Video conferencing for home care delivery in Japan and its emerging implications for the COVID-19 era: observational study

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Abstract

Background: Telemedicine has been increasingly used in many healthcare fields including home care, where patients receive medical care at home. Due to the current COVID19 crisis, the value of telemedicine via video-conferencing (VC) is more recognized allowing immobile patients to continue to receive care. Despite the increased use, the efficacy of telemedicine in the home care settings in Japan remains to be appraised.

Objective: The purpose of this study is to identify the use and impacts of telemedicine in home care delivery in Japan.

Methods: Retrospective observational study was employed using patient and other administrative records stored in our home care clinic. We considered patients who were involved in VC with our home care physicians and telepresenters (medical assistant who is present with the patient during a telemedicine session) nearby the patients during 2018 and 2019. We extracted sociodemographic data of the patients and the process of unplanned video conferences and descriptively illustrated some informative cases.

Results: In a home care clinic in Japan, VC was conducted in 17 cases (involving 14 patients) over the 2-year period. Of all the cases, two (11.8%) required emergency transfers and were hospitalized. In the remaining 15 cases, 12 were thought to need medications or go to a clinic for consultation, while the remaining three were ordered to rest. The symptoms subsequently improved in 14 cases, and only one patient was later hospitalized due to the development of pneumonia from an upper respiratory infection.

Conclusions: Consultations via VC were generally as safe and effective as the face-to-face. Telemedicine was deemed effective for assessing the patients' conditions in the home care setting in situations where home visits cannot be carried out.

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Keywords: video conference, home care, caregiver, telepresenter

Introduction

Telemedicine, the use of information and communication technology (ICT) to deliver health care (clinical services only) at a distance, is being increasingly used to deliver health care covering a wide range of specialties, for numerous conditions and through a variety of differing channels and systems. An ever-increasing body of evidence suggests that care delivered via telemedicine is safe and can be as, if not more, effective and economical as the facer-to-face. Nevertheless, significant barriers to wider use are identified: healthcare providers and patients facing regulatory ambiguities, financing and reimbursement uncertainties, and vague rules and regulations. Inequalities in both health and digital literacy are another concern that patients who could benefit the most are often those who are the least able to have access to or make use of telemedicine. Telemedicine is developed to improve effectiveness, efficiency and equity in health care, however it can also create unprecedented risks and amplify existing inequalities.

Japan has been actively promoting telemedicine as a means to help meet the evolving healthcare needs of the population. Key areas of focus have been 1) access to healthcare for rural and remote communities, 2) home telemedicine and 3) illness prevention and lifestyle modification. The Japanese government has been encouraging telemedicine, especially as part of a strategy focusing on an effective home-based primary care approach, which is for move-away from the nation’s famed lengthy hospitalization practice. In 2015, Japan’s Ministry of Health, Labour and Welfare (MHLW) permitted the use of telemedicine in areas other than rural and remote areas [1] and, in 2016, approved telemedicine as a clinical intervention equivalent to face-to-face medical consultation, allowing costs to be covered in the national health insurance scheme (instead of XXX). In Japan, provider-to-patient telemedicine services have been permitted since 2018, but only after an initial face-to-face meeting has taken place between the physician and the patient. It is the sole responsibility of the doctor to decide whether remote health care is safe and appropriate.

Only few telemedicine studies in Japan have been published, mostly in the Japanese language, limiting the global reach. In-depth appraisal of the efficacy of telemedicine is particularly important in the homecare settings, as there are many factors that could prohibit physicians to physically visit patients' home immediately such as usual busy visiting schedule natural disasters or rapid infection of diseases. Telemedicine via VC is one possible means to help overcome this problem, however its efficacy and safety in assessing patients' conditions including identifying potential acute illnesses, has not been evaluated in the homecare setting in depth to date. Accordingly, the main goal of this study was to appraise the efficacy, safety and key elements of VC in the homecare setting in Japan.

