Telemedicine Visits for Patients and Providers at a Rural Clinic Throughout COVID-19: An Evaluation of Experiences and Acceptability in Diabetes Management

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1 | Introduction

1.1 Problem Description

Diabetes is a pressing clinical issue in the United States, affecting 34.2 million people and accounting for nearly $250 billion in public costs annually (CDC, 2020). Diabetes disproportionately affects rural populations in the United States, with the CDC (2018) reporting 17% higher prevalence in rural areas. Compounding this problem are numerous factors that present as barriers to care, including primary care provider (PCP) shortages, distance to health clinics, limited transportation, lower income levels, and lower levels of education (McLendon, 2017). A major concern for those with complex diabetes is lack of specialty care (namely endocrinology and ophthalmology) in rural areas, a supply-demand mismatch that is expected to worsen over the next decade, as well as lack of access to diabetes self-management education and support (DSMES) (Bouchonville, Paul, Billings, Kirk & Aurora, 2016; CDC, 2020). Access to such care could potentially lessen the unequal burden of diabetes in rural areas.

Telemedicine, defined by Bouchonville et al. (2016) as "the use of medical information exchanged from one site to another via electronic communications to improve a patient's clinical health status", can provide a bridge to primary and specialty care for those in rural areas (p. 96). However, the adoption of telemedicine has been impeded by multiple factors, including complex and varied reimbursement requirements and/or lack of parity with in person care, lack of broadband internet in rural areas, especially very rural areas, and the cost of infrastructure requirements, especially for small clinics and private practices (Drake, Zhang, & Polsky, 2019; Neufeld, Doarn, & Aly, 2016). These factors must be considered and addressed when considering telemedicine utilization in rural areas.

1.2 Available knowledge:

1.2.1. Search strategy

For diabetes in telemedicine themes, the CINAHL, PubMed, and Scopus databases were searched for English-language articles published in the United States between 2010 and present. Keywords and PubMed MeSH terms included *telemedicine*, *diabetes* or *diabetes mellitus Type 2*, *rural health*, *rural populations*, *rural nursing* or *rural communities*, and *United States*. Reviews and meta-analysis were identified through Scopus database searches and limited to publication within the last five years. To identify themes specific to telemedicine surveys and surveys during the Covid-19 pandemic, the Scopus database was searched for English-language articles published between 2015 and present. Keywords included *telemedicine* or *telehealth surveys*, *patient acceptability* or *satisfaction surveys* and *telemedicine* or *telehealth, provider telemedicine* or *provider telehealth surveys*, and *Covid-19*. Additional studies were identified by searching through citations and cited by links of principal articles within the Scopus database.

1.2.2. Benefits of telemedicine

There has been significant research investigating the use of telemedicine in diabetes care with evidence of improved outcomes, with the American Diabetes Association (ADA, 2020) recommending use of telemedicine approaches in the treatment of diabetes as part of the Chronic Care Model (CCM). Improvement in hemoglobin A1c and impact on self-management are widely cited as outcomes of telemedicine in general (Borries et al., 2019), while other themes include the successes of team-based care in relation to telemedicine in diabetes management, the effects of policy and access on widespread implementation, and the incorporation of teleconsultation into multi-faceted, interdisciplinary interventions and/or as a way to support rural providers with complex cases (Bouchonville et al., 2016; Davis, Hoover, Keller, &

Repogle, 2019; McLendon, Wood, & Stanley, 2019; McLendon, 2017). Taken together, telemedicine is a potentially valuable care delivery approach for rural patients with diabetes.

1.2.3. Barriers to telemedicine implementation

A significant barrier to implementation of telemedicine is inconsistent reimbursement. Medicare and Medicaid coverage varies between states as far as what services are covered; real-time, or synchronous, video has historically been the only reimbursed service and for this the patient cannot be at home but must be at an approved originating site (Neufeld et al., 2016; Mehrotra et al., 2016). While Medicaid expansion in 2010 led to parity law development in many states, rates of telemedicine utilization remained extremely low overall despite evidence of clinical benefit, particularly in rural areas, and evidence of both patient and provider satisfaction with use (Borries et al., 2019; McLendon, 2017; Mehrotra, 2016). Medicare increased telemedicine usability in 2019 via the reimbursement of Virtual Check Ins, brief patient-initiated exchanges that may be asynchronous or synchronous depending on the technology used (Verma, 2020). In 2020, Medicare began reimbursement for online electronic health record (EHR) portal communications, or e-visits, which allow for non-face-to-face interaction for established patients (Verma, 2020). Recently, access to telemedicine has been widely expanded via the Coronavirus Preparedness and Response Supplemental Appropriations (CARES) Act of 2020, in response to the Covid-19 pandemic (Centers for Medicare & Medicaid Services [CMS], 2020). This legislation allows for care to be delivered to a patient's place of residence and reimbursed at the same rate as an in-person visit, reducing the need for travel to a health care providers office (CMS, 2020). To what degree this emergency-based change will lead to permanent alterations in health care delivery is unknown, but such changes would allow for a reimagining of chronic disease management, particularly in rural areas.

