# A national teledentistry study on the knowledge, attitudes, training and practices of private dentists

Nicolas Giraudeau, Mathieu Bauer, Paul Tramini, Camille Inquimbert, Steve Toupenay

Original Research

DIGITAL HEALTH

Digital Health
Volume 8: 1–7

DOI: 10.1177/20552076221085069
journals.sagepub.com/home/dhj
SAGE

# A national teledentistry study on the knowledge, attitudes, training and practices of private dentists

**Nicolas Giraudeau[1,2,3], Mathieu Bauer[2], Paul Tramini[2,4], Camille Inquimbert[2,5] and Steve Toupenay[6,7]**

## Abstract

**Objectives:** Nationally examine the self-perceived knowledge, attitudes and practices of TeleDentistry (TD) among dentists in private practice in France.

**Methods:** A descriptive questionnaire-based survey was conducted nationwide from 10 November 2020 to 13 December 2020. The national scale survey was both anonymous and voluntary and was sent by the National Board of Dentists to 42,464 private dentists that were officially registered in France. The questionnaire included 36 questions divided into various sections: (i) general profile (gender, age range, and university, where respondents completed their dental studies), (ii) general knowledge of telemedicine, and (iii) familiarity with current regulations on telemedicine and activities that qualify as telemedicine.

**Results:** Only 57.1% of dentists in private practice stated that they had never heard nor knew about TD (n=2,887). Only 1.5% (n=76) stated they had attended a training module on telemedicine and/or TD during their studies at university. Only 1.3% (n=26) of dentists who practised a TD activity stated that they knew about telemedicine regulations. Only 65.7% (n=2,020) of those who had never practised and 74.8% (n=1,485) who had practised TD acknowledged that they would like to practice TD.

**Conclusions:** In conclusion, this study found a significant need for TD education and training as well as on regulations. It may be necessary in the future to ensure that all stakeholders in the field of dentistry work together to improve these two topics for dental practitioners. It is also worth noting that TD and telemedicine are public health tools and that they could provide inequitable access to medical care. However, TD must be implemented to decrease inequality and ensure it does not do the opposite.

## Keywords

Telemedicine, dental curriculum, dental education, teledentistry, eHealth

Submission date: 22 July 2021; Acceptance date: 16 February 2022

## Introduction

The use of digital technology has been expanding for more than a decade and rapidly so since the beginning of the COVID-19 pandemic. In dental practice, this was particularly seen through teledentistry (TD) which was used to compensate for the inability of and difficulties faced by patients requiring dental work. Nevertheless, the real interest and capacity of its use during this period have been questionable.[1] In the recent literature, dentists have expressed fears and misunderstandings about the use of TD. Most studies have been based on pilot projects or

[1]CEPEL, UMR 5112 CNRS, Montpellier University, Montpellier, France
[2]University Hospital Center Montpellier, France
[3]French Society of Digital Health, Paris, France
[4]LBN, LBN, University of Montpellier, Montpellier, France
[5]Institut Desbrest d'Epidémiologie et de Santé Publique, IDESP UMR UA11 INSERM Univ. Montpellier, Montpellier, France
[6]Centre des Maladies Rares Orales et Dentaires, Hopital Rothschild, AP-HP, Faculté Odontologie Garancière Université de Paris Cité, Paris, France
[7]Conseil National de l'Ordre des Chirurgiens-Dentistes, Paris, France

**Corresponding author:**
Nicolas Giraudeau, UFR d'Odontologie, 545, Avenue du Pr Jean Louis Viala, 34080 Montpellier, France.
Email: nicolas.giraudeau@umontpellier.fr

small-scale experimentation at a local level.[2–4] To date, the literature on TD at a national scale does not exist.

In France, legislation created in 2009 and a national decree a year later allowed the use of telemedicine by medical professionals to be implemented and enforced the regulation of telemedicine use to be defined, respectively.[5] Five activities that were defined in the decree were teleconsultation, teleexpertise, telemonitoring, tele-assistance, and emergency regulation, and these activities were considered as remote medical activities carried out by medical doctors, dentists, and midwives.

