


# Present state and perceived future use of teledentistry in long-term care facilities in Japan: A cross-sectional study

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## Abstract

**Objectives:** Teledentistry could be effective in managing oral health through the provision of oral hygiene instruction and diagnostic services. This study aimed to assess the perception and usefulness of teledentistry in Japanese long-term care facilities.

**Methods:** We conducted a questionnaire survey to compare related factors of the usefulness of teledentistry and identify issues in its implementation. We chose 1000 facilities using a stratified random sampling method. The questionnaires were sent to the facilities in August 2021 and collected in December of the same year. Responses to the questionnaire items regarding the usefulness of teledentistry for oral management were divided into three groups according to the answer: perceiving teledentistry as “useful,” “not useful,” or “neither,” including facilities that do not currently use teledentistry.

**Results:** In total, 26.1% (261) responded to the questionnaire, and among these, 184 facilities answered the question regarding the usefulness of teledentistry. Only two of these facilities implemented teledentistry. Facilities with dental hygienists ( $p = 0.040$ ) and those that receive insured medical treatment: reimbursement for oral feeding maintenance II ( $p = 0.040$ ) tended to perceive teledentistry as useful in the management of patients with coronavirus disease. The higher the number of services that responded to the question “what kind of services do you think can be provided via teledentistry?” the higher the percentage of “useful” responses.

**Conclusions:** Although only a few facilities use teledentistry, many long-term care facilities perceive it as useful even without using it. The presence of dental hygienists and interprofessional work done with reimbursement for oral feeding maintenance II contributed to the perception of the usefulness of teledentistry in long-term care facilities.

## Keywords

Dentistry, long-term care facility, oral management, teledentistry, information and communication technology

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## Introduction

Telemedicine using information and communication technology (ICT) is a form of medical care that was quickly introduced in Japan because it reduces the risk of spreading infectious diseases, such as coronavirus disease (COVID-19),<sup>1</sup> and allows for continuous medical care.<sup>2,3</sup> Initially, teledentistry was not covered by insurance; however, since it was permitted for a certain period, its usefulness has begun to be reported.<sup>4–8</sup> Long-term care facilities managed under Japan's health insurance system include "special nursing homes for the elderly," which serve as places for older people in need of care, "geriatric health care facilities," which provide rehabilitation and support for returning home, and "convalescent care facilities," which provide long-term care for older people in need of ongoing medical care and nursing care. Some facilities are attached to hospitals with long-term care facilities. Dental approaches vary according to the type of facility. In all facilities, dental intervention aims to prevent the onset of infections in residents caused by oral bacteria and the spread of infections to other residents through droplet transmission, as well as to manage oral hygiene and detect and prevent early deterioration of oral functions related to quality of life (QOL). Ultimately, this approach aims to reduce the risk of aspiration pneumonia and maintain and improve QOL.<sup>9–11</sup> In Japanese long-term care facilities, it is common for each nursing home to have an affiliated house call dentist. Oral health management is provided to each resident as part of the long-term care insurance system. In addition, dental technical advice and guidance are provided to facility staff.

Oral intake and nutritional management in residents are supported as part of the reimbursement for oral feeding maintenance. In insured medical treatment, reimbursement for oral feeding maintenance is provided and dentists participate in meetings and meal observations as members of the team. Reimbursement for oral feeding maintenance in insured medical treatment is categorized as I and II. Type I (oral maintenance I) involves additional compensation for efforts to support oral intake, such as meal observations and meetings with a multidisciplinary team. Type II (oral maintenance II) provides additional compensation when at least one physician, either a dentist, dental hygienist, or speech-language pathologist, participates in meal observations and meetings. An association between oral status and foods available for oral intake has been reported in older adults in nursing homes,<sup>12</sup> and comprehensive management is needed for this population. The revision of the long-term care tariff in 2021 initiated the use of ICT in nursing care to reduce manpower and improve operational efficiency. This is known as the long-term care information system for evidence (LIFE).<sup>13</sup> The government supports the introduction of ICT equipment in terms of cost. ICT-applied teledentistry may be useful for the oral management of

older people requiring long-term care in facilities, which is not compulsorily rendered face-to-face, such as health management, technical advice, and guidance.