Methods

Setting and Participants

The Orange Home-care Clinic is a clinic specializing in providing medical care to patients based in their own homes or residences in Fukui City, Japan. This clinic has 5 working teams consisting of one physician and one clerk per team, treating 330 patients. Each team visits 8-10 patients a day on weekdays. The visiting area covers a radius 16km from the clinic. Due to various unforeseen circumstances (e.g., natural disasters), the clinic used VC in 17 instances from January 2018 to December 2019.

Integrated Community Care System

In Japan, the Integrated Community Care System, which is designed to provide medicine, nursing, and life support in an integrated format, has been developed to enable elders to continue living at home in the manner to which they have become accustomed [2]. Therefore, the patients involved in this research were those living in specialized housing facilities for the elderly or those living at home, where a formal caregiver was available. Additionally, patients who were regularly visited by

their physician, living in their own residences with the assistance of informal family caregivers or in facilities, were included in this study.

Cooperation between home care physicians and visiting nurses

In Japan, visiting nurses belong to clinics, hospitals or nurse stations and provide care to patients who were certified to need care by local governments, with the service and interventions covered under the healthcare insurance system. They provide physical and mental health services, including medical care and basic life support services. However, any physical intervention, such as management of IVs or blood sampling, is limited and can only be given under the supervision of the attending physician.

Online examination in Japanese home care setting

The MHLW has created strict definitions for what constitutes an examination in which physicians deal with patients via a digital audiovisual link, such as via a phone or the Internet, a procedure referred to as an ‘online’ examination. Online examinations are conducted in the same manner as the face-to-face examinations. Until recently, the first examination must have been face-to-face, however, due to COVID19, online examination can be used as the first examination session. Relatedly, as of April 2020, physicians who intend to use VCs are required to undertake training regulated by the MHLW.

Doctor to Patient with Nurse (D to P with N) has been introduced as one common form of implementing online examinations, in which patients who receive home care see the home care doctor via a digital audiovisual connection but with a visiting nurse attendance. In this situation, visiting nurses are supposed to provide medical assistance within the range expected in the Treatment Plan and Visiting Nursing Instruction. Therefore, physicians are primarily responsible for the intervention, in an oversight capacity, conducted as part of any online examination.

Data collection

The basic information on patients such as age, sex, primary diseases and availability of caregiver were collected from medical records at our clinic. Data on cases where VC was used, such as the reason for the consultation, the telepresenter, any intervention, and the outcome were collected from medical records and other documentation.

Availability of caregiver was categorized into 1) formal caregiver with patient living in a facility; 2) informal caregiver (patient living with family member); 3) no caregiver (with patient living alone).

Reason for VC consultation involved the chief complaint when consultation was requested by the patient or the caregiver.

The telepresenter was the person with the patient who orchestrated the online VC connection with the physician.

The intervention referred to any medical procedures which were determined during VCs.

The outcome was categorized into 1) symptom improvement when the patients did not need additional treatment other than intervention decided through VC or 2) hospitalization (when the patient was hospitalized after the VC).

Ethical Review

This research adheres to the Ethical Guidelines for Medical and Health Research Involving Human Subjects and meets Japan's local legal requirements. The study approval was granted by the Ethics Committee of the Medical Governance Research Institute on June 4, 2020 (MG2018-18-20200604).

Results

Participant Statistics

Table 1 shows the summary of all the cases.

Table1. Sociodemographic of the patients and the process of unplanned video conferences.