Regarding TD in the country, it has been considered as an application of telemedicine in dentistry. In other words, TD strictly comprises the clinical activity of a dentist and does not refer to training or educational sessions for students at dental school nor dental professionals as previously considered, particularly in comparison with the definition of TD activity in other countries. Furthermore, the development of TD has been on the agenda of the French Dental Association as well as dentistry unions and representatives of the national health insurance system. Due to the current governmental reforms and the will of the dental community to implement TD at a national scale, a country-wide survey was deemed necessary to better understand the current situation. The objective of this study was to examine the self-perceived knowledge, attitudes, and practices of TD among dentists in private practice in France.

## Methods

A descriptive questionnaire-based survey was conducted nationwide from 10 November 2020 to 13 December 2020. The survey was based on a similar structure used in a previous study conducted on medical students and hospital residents in France and adapted to dental specificities.[6] The national scale survey was both anonymous and voluntary and was sent by the National Board of Dentists to all (n = 42,464) private dentists that were officially registered in France.[7] The study received ethical approval from the Institutional Review Board from the University Hospital of Montpellier under application number 202000512.

### Questionnaire

The questionnaire included 36 questions divided into various sections: (i) general profile (gender, age range, university where respondents completed their dental studies), (ii) general knowledge of telemedicine, and (iii) familiarity with current regulations on telemedicine and activities that qualify as telemedicine. Questions about any previous education on telemedicine, use of telemedicine during daily dental practice, and personal attitudes were also asked. There were open-ended questions available towards the completion of the survey for any additional commentary. This questionnaire was pretested on 15 private dentists before being sent.

### Analysis

The analysis performed with the answers to the survey included descriptive rates for each question and comparisons (where relevant) with chi-square and exact test of Fischer using Stata® software (StataCorp., Texas, USA).

## Results

In total, 5059 respondents participated in the survey. Three participants did not match the age range selection criteria leaving a total of 5056 responses to be included in the final analysis. The response rate of this study was 11.9%.

### Participant profile

The majority age range of dentists in private practice in France was in the 30- to 45-year-old category (37.7%) and 45- to 60-year-old category (36.1%). Females represented 70.6% of the total number of participants and the majority of participants completed their dental studies at the University Paris V (10.2%), Lyon (8.3%), Bordeaux (7.7%), and overseas institutions (7.7%).

### Knowledge

Participants were asked if they knew the difference between eHealth and telemedicine with 73.5% choosing the correct response. Participants who understood the different types of telemedicine activities stood at 93.4%. Teleconsultations were completely understood (100%) whereas teleexpertise was understood the least at 45.1%. Other telemedicine activities with correct responses were broken down to telemonitoring (72.1%), tele-assistance (74.3%), and emergency regulation (88.6%).

In total, 57.1% of dentists in private practice stated that they had never heard nor knew about TD (n = 2887). The most cited source of information for participants to have some understanding of TD and telemedicine were articles in specialist publications (58%) and various websites (41.6%). Less than 1% (0.7%, n = 35) of responding dentists stated that they had good knowledge of telemedicine regulations whereas 8.8% (n = 445) stated that they knew little about telemedicine regulations. Most participants stated that they had no knowledge of telemedicine regulations at 90.5% (n = 4576).

### Training

A very low number of respondents, 1.5% (n = 76) (Table 1) stated they had attended a training module on telemedicine and/or TD during their studies at university. Moreover, among those that had attended training, 75.2% (n = 57)

felt that their training was insufficient (Table 1). Regarding interest in future training in TD, 77.7% (n = 3929) dentists answered that they were interested and the majority at 60.5% (n = 2377) expressed a preference for online training sessions.