The target population for teledentistry in long-term care facilities comprises older adults requiring long-term care. Support from not only doctors to patients but also from nurses, care workers, and other nursing staff is necessary because high costs and manpower may be required to start and operate the system. Recent reports from 2021<sup>14</sup> indicate that the use of teledentistry in long-term care facilities in countries other than Japan is limited, with specific applications, such as in meal support.<sup>15</sup>

Teledentistry is considered a subspecialty of telemedicine,<sup>16</sup> and since the challenges and issues are similar, the implementation and advancement of telemedicine are expected to lead to the implementation and development of teledentistry. Therefore, it is necessary to focus on online medical treatment, which may lead to further progress in the medical field, and to examine how it should be applied in the dental field and long-term care facilities in Japan.

This study hypothesized that factors such as the type of facility, number of staff, and differences in caregiving fees, such as the Oral Intake Maintenance Addition would affect the frequency and utilization of teledentistry. Therefore, this novel study aimed to clarify the *current use and perceived usefulness* of teledentistry in long-term care facilities in Japan.

## Materials and methods

This prospective cross-sectional study used a questionnaire survey on oral hygiene and other oral management to address the current use and perceived usefulness of teledentistry, supported by the Japan Ministry of Health, Labor and Welfare. We selected 1000 facilities using a stratified random sampling method by prefecture from the list (as of August 2021) of health service facilities, including special nursing homes, integrated facilities for medical and long-term care, and sanatorium-type medical care facilities for older adults requiring care listed on the local government's website linked to the Welfare and Medical Service Network System (WAM NET). WAM NET is a comprehensive information website related to welfare, health, and medical services, managed by an organization specializing in welfare and medical services. It provides information about health service facilities throughout Japan. The questionnaires were mailed once to the relevant facilities in August 2021 and collected by mail by 3 December 2021 for analysis. No reminders to return the questionnaires were sent. There were no exclusion criteria for eligible facilities. Informed consent to participate in the survey was obtained through the completion of the questionnaire. Because the questionnaire survey did not include personal information, this study protocol was

granted an exemption by the Ethical Committee of the Japanese Society of Gerodontology.

### Data collection

To understand the characteristics of the facilities, the questionnaire items included the type of facility, any attached medical and/or nursing care, types and number of workers, availability of dental hygienists, and availability of treatment by a dentist. The use of the oral feeding maintenance I and II was also investigated.

Data on whether residents tested positive for COVID-19 from November 2020 to October 2021 as well as frequency of oral care for residents and facility protocols of the oral care methods for those who tested positive for COVID-19 were included in the category of COVID-19 diagnosis of the questionnaire. For teledentistry, the questionnaire included questions regarding whether the cooperating dental institutions provided guidance and advice online, whether they were interested in the teledentistry field, and other related issues. Regardless of their experience with teledentistry, respondents answered items in which they thought the teledentistry could be used.

### Data analysis

The characteristics of the subject facilities are summarized. A descriptive analysis of the management of COVID-19 and the use of teledentistry was performed. All questionnaire items, such as instruction and advice on oral management, including oral care by teledentistry, were extracted from the questionnaire. Respondents who answered “Yes” to the question “In oral management for individuals who have tested positive for COVID-19, do you think guidance and advice via teledentistry is useful?” were categorized into useful, those who answered “No” into Not useful, and those who answered “Neither” were grouped into a third category. Thus, three groups were established. This includes responses from facilities that have not used teledentistry to date. The survey items were then compared. For statistical analyses, Fisher’s exact test, Bonferroni correction, and the Kruskal–Wallis test were used to compare the questionnaire items between the groups. The level of significance was set at  $p < 0.05$ . SPSS version 28.0 J (IBM Inc., Tokyo, Japan) was used for statistical analysis.