Even with broad implementation of telemedicine, many rural areas may still lack access due to lower rates of broadband internet coverage, either due to geographical area, cost, or both. An observational study found that broadband penetration was lowest in the Counties with Extreme Access Considerations (CEAC), or the most rural areas, which congruently have the lowest rates of access to primary care (Drake et al., 2019). These findings highlight the fact that even if telemedicine reimbursement and parity were ensured, as with the CARES Act, this technology may not reach the most vulnerable populations, namely those without insurance and those in the most rural areas. This disparity holds true when looking at patients in rural areas with diabetes, as those who are already engaged in the healthcare system are more likely to receive diabetes care via telemedicine, versus telemedicine reaching marginalized populations (McDonnell, 2018). These issues will likely continue to serve as barriers despite increased reimbursement at the clinic and provider level.

1.2.4. Acceptability of telemedicine

Generally, patients and providers have expressed satisfaction with telemedicine use in diabetes as far as convenience, safety, and access (Borries et al., 2019; Haider, Aweid, Subramanian, & Iranpour, 2020); McLendon, 2017). Available literature highlights the need for more research into acceptability and implementation challenges, especially in terms of resource poor areas, rural areas, and in regard to patient adherence (McLendon, 2017; Lee et al., 2017; Lee, Black, & Held, 2019). Additionally, much of the survey data regarding telemedicine use in diabetes gauges satisfaction and acceptability of short-term and/or variable interventions, which, given the recent changes in telemedicine usage in the context of the Covid-19 pandemic, does not necessarily reflect current realities.

1.2.5. Telemedicine surveys

Patient and provider perceptions, attitudes, and beliefs regarding telemedicine use in general and in diabetes care specifically are often assessed via survey, both historically and during the Covid-19 pandemic, and numerous instruments have been developed to evaluate this method of health care delivery. Constructs typically measured are patient and provider satisfaction, experience, preferences, and attitudes regarding telemedicine, as well as technical quality, effectiveness, and usefulness of telemedicine interactions (Langbecker, Caffery, Gillespie, & Smith, 2017); surveys regarding diabetes management often evaluate quality of consultation and access to care, as well as improvement of self-management or self-efficacy based on intervention (McLendon, 2017). While many publications have made use of validated surveys, such as the Telemedicine Perception Questionnaire (TMPQ), the Telemedicine Satisfaction Questionnaire (TSQ), or the Telehealth Usability Questionnaire (TUQ), it is also common to see instrument development as part of study design (Langbecker et al., 2017). The flexibility and adaptability of telemedicine interventions based on setting and patient factors, and therefore how concepts are operationalized, may restrict the use of existing, validated instruments. However, as telemedicine use increases, it will become increasingly important to use validated surveys to allow for comparison and integration of data.

1.2.6. Telemedicine survey use during Covid-19 pandemic

While there is not available literature regarding telemedicine use in diabetes during Covid-19, studies in other populations have evaluated telemedicine interventions and are relevant to further study on use. An obstetric provider interview based study that took place during the Covid-19 pandemic revealed high ratings of ease of use, efficacy compared to in-person visits, and increased motivation to use telehealth beyond the pandemic as compared to prior motivation; patient side internet access or interpreter related issues were noted as barriers, while use was

facilitated by mentors and workplace supports such as modules (Madden et al., 2020). These findings are supported by earlier research suggesting that providers are more likely to use telemedicine technology if use is supported by their workplace setting, especially rural practices (Jetty, Moore, Coffman, Petterson, & Bazemore, 2018; King, Richards, & Godden, 2007). Although telemedicine acceptability is generally high among providers, barriers to acceptability or usability include concerns about privacy, liability, clinical quality, and lack of data regarding use; these barriers fluctuate based on clinical setting and population (Kalra et al., 2020); Madden et al., 2020; Slightam et al., 2020). Overall, the literature on provider acceptability indicates that this feedback is essential to understanding the complete picture of telemedicine use in any setting, including in primary care and diabetes management.