### Practices

During their dental studies, only 1.2% (n = 60) of respondents stated that they had practised TD during their studies, however, among dentists who stated they had practised TD, only 8.3% (n = 5) revealed that they knew enough about telemedicine regulations to practice it. In daily clinical activity, 39.3% (n = 1985) of respondents reported having performed at least one type of TD activity at their dental practice. Those who practised less than five TD activities accounted for 19.2% (n = 382), while 34.6% (n = 686) of participants practised between 5 and 20 TD activities. Those that had practised more than 20 forms of TD activities represented 46.2% (n = 917). The two types of activities that were referred to the most were teleconsultation at 27.9% (n = 553) and emergency calls at 23.9% (n = 474) (Table 2).

A majority of 55.3% (n = 1096) dentists who already practised TD in the past were satisfied, and satisfaction with the quantity of their experienced TD activity grew significantly (p = 0.001, Cramer coefficient = 0.6) as shown in Figure 1. However, only 1.3% (n = 26) of dentists who practised a TD activity stated that they knew about telemedicine regulations. For dentists who never practised TD (n = 3074), 72.2% (n = 2219) of them were motivated to begin (Figure 1).

**Table 1.** Distribution of dentists in private practice who stated that they had attended a training module on telemedicine and teledentistry during their studies.

| Year | Percentage | Number |
|---|---|---|
| First year | 9.2% | 7 |
| Second and third years (DFGSO*) | 2.6% | 2 |
| Fourth and fifth years (DFASO**) | 15.8% | 12 |
| Sixth year (DFTCC***) | 21.1% | 16 |
| Dental residency | 3.9% | 3 |
| Continuous education | 47.4% | 36 |
| **Total** | **100%** | **76** |

*Diplôme de Formation Générale en Sciences Odontologiques, **Diplôme de Formation Approfondie en Sciences Odontologiques ***DFTCC Diplôme de Formation Terminale Cycle Court.

### Attitude

As shown in Table 3, there was a significant variation in the attitudes to TD between dentists who did not previously practice TD and those who did (p < 0.0001). Dentists who had never practised TD (63.2%, n = 1944) partially or completely agreed that TD was a relevant solution to improve access to dental care, and 69.1% (n = 1371) stated the same among those who had practised TD at least once.

Three hundred and forty-nine respondents, who had never practised TD in the past, perceived TD as a threat to traditional dental activity compared to 9.2% (n = 182) who had practised a TD activity at least Moreover, over three-quarters of respondents who had never practised TD (n = 2311) and those that had already employed TD into their dental practice (n = 1582) considered TD as an opportunity to improve dental practice.

For future TD practices, 65.7% (n = 2020) of those who had never practised and 74.8% (n = 1485) who had practised TD acknowledged that they would like to practice TD. Furthermore, most dentists, who had never practised (n = 2193) and those who had practised TD in the past (n = 1591), responded that they thought their patients would accept TD in their routine dental care.

## Discussion

In this study, the knowledge, attitudes, and practices of private dentists were evaluated to better understand the TD landscape. Moreover, this study examined the current situation and needs in dentistry on telemedicine. In France, the mean age of dentists is 46.3 years old.[7] Respondents in this study, however, contributed from all

**Table 2.** Relationship between the knowledge of applicable telemedicine regulations and number of teledentistry (TD) activities performed.

| | | Knowledge of telemedicine regulations | | |
|---|---|---|---|---|
| | | Yes (%) | A little (%) | None (%) |
| Number of telemedicine activities | None | 34.2 | 40.0 | 63.0 |
| | Less than five | 15.8 | 10.1 | 7.2 |
| | Between 5 and 20 | 5.3 | 20.2 | 13.0 |
| | More than 20 | 44.7 | 29.7 | 16.8 |
| TD activity | Yes | 1.3 | 13.4 | 85.3 |
| | No | 0.4 | 5.8 | 93.8 |