## Results

The response rate to the questionnaire was 26.1% ( $n = 261$ ). The 184 facilities (18.4%) that responded regarding the perceived usefulness of teledentistry were included in the analysis. Of the 184 facilities, 22.8% ( $n = 42$ ) were health service facilities for older adults, 71.2% ( $n = 131$ ) were special nursing homes for older adults and 6.0% ( $n = 11$ ) sanatorium-type medical care facilities. Only 0.9% ( $n = 2$ )

of the facilities, which were special nursing homes for older adults, had implemented teledentistry in practice. Both facilities also operated multiple care facilities, such as multifunctional long-term care in a small group home. Fourteen facilities (6.5%) had COVID-19-positive residents from November 2020 to October 2021, nine had hospitalized patients, and four quarantined COVID-19-positive residents. When the in-facility quarantine was implemented, most facilities restricted or reduced the oral management system for older adults certified as requiring care. Table 1 shows the association between facility characteristics and perceived usefulness.

### Effect of teledentistry

Of the 184 facilities, 78 (42.4%) perceived teledentistry as “useful,” 15 (8.2%) as “not useful,” and 91 (49.5%) as “neither.” The percentage of respondents who perceived teledentistry as useful did not differ according to facility type (Table 1). Significant associations were noted regarding the perceived usefulness of teledentistry in facilities with dental hygienists and those providing oral feeding maintenance II (Table 1) ( $p < 0.05$ ). In the question regarding interest in teledentistry, the “Neither” group was the largest among the three groups, accounting for 49.4% ( $n = 86$ ), while the “Not Useful” group accounted for 7.8% ( $n = 13$ ). Each of the three groups (“useful,” “not useful,” and “neither”) was further divided into two subgroups: “interested” and “not interested.” Among these six groups, the group that found teledentistry neither interesting nor useful was the largest.

Facilities indicated the types of services that could be provided via teledentistry, which included “dental examinations” in 52 cases (30.4%), “examination of mucous membrane diseases” in 11 (6.0%), “guidance and management of oral management” in 87 (47.3%), “evaluation of feeding and swallowing” in 45 (24.5%), “evaluation of food morphology” in 24 (24.5%), “nutritional guidance” in 38 (20.7%), and “participation in meal rounds” in 49 (26.6%). We compared the perceived usefulness of teledentistry to the total number of services facilities indicated could be provided by teledentistry and to that of staff at the facilities. Respondents who indicated that teledentistry would be useful for oral management of patients with COVID-19 also responded that teledentistry could be used with a significantly higher number of services. However, the number of facility staff and that of residents managed per staff member were not significantly associated with the perceived usefulness of teledentistry (Table 2).

The perceived usefulness of teledentistry was compared with the issues commonly associated with teledentistry, as listed in Table 3. The number of responses was low. Capital investment was considered the biggest issue, followed by material reliability and usage, business continuity, and the affinity between dental care and online services. No

Table 1. Association between facilities' characteristics and usefulness of teledentistry.

		Q. In oral management for individuals who have tested positive for COVID-19, do you think guidance and advice via teledentistry is useful?				<i>p</i> -value <sup>a</sup>
		Total (%)	Useful (%)	Not useful (%)	Neither (%)	
Q. Type of facility (N = 184)						
	Health services facility for older adults	42 (22.8%)	16 (8.7%)	4 (2.2%)	22 (12.0%)	0.833
	Special nursing home for older adults	131 (71.7%)	58 (31.5%)	11 (6.0%)	62 (33.7%)	
	Sanatorium-type medical care facilities for older adults requiring care	11 (6.0%)	4 (2.2%)	0 (0%)	7 (3.8%)	
Q. Visiting dentist (N = 184)						
	Yes	161 (87.5%)	68 (37.0%)	14 (7.6%)	79 (42.9%)	0.815
	No	23 (12.5%)	10 (5.4%)	1 (0.5%)	12 (6.5%)	
Q. Visiting dental hygienist (N = 183)						
	Yes	32 (17.5%)	20 (10.9%)	1 (0.5%)	11 (6.0%)	0.040*
	No	151 (82.5%)	58 (31.7%)	14 (7.7%)	79 (43.2%)	
Q. Reimbursement for Nutrition Management (N = 184)						
	Yes	32 (17.4%)	13 (7.1%)	4 (2.2%)	15 (8.2%)	0.586
	No	152 (82.6%)	65 (35.3%)	11 (6.0%)	76 (41.3%)	
Q. Reimbursement for oral feeding transition? (N = 184)						
	Yes	25 (13.6%)	12 (6.5%)	3 (1.6%)	10 (5.4%)	0.454
	No	159 (86.4%)	66 (35.9%)	12 (6.5%)	81 (44.0%)	

(continued)

Table 1. Continued.