ID	Age	Sex	Primary disease	Availability of caregiver	Reasons for online consultation	Telepresenter	Diagnosis	Intervention	Outcome
1-1	97	Female	Stomach cancer	Formal caregiver	Fall	Visiting nurse	Suspect of bone fracture	Prescription of pain reliever	Symptom improvement
1-2	97	Female	Stomach cancer	Formal caregiver	Phlegm	Visiting nurse	Bacterial infection	Prescription of antibiotics	Symptom improvement
2	92	Female	Dementia	Formal caregiver	Vomiting	Visiting nurse	Gastroenteritis	Prescription of antiemetic drug	Symptom improvement
3	93	Male	Dementia	Informal caregiver	Scratch	Visiting nurse	Eczema	Applying ointment	Symptom improvement
4	70	Female	Last stage of stomach cancer	Informal caregiver	Headache	Visiting nurse	Muscle-contraction headache	Treatment in acupuncture clinic	Symptom improvement
5	66	Female	Last stage of lung cancer	Informal caregiver	Uncomfortable feeling	Visiting nurse	Dehydration	Infusion	Symptom improvement
6	35	Male	Cerebral contusion	Informal caregiver	Suspect of drug eruption	Visiting nurse	Drug eruption	Stopping antibiotics	Symptom improvement
7	33	Male	Acquired cerebral palsy	Informal caregiver	Suspect of Low-temperature burn	Informal caregiver	Low-temperature burn	Applying ointment	Symptom improvement
8	16	Male	Fibroma molluscum type1	Informal caregiver	Fever	Visiting nurse	Acuter bronchitis	Applying antibiotics	Symptom improvement
9	11	Male	West syndrome	Informal caregiver	Epileptic seizures	Institutional nurse	Epileptic seizures	Watch and wait	Symptom improvement
10	7	Male	Cerebral palsy	Informal caregiver	Swelling of the eyelid	Institutional nurse	Hordeolum	Prescription of eye-drops	Symptom improvement
11-1	4	Female	Double outlet right ventricle	Informal caregiver	Suspect of CV block	Visiting nurse	CV block	Emergency transfer	Hospitalization
11-2	4	Female	Double-outlet right ventricle	Informal caregiver	Vomiting, Diarrhea	Visiting nurse	Dehydration	Emergency transfer	Hospitalization
12	3	Female	Lissencephaly	Informal caregiver	Tachycardia	Visiting nurse	None	Watch and wait	Symptom improvement
13-1	2	Male	Cerebral palsy	Informal caregiver	Increase of phlegm	Informal caregiver	Upper respiratory inflammation	Watch and wait	Symptom improvement
13-2	2	Male	Cerebral palsy	Informal caregiver	Fever	Visiting nurse	Middle ear inflammation	Continuing antibiotics	Hospitalization
14	72	Female	Rheumatoid arthritis	No caregiver	Eczema	Visiting nurse	Miliaria	Prescription of ointment	Symptom improvement

Online VCs were conducted in 17 instances with14 patients (3 patients conducted VC twice). Of the 14 patients, 5 were children and 5 were elderly (over 65 years old). Six patients were male. As for primary diseases, 9 were nervous or cerebral vascular, with cancer also being common. Eleven patients lived with family members, two lived in assisted-living facilities, and one patient lived alone.

The reasons for the VC consultation and diagnoses are also shown in Table 1. In 13 instances (76.5%) visiting nurses coordinated the VC, while in 2 instances (11.8% institutional nurses performed that task. In 2 instance (11.8%) an informal caregiver handled the VC.

As for subsequent interventions, a new prescription of medicine followed in five (29.4%) VCs; in three (17.6%), guidance on the application of medicine ensued, “watch and wait” instructions were given following three (17.6%), while in two (11.8%) instances emergency transfer to hospital was advised.

As regards outcomes, 14(82.4%) VC resulted in improvement of the problematic symptoms and the remaining three (17.6%) resulted in hospitalization. One hospitalization was due to pneumonia from upper respiratory infection which occurred

independently after the VC had taken place.

In ID 1-2, although a formal caregiver was available, a visiting nurse was called and subsequently organized and conducted the VC. In ID 6 and ID 8, an informal caregiver was available and they summoned a visiting nurse who organized and conducted the VC. In ID 7, an informal caregiver was available and organized and conducted the VC.