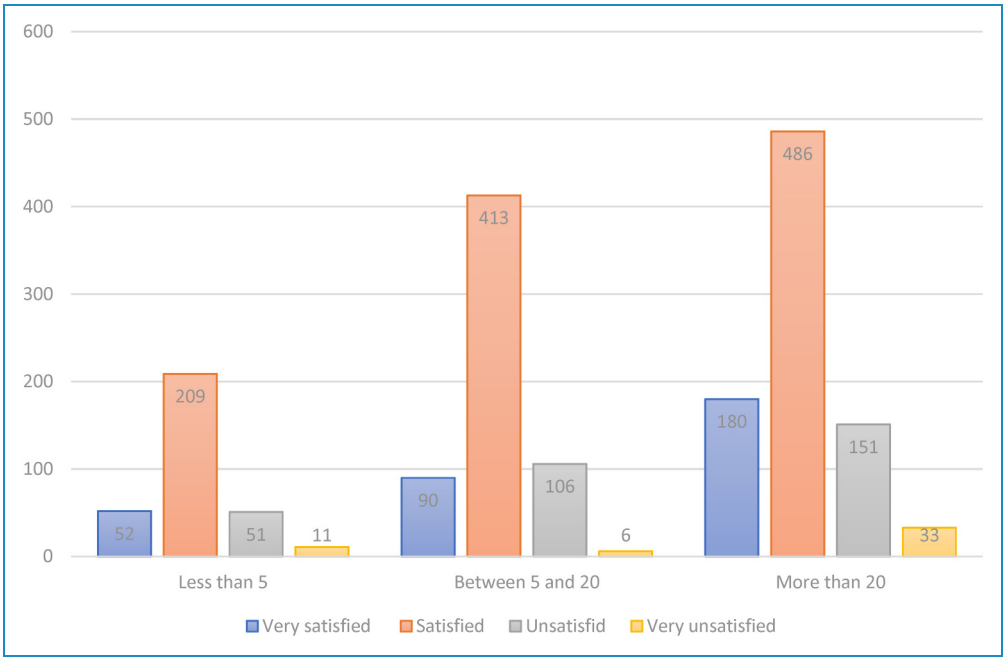


**Figure 1.** Number of private dentists in France satisfied versus the number of teledentistry activities performed in their dental practice.

age groups with 36.1% of them being aged between 45 and 60 years. The majority of respondents were women (70.6%) compared to the aggregate percentage in the profession (47.3%), which may show that female dentists may share a higher interest in TD.

More than half the dentists that participated in the study (57.1%) stated that they had no previous knowledge about TD, which may be surprising in relation to the temporary closing of dental offices during the COVID-19 nationwide lockdown in 2020. The terminology of 'teledentistry' used in this survey may not have been clear enough and respondents may not have understood certain questions. Furthermore, a previously held communication campaign on teledental projects and a study conducted at the Montpellier University in 2014 may not have influenced the participants' previous knowledge either.

The survey was chosen to be released after the initial COVID-19 health lockdown of the country which required the closing of all private dental practices in France. As a result of the lockdown, numerous dentists only had telephone communication to stay connected with their patients and answered emergency calls and sent prescriptions after a call whenever necessary. From our findings, the two primary telemedicine activities known to the participants were teleconsultation and emergency regulation. This may be identified as one example of the lack of uniformity and homogeneity between the understanding of TD amongst dentists and the use of it.

The questions on terminology in the study may have been a limitation because the difference between the various types of TD activities may have been difficult to understand. This could be changed in future studies to ensure education on terminology surrounding TD is incorporated. This study found that there was very limited self-declared knowledge on regulations 10 years after they came into effect; this finding was similar to a study previously conducted amongst medical students and residents in France.[6]

Of the 35 dentists who stated that they knew telemedicine regulations well, only 26 had training at the university they studied in, and only five had the opportunity to practice TD during their studies. Furthermore, only 25 of these used TD in their own dental practice. Improving the educational pathway that dentists follow related to telemedicine in general and specifically on regulation may be necessary for the future.

Regarding training, a very limited number of dentists were trained in TD (mainly during the last years of initial education and/or during continuous education). Even among the 76 dentists who received education in TD, only 15.8% (n = 12) stated that they were generally aware of telemedicine and TD regulations with just under a third (n = 23) stating that they only knew a little about them. However, forty-one dentists (53.9%) admitted that they did not know the regulations at all which matches with the 75.2% (n = 57) believing that their training module(s) were insufficient.

