decreased.⁵ Another study conducted in Brazil reported an increase in self-reported need for dental treatment during the COVID-19 outbreak.⁶

In Chile, this article is the first study that reports reasons for dental visits, including urgent dental visits that require treatment for the elderly population during the COVID-19 pandemic.

Regarding reasons for consultation that do not require immediate attention, the replacement of prostheses or restorations stands out (42.22%), which reflects the general poor state of oral health of the elderly, which is in accordance with another oral health study in Chile.²

The categorization of urgencies by need for treatment, either due to infection or pain (24.44%) or to avoid pulp involvement (26.67%), was consistent with the literature.³ Unfortunately, we do not have information prior to the pandemic to compare what was the most frequent reason for dental emergency visits in the Chilean elderly population. However, in order to have an approach prior to care, the OHIP-14Sp was applied, a validated instrument in older adults in Chile.⁸

Two dimensions stood out, functional limitation and psychological disability, evidencing the decrease in quality of life in relation to oral health in this segment of patients of the Chilean population.

Like the teledentistry protocol during COVID-19 in dental establishments of the Armed Forces of India,⁹ our protocol considered carrying out teledentistry based on a technological web platform, which was developed in three modalities, synchronous (live audiovisual communication), asynchronous (transmission of health information through the TEGO platform) and remote monitoring of patients.

The use of the TEGO platform stands out, which was designed specifically for this study. Teledentistry has multiple advantages in the care of older adults, among them the reduction in the number of patient trips to their care center.³

In this sense, the presented teledentistry protocol reduces the number of face-to-face visits both in the recruitment phase and in patient care through a telephone call from the social worker, and through monitoring and follow-up through the use of the mobile application. In this way

- 1) the exposure of the elderly to COVID-19 was reduced;
- 2) access to urgency and priority dental care was improved;
- and 3) prevention was carried out through educational video capsules which can be played on the app.

CONCLUSION.

Teledentistry protocol for urgent and priority dental care of the elderly in the context of the COVID-19 pandemic with a focus on the general dentist, remotely supported by a staff of specialists, was a useful tool to effectively systematize the care of elderly patients, reducing the risk of exposure to COVID-19 and solving the dental urgencies in this population.

Conflict of interests:

The authors declare no conflicts of interest.

Ethics approval:

Study protocol approval was granted by the Universidad de la Frontera Ethics Committee, decision 090/20.

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Conceptualization: Beltrán V, Sanzana-Luengo C, Díaz L. Research, methodology and supervision: Beltrán V, Sanzana-Luengo C, Díaz L. Data gathering: Sanzana-Luengo C, Díaz L. Data analysis: Alvarado E. Writing—original draft: Sanzana-Luengo C, LD. Writing—review and editing: Beltrán V, Sanzana-Luengo C, LA. Image work: Sanzana-Luengo C, Díaz L.

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REFERENCES.

1. da Hora Sale S PH, Lopes de Gusmão Sales P, da Hora Sales ML. COVID-19: how to decrease the risk of infection in dental practice? *Minerva Stomatol.* 2020 Oct;69(5):324-327. doi: 10.23736/S0026-4970.20.04372-1. PMID: 32407062.
2. León S, Giacaman R. Desigualdades en Salud Bucal para Personas Mayores en Tiempos del COVID-19. La Teleodontología y la Odontología de Mínima Intervención como Caminos de Solución. *Int J Interdiscip Dent.* 2020;13(3):147-50.
3. Aquilanti L, Santarelli A, Mascitti M, Procaccini M, Rappelli G. Dental Care Access and the Elderly: What Is the Role of Teledentistry? A Systematic Review. *Int J Environ Res Public Health.* 2020 Dec 4;17(23):9053. doi: 10.3390/ijerph17239053. PMID: 33291719; PMCID: PMC7729836.
4. Ministerio de Salud (MINSAL). Orientaciones para atención odontológica en Fase IV COVID-19. Santiago de Chile, Subsecretaría de Salud Pública. División de Prevención y Control de Enfermedades. Departamento Salud Bucal. Ministerio de Salud, Gobierno de Chile. 2020. June 26, 2021. <https://diprece.minsal.cl/wp-content/uploads/2020/03/ORIENTACIONES-ATENCION-ODONTOLOGICAS-COVID-19-.pdf>
5. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. *J Dent Sci.* 2020 Dec;15(4):564-567. doi: 10.1016/j.jds.2020.02.002. PMID: 32296495; PMCID: PMC7156222.
6. Oliveira LM, Zanatta FB. Self-reported dental treatment needs during the COVID-19 outbreak in Brazil: an infodemiological study. *Braz Oral Res.* 2020 Sep 4;34:e114. doi: 10.1590/1807-3107bor-2020.vol34.0114. PMID: 32901729.
7. Sinjari B, Rexhepi I, Santilli M, D'Addazio G, Chiacchiaretta P, Di Carlo P, Caputi S. The Impact of COVID-19 Related Lockdown on Dental Practice in Central Italy-Outcomes of A Survey. *Int J Environ Res Public Health.* 2020 Aug 10;17(16):5780. doi: 10.3390/ijerph17165780. PMID: 32785056; PMCID: PMC7459991.
8. León S, Bravo-Cavicchioli D, Correa-Beltrán G, Giacaman RA. Validation of the Spanish version of the Oral Health Impact Profile (OHIP-14Sp) in elderly Chileans. *BMC Oral Health.* 2014 Aug 4;14:95. doi: 10.1186/1472-6831-14-95. PMID: 25091189; PMCID: PMC4128544.
9. Chopra SS, Sahoo NK. Protocol for teledentistry during COVID-19 in Armed Forces dental establishments. *Med J Armed Forces India.* 2020 Jul;76(3):356-359. doi: 10.1016/j.mjafi.2020.05.016. PMID: 32773944; PMCID: PMC7303030.