Indicative VC examples

ID1-2

The patient was a 97-year-old female with early-stage gastric cancer and chronic heart failure. She lived in a long-term facility with no full-time nurses in which helpers provided various care services to the residents. The patient was able to walk using a walker and take a bath with the support of helpers. Informal caregivers were not available. As she was unable to visit a clinic by herself because of lower-extremity muscle weakness and as her gastric cancer was relatively stable, her medical home care started in February 2015 and a team visited her twice a month. She wished to spend the rest of the life in the facility. One night in October 2018, the facility part-time nurse

contacted us as the patient had an approximately two-week history of phlegm and breathlessness. The last regular visit by a home care physician was 12 days previously, when she showed no outwards signs of severe phlegm and breathlessness. Her body temperature was 37.3℃, blood pressure was 155/92, pulse rate was 80, saturation of percutaneous oxygen was 94%, and state of consciousness was clear. Although a home care physician attempted to visit the facility, the physician was not able to do so immediately. Therefore, the physician ordered a visiting nurse from our clinic to visit the patient's facility and instead carried out a VC. The nurse told the physician that there were no obvious lung noises, which suggested pneumonia was not present and her body movement, such as standing and sitting, was smooth. As a result of the VC examination, the physician ordered the nurse to take a blood test to judge whether there was an acute bacterial respiratory infection and deterioration of chronic heart failure or not. The nurse returned the blood sample to the clinic and submitted it for testing. The next day, the physician diagnosed a bacterial respiratory infection based on the results of the blood test. The blood test also indicated the white blood cell (WBC) count was 5180/μl and C-reactive protein (CRP) was 0.12 mg/dl. The physician wrote a prescription for oral

antibiotics and faxed it to a specified pharmacy. The pharmacist delivered the drugs to the patient's home and started treatment with the antibiotics (levofroxacin 500 mg once per day for 7 days). A few days later, the physician confirmed an increase of N-terminal pro-brain natriuretic peptide (NT- pro BNP) as a result of a new blood test and diagnosed deterioration of chronic heart failure, and treatment with a diuretic drug (furosemide 20 mg once per day for 7 days) was started**.** In this case, the nurse being physically with the patient during the online examination allowed the diagnosis of an acute bacterial respiratory infection and deterioration of the patient's cardiac problem, thereby allowing prompt treatment

ID 8

The patient was a 16-year-old male patient with neurofibromatosis type 1. He had a gastrostomy to be fed and underwent non-invasive positive pressure ventilation every night. He spent most of the daytime using a wheelchair and lived in his house with the support of his parents. His twice-monthly home care started in February 2011 to help reduce the burden on his family who frequently had to visit emergency medical

departments due to his regular fevers. One morning in September 2018, the patient's family reported to us by telephone that the patient had fever of 37.8℃ with excess phlegm, but that his respiratory condition was not troublesome. As the condition was not serious but needed careful monitoring, our physician told the family to do an observation with an antipyretic drug and water intake. In addition, the physician ordered the visiting nurse to visit the patient's residence to check the patient's condition because he had suffered with acute viral bronchitis with bacterial secondary infection and was treated with an antibiotic one month before this consultation. When the visiting nurse visited the patient's residence that afternoon, his temperature was 37.8°C, even though an antipyretic drug was administered about three hours previously, and thus the nurse decided to conduct a VC. The patient's condition was similar to acute bronchitis he had experienced one month before, which had been resolved when our team visited 2 weeks prior. Therefore, the physician diagnosed acute viral bronchitis with bacterial secondary infection from the clinical symptoms and the patient's past history, and prescribed a course of antibiotics, sultamicillin tosylate dihydrate 9g after every meal for 7 days. The prescription was faxed to the pharmacy and patient's mother went to the pharmacy to

get the medication and administered it as per instructions. The physician performed a follow-up home visit two days later because the fever continued. At that visit, since the physician suspected pneumonia, the physician performed a sputum test and a blood test to decide whether his antibiotic drug had to be changed or not. The results of the laboratory test showed that the WBC was 9410/μl and his CRP was 3.14 mg/dl. The physician judged that his infection was improving based on the test results that the bacterial infection was clearing. The physician decided not to change the antibiotic drug and to finish the antibiotic treatment in 7 days because adolescents with special care needs the patient concerned are prone to bacterial infections and secondary viral infections, and the infections are often severe. The patient's condition improved one week later, and the bacterial culture of sputum did not reveal any infection. In this case, online medical examination was useful to diagnose possible acute viral bronchitis with bacterial secondary infection based on the patient's past history and action could be taken to respond to the changes.