It is encouraging to see that 77.7% of the participants were interested in attending education and training sessions in the future on TD. This could be a starting point for the Dean of the National Board of Dental Faculties (*Conference National des Doyens d'Odontologie*) to consider preparing the national online training module(s)

**Table 3.** Survey results for the attitudes of dentists in France in a private practice that carried out teledentistry (TD) and those that did not.

| | | No TD activity | n = 3074 | TD activity in practice | n = 1985 | |
|---|---|---|---|---|---|---|
| Attitudes practitioner | Answer | **n** = | % | n = | % | *p*-value |
| TD is a relevant solution to improve patient pathways | Fully agree | 955 | 31.1 | 822 | 41.4 | <0.0001 |
| | Agree | 1475 | 48.0 | 859 | 43.3 | |
| | Disagree | 298 | 9.7 | 193 | 9.7 | |
| | Fully disagree | 91 | 3.0 | 41 | 2.1 | |
| | Do not know | 255 | 8.3 | 70 | 3.5 | |
| | Total | 3074 | 100.0 | 1985 | 100.0 | |
| TD is a relevant solution to improve access to care for patients | Fully agree | 729 | 23.7 | 563 | 28.4 | <0.0001 |
| | Agree | 1215 | 39.5 | 808 | 40.7 | |
| | Disagree | 663 | 21.6 | 429 | 21.6 | |
| | Fully disagree | 193 | 6.3 | 98 | 4.9 | |
| | Do not know | 274 | 8.9 | 87 | 4.4 | |
| | Total | 3074 | 100.0 | 1985 | 100.0 | |
| TD is a threat to dental practice | Fully agree | 119 | 3.9 | 39 | 2.0 | <0.0001 |
| | Agree | 230 | 7.5 | 143 | 7.2 | |
| | Disagree | 1678 | 54.6 | 1083 | 54.6 | |
| | Fully disagree | 691 | 22.5 | 581 | 29.3 | |
| | Do not know | 356 | 11.6 | 139 | 7.0 | |
| | Total | 3074 | 100.0 | 1985 | 100.0 | |
| TD is an opportunity to improve dental practice | Fully agree | 696 | 22.6 | 598 | 30.1 | <0.0001 |
| | Agree | 1615 | 52.5 | 984 | 49.6 | |
| | Disagree | 367 | 11.9 | 236 | 11.9 | |
| | Fully disagree | 123 | 4.0 | 60 | 3.0 | |
| | Do not know | 273 | 8.9 | 107 | 5.4 | |
| | Total | 3074 | 100.0 | 1985 | 100.0 | |
| Desire to practice TD in the future | Fully agree | 643 | 20.9 | 579 | 29.2 | <0.0001 |
| | Agree | 1377 | 44.8 | 906 | 45.6 | |
| | Disagree | 464 | 15.1 | 256 | 12.9 | |

(continued)

**Table 3.** Continued.

| Attitudes practitioner | Answer | No TD activity n = | n = 3074 % | TD activity in practice n = | n = 1985 % | *p*-value |
|---|---|---|---|---|---|---|
| | Fully disagree | 220 | 7.2 | 75 | 3.8 | |
| | Do not know | 370 | 12.0 | 169 | 8.5 | |
| | Total | 3074 | 100.0 | 1985 | 100.0 | |
| Belief that patients will accept TD | Fully agree | 686 | 22.3 | 589 | 29.7 | <0.0001 |
| | Agree | 1507 | 49.0 | 1002 | 50.5 | |
| | Disagree | 334 | 10.9 | 193 | 9.7 | |
| | Fully disagree | 62 | 2.0 | 25 | 1.3 | |
| | Do not know | 485 | 15.8 | 176 | 8.9 | |
| | **Total** | **3074** | **100.0** | **1985** | **100.0** | |

*TD: teledentistry.

conceived by experienced teachers from dental schools in France. The *Conseil National de l'Ordre des Chirurgiens-Dentistes* and the dentistry unions could also become involved in the project. A module could also be based on the theoretical aspects of TD and any tangible evidence-based research developed by academics in the field. Furthermore, it could be linked to the practice itself for successful implementation.