		Q. In oral management for individuals who have tested positive for COVID-19, do you think guidance and advice via teledentistry is useful?			<i>p</i> -value <sup>a</sup>
	Total (%)	Useful (%)	Not useful (%)	Neither (%)	
Q. Reimbursement for oral feeding maintenance I (N=184)					
Yes	70 (38.0%)	32 (17.4%)	8 (4.3%)	30 (16.3%)	0.249
No	114 (62.0%)	46 (25.0%)	7 (3.8%)	61 (33.2%)	
Q. Reimbursement for oral feeding maintenance II (N=184)					
Yes	40(21.7%)	23(12.5%)	4(2.2%)	13(7.1%)	0.040*
No	144(78.3%)	55(29.9%)	11(6.0%)	78(42.4%)	
Q. Online with cooperating dental institutions (N=184)					
Yes	2 (1.1%)	2 (1.1%)	0 (0.0%)	0 (0.0%)	0.324
No	182 (98.9%)	76 (41.3%)	15 (8.2%)	91 (49.5%)	
Q. Residents test positive for COVID-19 (N= 184)					
Yes	14 (7.6%)	8 (4.3%)	2 (1.1%)	4 (2.2%)	0.258
No	160 (87.0%)	66 (35.9%)	13 (7.1%)	81 (44.0%)	
Cannot answer	10 (5.4%)	4 (2.2%)	0 (0.0%)	6 (3.3%)	
Q. Have an interest in teledentistry (N= 174)					
Yes	87 (47.3%)	62 (33.7%)	3 (1.6%)	22 (12.0%)	<0.001*
No	87 (47.3%)	13 (7.1%)	10 (5.4%)	64 (34.8%)	

(continued)

Table 1. Continued.

		Q. In oral management for individuals who have tested positive for COVID-19, do you think guidance and advice via teledentistry is useful?				p-value <sup>a</sup>
	Total (%)	Useful (%)	Not useful (%)	Neither (%)		
Q. How to deal COVID-19 positive residents? (N=14)						
Hospitalize	9 (64.3%)	5 (35.7%)	1 (7.1%)	3 (21.4%)	0.396	
Quarantine in the facility	4 (28.6%)	3 (21.4%)	0 (0.0%)	1 (7.1%)		
Recuperate at home	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
Others	1 (7.1%)	0 (0.0%)	1 (7.1%)	0 (0.0%)		
Q. The way of oral care for residents that were quarantined (N=20)						
Reduce frequency	13 (65.0%)	7 (35.0%)	2 (10.0%)	4 (20.0%)	0.907	
Continue as before	1 (5.0%)	1 (5.0%)	0 (0.0%)	0 (0.0%)		
Others	6 (30.0%)	2 (10.0%)	2 (10.0%)	2 (10.0%)		

<sup>a</sup>Fisher's exact test and Bonferroni correction.

\*  $p < 0.05$ , \*\*  $p < 0.001$ .

**Table 2.** Association between the number of usage of teledentistry/staff and usefulness of teledentistry.

	Q. In oral management for individuals who have tested positive for COVID-19, do you think guidance and advice via teledentistry is useful?						<i>p</i> -value <sup>a</sup>
	Useful		Not useful		Neither		
	Median	Interquartile range	Median	Interquartile range	Median	Interquartile range	
Q. What kind of services do you think that can be provided via teledentistry (Multiple answers allowed)							
Number of services answered	2	1–3	1	0–2	1	0–2	<0.001*
Q. Number of staff (persons)							
Number of staff	48.0	33–60.5	56.0	31–68	45.0	35–58	0.603
Number of full-time staff	37.0	26–47	38.0	27–47.5	35.3	24.5–44.5	0.626
Number of residents per staff member	1.7	1.47–2.06	1.8	1.64–2.00	1.9	1.40–2.22	0.854
Number of residents per full-time staff	7.8	3.66–12.82	7.4	3.95–9.71	6.0	3.98–12.95	0.68

<sup>a</sup>Kruskal–Wallis test.