ID 6

The patient was a 35-year-old bedridden male patient who had a post-operative left acute subdural hematoma following surgery caused by a traffic accident. He had undergone a number of medical procedures, including a tracheostomy, two gastrointestinal stomata, a gastronomy, and insertion of a ventral venous catheter. The two gastrointestinal stoma were used to drain intestinal fluids because he developed non-occlusive mesenteric ischemia and had most of his intestinal tract removed in May 2017. For that reason, he had a gastrostomy and used the central venous catheter for 24 hours to get nutrition. His parents provided his daily care and home visiting nurses provided regular medical attention. Our clinic provided weekly medical homecare after his discharge from hospital in March 2018. In April 2018, the visiting nurse telephoned our clinic to report that the patient had had fever for a few days and the physician ordered the nurse to take blood for testing. From the results, increased WBC (10210/μl with a left shift) and CRP (5.65 mg/dl), the patient was judged to have an acute bacterial infection. The doctor took sulbactam sodium and ampicillin sodium to the patient's residence and ordered the nurse to administer it during morning and evening visits. A

few minutes after the intravenous injection of the antibiotic, eczema appeared on the patient's chest, indicating some kind of allergic reaction. Therefore, an online visual medical examination was conducted to check the patient's condition. No other abnormal findings were observed such as respiratory distress or decrease in saturation of percutaneous oxygen, and the eczema disappeared 30 minutes after the intravenous injection. For this reason, the physician decided to perform a follow up with daily visits from the visiting nurse. The reaction reminded the patient's father of a previous history of allergic reactions and he reported that the same reaction was observed when he was hospitalized. The home care physician did a consultation to the hospital, but details were unknown. Thus, we discontinued sulbactam sodium, ampicillin sodium because these drugs were suspected as allergens and initiated ceftriaxone sodium hydrate instead. In this case, online medical examination was useful to diagnose possible allergic reactions and helped to change the antibiotics being administered.

ID 7

A 33-year-old male patient was bedridden due to cerebral palsy and had undergone a

gastrostomy. Our twice-monthly home care service started in December 2014 because the patient's family had to regularly take him to a hospital due to him regularly developing a fever. In December 2018, the family phoned our clinic to report that there was redness in the joint of the left hand which seemed to be a low-temperature burn. Our physician made an online medical examination using the family's mobile phone to ascertain whether a home visit was required to deal with the situation. In discussion with the family, the physician confirmed that the red lesion appeared after using a hot-water bottle to keep the left hand warm and that there was no pain, only redness. Therefore, the physician decided to treat the burn with steroid ointment which was prescribed to be applied to the granulation around the gastrostomy and told the family to contact the clinic if there was any worsening in the patient's condition. After two weeks, the burn was healed at the time of the next regular visit. In this case, online medical treatment was useful to diagnose a low-temperature burn and to start treatment immediately without the need for a visiting nurse being present.

Discussion

Treatments using VC in the clinic were generally safe and effective. As shown in Table 1, for 13 cases (76.5%) the problematic symptom causing the need for a VC improved without emergency transfer or treatment in a hospital or clinic. In six (35.3%) instances no intervention by medical professionals was required. The use of VC was generally effective and prevented unnecessary doctor visits in some cases.

One key element was mutual collaboration between medical staff in the prevailing situation. In Japan, where specialized home medical care is provided by a doctor from a specialized Home-care clinic working together with system whereby a corps of local visiting nurses also provide home care. The VCs enabled the visiting nurses to implement prompt blood tests necessary for diagnosis and treatment and to respond promptly in following up the patients' conditions. In fact, as research by Funderskov et.al showed, the use of video consultation allows community-based nurses to discuss their observations, enabling them to take part in active home care, including palliative care [3].