In France, the practice of TD was launched by the e-DENT project[8] in 2014 and was used especially with elderly people in nursing homes, disabled people in care facilities,[9] or with prisoners.[10] Only one other TD program in France was identified in scientific literature, however, many smaller-scale projects were implemented all over the country.[11] Unfortunately, the impossibility for dentists to be provided with remuneration from the French national health insurance plan may have made it difficult to implement and develop TD on a national basis to date.[12] From this study, 39.2% (n = 1982) stated that they already practice TD which does not match the national situation, however, the misunderstanding of the terminology employed may be a reason for it. Dentists from this study did not know that TD is an officially and legally regulated medical activity and not merely an act of giving advice over the phone. This could quantify the data found in Table 2 which shows that among the 1982 dentists who stated that they have practised TD at least one time, only 1.3% claimed to completely understand telemedicine and TD regulations whereas 13.4% had minimal familiarity, and 85.3% were clearly unfamiliar with them. It could be possible that some respondents thought that they practised TD but were not doing so in its legal form.

Moreover, 1690 dentists in private practice mentioned that they had practised telemedicine without any knowledge on the regulation of it. It is thus conceivable that a lot of malpractice may have been committed during the lockdown period in 2020. In terms of satisfaction, the more participants practised TD, the more they were satisfied ($p = 0.001$), in contrast to only 16.9% ($n = 854$) of dentists who do not practice TD that expressed they do not currently feel ready for it. The difference ($p < 0.0001$) between the group of dentists who had never practised TD and the group that did at least once showed an optimistic point in favour of the development of TD in the future. This may indicate that when dentists practised TD, they were more convinced of its interest in patients and public health.

For 71.3% (n = 2, 193) of dentists who had never practised TD and 80.2% (n = 1591) who had practised TD stated that patients would personally accept TD (Table 3). This medical professional point-of-view is similar to that of a previous study done on elderly patients where patients with disabilities were accepting of TD in their nursing homes.[13] Contrary to this attitude was 10.5% (n = 531) of responding dentists who believed that TD is a threat to dental practice. This proportion included those who had never practised and those who had. One response showed that the respondent had practised more than 20 TD activities and seemed satisfied with TD however stated that it could be a threat to their dental activity. This may be understandable because telemedicine and TD are a change for the traditional relationship between patient and practitioner.

This was the first nationwide study on TD for private dentists in France. It was also the largest study on TD education to date.[14] The participation of the French Society of

Digital Health (SFSD) and the *Conseil National de l'Ordre des Chirurgiens-Dentistes* may show that this is a topic that both experts in digital health and dentistry would like to work on and advance in the country. Concurrently, a report was published with recommendations on how to improve the development and acknowledgement of TD in France.[15] On an international level, the World Health Organization (WHO) has launched a global *mOralHealth* program that includes TD which may also be taken into consideration for the future.[16]

## Conclusion

In conclusion, this study showed the self-perceived knowledge, attitudes, and practices of TD among dentists in private practice in France. It found a significant need for TD education and training as well as regulations. It may be necessary in the future to ensure that all stakeholders in the field of dentistry work together to improve these two topics for dental practitioners. It should be shocking to see that TD has been practised by a dentist who did not the regulation about its practice and it should be changed. The future of TD implementation and development. It is also worth noting that TD and telemedicine are public health tools and that they could provide inequitable access to medical care. However, TD must be implemented to decrease inequality and ensure it does not do the opposite.