\*  $p < 0.001$ .

**Table 3.** Association between issues of teledentistry and its usefulness.

Issues of teledentistry	Q. In oral management for individuals who have tested positive for COVID-19, do you think guidance and advice via teledentistry is useful?				<i>p</i> -value <sup>a</sup>
	Total	Useful	Not useful	Neither	
Capital investment	34	12	5	17	0.674
Material reliability and usage	17	6	2	9	
Business continuity	10	3	1	6	
Affinity between dental care and online	2	2	0	0	
Others	2	2	0	0	

<sup>a</sup>Fisher's exact test and Bonferroni correction.

relationship was noted between the perceived usefulness of teledentistry and other issues.

## Discussion

This study revealed that teledentistry was rarely introduced or used in long-term care facilities in Japan. A comparison by facility type indicated no significant difference in the

number of respondents who perceived teledentistry as useful. The availability and number of medical, nursing, and rehabilitation staff on duty at all times differed according to facility type, which may have affected the results. Telemedicine is covered by health insurance in Japan. However, similar to teledentistry, there are few reports on its implementation in long-term care facilities in Japan. Reports on teledentistry in long-term care facilities are



limited in Japan and internationally; however, the application of teledentistry in the examination, rehabilitation, and post-intervention follow-up of residents in long-term care facilities was reported.<sup>14</sup> The lack of prior knowledge and examples may have contributed to the lack of teledentistry in long-term care facilities. There are issues related to data privacy issues and regulations, capital investment, material reliability and usage, business continuity, and affinity between dental care and online like the issues highlighted in this study.<sup>17</sup> Previous reports have indicated that the effectiveness and acceptance of teledentistry may influence its implementation.<sup>18,19</sup> In addition, a previous study<sup>20</sup> revealed that the willingness and adaptability of healthcare professionals affected the quality and efficiency of telehealth. Therefore, sufficient training and understanding are necessary before implementing teledentistry. The majority of respondents perceived teledentistry as “useful.” However, approximately the same number of facilities answered “neither.” The responses regarding the presence or absence of interest were similar. In this study, the lack of knowledge and experience in teledentistry may have led to the neutral option answers. It would have been better to have the respondents answer why they answered “neither,” which could have led to the resolution of future issues. As more specific cases are reported and the usefulness of teledentistry is perceived, it may replace face-to-face dental care in an increasing number of cases.

“Facility service user’s oral hygiene management” refers to the oral hygiene management of residents using geriatric health care facilities, as previously mentioned. The category of “oral hygiene management” in the research project (2021) supported by the Japan Ministry of Health, Labor and Welfare reported that the implementation rate of oral hygiene management in facilities increased from 65.7% to 71.9%, and the frequency of advice and guidance provided to caregiving staff increased in 17.5% of the facilities compared to 2018. Originally, the background includes the fact that the intervention rate for dental care among facility residents was not high, but the demand for oral hygiene management in facilities is increasing. However, this study found that the actual visits by dental hygienists, who play a central role in oral hygiene management, to these facilities were limited. In contrast, teledentistry offers the advantage that it does not necessarily require the presence of dental professionals at the remote site. Furthermore, teledentistry can facilitate the provision of oral hygiene management and diagnostic services, serving as a tool for facilities to adopt such practices. In addition to face-to-face treatment, teaching daily cleaning methods and sharing the oral conditions of older adults who need long-term care through teledentistry are effective in making it easier to notice changes in their oral condition and refer them to dental treatment at an early stage.<sup>21</sup> This would be applicable even to healthy patients residing in long-term care facilities. When teledentistry was not used, there were cases of remote online visits

for facility residents and their families. Remote visits are effective in reducing loneliness and social isolation among older adult residents of facilities.<sup>22</sup> Facilities that have introduced remote visits have materials, systems, and knowledge that may reduce the difficulties in introducing teledentistry.