VCs allow analysis of outward appearances of signs and symptoms. Interviews with patients and clinicians in previous studies showed that video consulting was better than telephone consulting, especially in consultations involving psychological assessment where visual cues are important as with ID 1-2 in our research [4]. As for feasibility and accuracy of diagnosing through VCs, according to the review conducted by Trettel et.al, most articles on teledermatology reported that telemedicine under respective conditions was feasible, reliable and effective [5]. In comparing face-to-face consulting and video consulting, according to Tylor et.al, clinicians rate the experience of conducting a telehealth session compared with a home visit as equivalent or better in 90.3% of cases, and the communication environment was the important factor in the evaluation [6]. Japan has a usually reliable digital communication system, although there are parts of the mountainous country where mobile signals are absent. In our cases, most of the VCs with the patient's home were done using 4G connections and the communication channel was never interrupted or lost.

When healthcare professionals are unable to reach the patient it is hard to deal with any

medical complications solely based on documentation and verbal commentary. In addition, where the person making contact is either not a technically adept person or in possession of suitable communication equipment, VCs are not possible. When an audiovisual link can be reliably established and maintained, our Home-care doctors can grasp the basic situation and needs of the patient based on the information conveyed through audiovisual channels.

There are several critical points that need to be considered with respect to incorporating telemedicine in the home care setting. First, the telepresenter, the person who organized the VC in patient's home, is critical. It is ideal that the main caregivers, including informal caregivers, are able to orchestrate VCs, even though this might be a heavy burden for informal caregivers. Future research is expected to clarify whether unofficial caregivers can play the role of telepresenter appropriately and what kind of support or intervention is required to overcome this problem. Further, in addition to the medical and health literacy, the technological literacy of patients, their caregivers and attendant nursing staff have to be taken into account. A study of telemedicine between nurses and

patients at home in Norway highlighted the importance of the levels of training and experience of VC [7]. In particular, elderly people are not used to using digital devices and many do not even own or have access to a computer or sophisticated mobile phone. According to Japan's Ministry of Internal Affairs and Communications, the ratio of internet users is about 20% in those aged >80 years old while it is over 90% in people in their 20s-40s [8]. It might be helpful to instruct all the homecare patients on how to use communication devices in telemedicine. A previous study recommended supporting digital literacy and confidence of older people in order to strength their intention to use technology [9]. With respect to the cost of communication devices, some patients do not have any equipment capable of accessing VC and this poses significant constraints on developing a VC telemedicine system, contradicting with one of the primary aims of VC implementation being equity. It is difficult for the Japanese national insurance system to cover the cost of provision of adequate devices, training in their use and the cost of the VC connection time. What is obviously important, is to encourage patients or caregivers to, wherever and whenever possible, be able to use modern communication equipment enabling them to use a VC or telemedicine in times of emergency or

whenever a physician is unable to make a physical visit.

Second, telemedicine may miss some important clinical information that could be obtained in the face-to-face consultation. Of note, we should be aware that a use of telemedicine in emergency cases in a home care setting is still in its infancy, and a careful and gradual evolution is imperative. It is essential or, at least desirable for physicians and other healthcare professionals to perform a follow-up in-person evaluation following any telemedicine event. It is also important to err on the side of caution when carrying out emergency telemedical consultations by calling for emergency transfers in cases possibly requiring rapid interventions or access to specialized doctors, facilities or equipment.

Conclusion

Consultation using VC in our clinic have generally been safe and effective**.** Telemedcine is a valuable substitute for emergency situations, especially when Home-care health personnel cannot get access to the patients under their care. Considering the vast and long-lasting impacts of the current global pandemic, the findings in this study can help

healthcare workers, patients and their families associated with homecare to appraise the characteristics of this relatively new approach.

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Conflicts of Interest

There is no funding to report. Dr Ozaki received a personal fee from MNES INC. outside the submitted work. Dr Nishikawa received a personal fee from MRT Inc. outside the submitted work. The other authors declare no conflicts of interest.

Abbreviations

VC =Video conference

MHLW= Ministry of Health, Labour and Welfare

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