**Acknowledgements:** The authors would like to thank AcaciaTools for their medical writing and reviewing services.

**Contributorship:** Nicolas Giraudeau: Conception, Design, analysis, and interpretation. Mathieu Bauer: Acquisition, analysis, and interpretation. Paul Tramini: Design and analysis. Camille Inquimbert: Analysis and interpretation. Steve Toupenay: Conception, Design, and interpretation

**Declaration of Conflicting Interests:** The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding:** The authors received no financial support for the research, authorship, and/or publication of this article.

**Informed Consent:** Not applicable, because this article does not contain any studies with human or animal subjects.

**Trial Registration:** Not applicable, because this article does not contain any clinical trials.

**Ethical approval:** Ethical approval was obtained from the University Hospital of Montpellier (study number 202000512). All patients signed a written informed consent form.

**Guarantor:** NG.

**ORCID iD:** Nicolas Giraudeau https://orcid.org/0000-0003-1141-0171

## References

1. Giraudeau N. Teledentistry and COVID-19: be mindful of bogus "good" ideas!. *Inquiry J Health Care Organ Prov Financing* 2021; 58: 004695802110150.
2. Wallace C, Schofield C, Burbridge L, et al. Role of teledentistry in paediatric dentistry. *Br Dent J* 2021; 25: 1–6.
3. Amenta F, Mahdi S and Allana R. Teledentistry-based program to improve oral hygiene indicators in rural Pakistan —A protocol. *J Contemp Dent Pract* 2021; 22: 406–411.
4. Inquimbert C, Balacianu I, Huyghe N, et al. Applications of teledentistry in a French inmate population: a one-year observational study. *PLoS ONE* 2021; 16: e0247778.
5. Article L6316-1. Sante Publique July 23, 2009.
6. Yaghobian S, Ohannessian R, Iampetro T, et al. Knowledge, attitudes and practices of telemedicine education and training of French medical students and residents. *J Telemed Telecare* Epub ahead of print 9 June 2020. DOI: 10.1177/1357633X20926829.
7. Cartographie publique ONCD [Internet]. Ordre-chirurgiens-dentistes.fr, https://www.ordre-chirurgiens-dentistes.fr/cartographie (2021, accessed 11 February 2021)
8. Giraudeau N, Valcarcel J, Tassery H, et al. Projet e-DENT : téléconsultation bucco-dentaire en EHPAD. *Eur Res Telemed/Rech Eurn Téléméd* 2014; 3: 51–56.
9. Olivier R, Thibault D, Stéphane V, et al. Oral care in facilities for disabled people: interest of teledentistry. *Dental Oral Maxillofacial Res* 2019; 5: 1–4.
10. Giraudeau N, Inquimbert C, Delafoy R, et al. Teledentistry, new oral care tool for prisoners. *Int J Prison Health* 2017; 13: 124–134.
11. Queyroux A, Saricassapian B, Herzog D, et al. Accuracy of teledentistry for diagnosing dental pathology using direct examination as a gold standard: results of the Tel-e-dent study of older adults living in nursing homes. *J Am Med Dir Assoc* 2017; 18: 528–532.
12. Giraudeau N, Roy O, Malthiery E, et al. The year of teledentistry in France? *J Int Soc Telemed eHealth* 2019; 2019: 7.
13. Petcu R, Kimble C, Ologeanu-Taddei R, et al. Assessing patient's perception of oral teleconsultation. *Int J Technol Assess Health Care* 2017; 33: 147–154.
14. Edirippulige S and Armfield N. Education and training to support the use of clinical telehealth: a review of the literature. *J Telemed Telecare* 2016; 23: 273–282.
15. Recommandations pour la reconnaissance et le développement de la télémédecine bucco-dentaire en France [Internet]. Société Française de Santé Digitale: SFSD, https://www.telemedecine-360.com/wp-content/uploads/2020/12/2020-RecommandationTelemedecine-Bucco-Dentair-SFSD.pdf (2020, accessed 11 February 2021)
16. Mobile technologies for oral health: an implementation guide [Internet]. World Health Organization, https://www.who.int/publications/i/item/9789240035225 (2021, accessed 9 February 2021).