In examining whether the presence of another attached medical and/or nursing care facility, collaboration with a dental hygienist, and commitment to oral intake and nutritional management were associated with the perceived usefulness of teledentistry, significant associations were found only between perceived usefulness and the presence of a dental hygienist at the facility, and between perceived usefulness and facilities providing oral feeding maintenance II. Facilities in which dental hygienists were available and used oral feeding maintenance II tended to perceive teledentistry as useful. The benefits of teledentistry were easily recalled because the facility staff’s knowledge and understanding of oral health management were easily obtained through involvement with the dental hygienist. This is because the dental hygienist becomes the key person in teledentistry, enabling smooth treatment. To provide oral feeding maintenance II, an observation assessment of the feeding situation and participation in meetings is required by a physician, an affiliated house call dentist, a dental hygienist, or a speech therapist. Therefore, oral feeding maintenance II necessitates collaboration between dental institutions and various professionals and is an indicator of whether interprofessional work was performed for oral maintenance. Oral feeding maintenance II also requires an affiliated house call dentist as an essential condition, and facilities actively collaborate with dental care institutions. Therefore, it is reasonable that many respondents perceive teledentistry as useful.

In contrast, oral feeding maintenance I have less stringent additional requirements, which might explain why no significant association is observed. Teledentistry is available regardless of time and location. Nutritional support is critical for managing the general condition of patients and improving their QOL. When it is challenging for professionals to meet face-to-face, smooth collaboration is possible using telemedicine. In this study, we compared the presence or the absence of affiliated facilities, assuming it might reflect the organizational structure and financial capacity of the welfare medical corporation owning the facility. However, no significant difference was found between the two conditions. Nonetheless, the facilities that had implemented teledentistry did not have affiliated medical facilities but had affiliated care facilities, suggesting that the presence of such facilities may have some influence on the implementation of teledentistry.

In teledentistry for older adults who require long-term care, it is desirable to have an extra person present during treatment because it is assumed that the doctor-to-patient system may be affected owing to communication



difficulties or other circumstances. The relationship between the number of staff at each facility, the number of residents taken care of per staff member, and the perceived usefulness of teledentistry were examined; however, no significant differences were observed (Table 2). The introduction of teledentistry depends on the situation at each facility. Therefore, it is necessary to examine specific devices and maintenance methods, educate facility staff, and determine their economic feasibility.

Capital investment is a common problem in teledentistry.<sup>13</sup> Although the environment in long-term care facilities is becoming better equipped through LIFE, full-scale digitalization of long-term care still requires case validation and system verification. Therefore, the results of this study indicate that the current system is not yet ready to utilize ICT for teledentistry and has not yet been introduced. Barriers to teledentistry for older adults include equipment and costs, as well as the lack of public policy on medical processes, privacy, security, and the effectiveness and reliability of teledentistry.<sup>16,18–23</sup> These are recognized as issues faced by dental professionals.<sup>19</sup> The affinity between dental treatment and online services may be utilized more effectively by presenting specific examples of teledentistry and adapting the operation for each facility. Currently, in Japan, teledentistry is only partially included in medical insurance schemes. Since this study has revealed some aspects of the reality of teledentistry, the next step would be to demonstrate and investigate its effectiveness and obtain case studies. Following the results of this study, consideration is being made to introduce teledentistry using long-term care insurance, as well as the introduction of equipment for teledentistry. Therefore, it is necessary to further investigate and reassess the issues.

### Limitations

This study has several limitations. First, it was a questionnaire survey, which had limitations in terms of accuracy in reflecting the actual situation and items. The respondents included facility directors, office clerks, dentists, dental hygienists, care workers, and nutritionists. Second, although stratified random sampling was used, it did not cover all the facility characteristics. Third, since this was a cross-sectional study, the causal relationship of perceptions of teledentistry was not clarified. Finally, this study was based on a questionnaire, and the respondents' professions were not specified, which could have influenced the results. Hence, the operational methods and indications for teledentistry should also be examined.

### Conclusion

This study analyzed the perceptions of the usefulness of teledentistry in long-term care facilities and the issues

involved in introducing teledentistry in Japan. Although there are only a few examples of teledentistry implemented in facilities, many facilities perceive its usefulness even without using it. Therefore, the collection of case studies at facilities that have implemented teledentistry and verification of its effectiveness in the future may provide suggestions for the diffusion of teledentistry in long-term care insurance facilities.

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