Current literature regarding patient usability and acceptability of telemedicine in the midst of Covid-19 is mainly limited to specialty care and international settings. Evaluation of usability of telemedicine in head and neck ambulatory visits through use of the TUQ found that patients reported high usefulness, ease of use, and effectiveness, but less reliability, which was mainly related to a perceived lack of equivalence to in-person visits (Layfield et al., 2020). A study based in a rheumatology clinic in India used consecutive sampling to administer a survey consisting of eight questions assessing patient satisfaction and agreement for continuing consultation, with continuation dependent on both reliability, i.e., trust that the provider did not miss something important, and satisfaction with the consultation (Shenoy et al., 2020). A survey based study at an academic eye center found similarly high levels of acceptance, with the most benefit derived from convenience and time saved and least benefit from effectiveness, however this was not well defined (Kalra et al., 2020). A hindrance of the literature on telemedicine in general, as well as studies specifically related to Covid-19, is the use of novel surveys and

subsequent lack of consistency in definition of constructs, making results difficult to compare. These studies described support the continued development of telemedicine in specialty settings, and also highlight further need to investigate patient's willingness to more generally shift away from in-person care on a long-term basis, such as in the primary care setting, through the use of validated surveys.

1.3 Rationale:

Telemedicine utilization, particularly in the wake of Covid-19 and lifted restrictions via the CARES Act, could theoretically cause a dramatic shift in health care delivery. In-person health care delivery is the normative standard, and whether virtual care delivery is an acceptable alternative for patients and providers is an aspect of this evolution of care that needs to be well studied in order to determine how to best utilize this technology. While there is evidence for acceptability for telemedicine generally and in the context of specialty care, less is known about the impact on primary care in rural areas, especially care delivery for chronic conditions such as diabetes, and there is little qualitative data regarding patient and provider experiences. Patients may have different expectations for primary versus specialty care, or chronic versus acute conditions. Investigation of the acceptability of telemedicine in this population is worthwhile as patients with diabetes in rural areas would hypothetically derive significant benefit from permanent or wholescale expansion of this care delivery technology. The Technology Acceptance Model (TAM) will be used as a theoretical framework for this project, as it has been shown to support investigation of both telemedicine usability and individual attributes relating to use (Harst, Lantzsch, & Scheibe, 2019; (Wade, Gray, & Carati, 2017).

1.4 Aims:

The purpose of this project is to explore patient and provider experience regarding telemedicine use for diabetes management in the context of increased telemedicine utilization due to Covid-19 and the CARES Act at a rural Federally Qualified Health Center (FQHC) in Scappoose, Oregon, and to potentially identify themes or specific barriers related to this care delivery approach that can then be further researched and/or addressed in the clinical setting.

2 | Methods

2.1 Context:

The clinical context for this project is a primary care rural health clinic (RHC) located in Scappoose, Oregon that is part of the health system of Oregon Health and Science University (OHSU), a large urban academic health center. This clinic serves approximately 15,000 patients, approximately 1200 of whom have a diagnosis of diabetes. Scappoose Clinic is a member of the Columbia Pacific Coordinated Care Organization (CCO) and identifies as a patient centered primary care home that engages in holistic health care, including whole family care and behavioral and mental health care. To complete this project and ensure alignment with clinic goals, this researcher worked with the medical director as well as the project coordinator for the Quality Improvement (QI) team at Scappoose Clinic. As this clinic defines "telehealth" as either scheduled telephone or synchronous two-way video visits, together referred to as "virtual visits", these terms were used within the survey and any communications regarding the study to ensure clarity and consistency in language; "telemedicine" is otherwise used throughout this report.

2.2 Eligibility and sample size rationale:

All patients over the age of 18 who had documented diagnosis of diabetes and were seen via telephone or video-based visit were reviewed for eligibility for this study. Eligibility was determined using the filter feature within the 'Chart Review' section of the chart within the Epic

EMR. For each patient chart, Encounter Type data was filtered to include “telemedicine”, “telephone-scheduled”, or “video/telehealth-scheduled” to capture all possible telehealth visits. Given that this study was based on retrospective chart review without an interventional component or a more comprehensive transition to telemedicine, as seen in similar studies, chart review of a six-month time period was conducted to increase eligibility. Unscheduled follow up telephone encounters or provider to patient MyChart messages were excluded. Additional exclusion criteria included patients with inactive or incomplete activation MyChart status, those who received specialty diabetic care exclusively, i.e., did not receive care for diabetes through their primary care clinic, and those who were currently hospitalized or had chart documentation of Spanish language preference on EMR. Upon chart review and application of exclusion criteria, 132 patients were eligible for participation (Appendix A).

3 | Outcome Evaluation

3.1 Implementation:

This study was reviewed by the Oregon Health and Science University Institutional Review Board (IRB) and was determined to be a quality improvement project that was exempted from further IRB review. A retrospective chart review of telehealth encounters was conducted for patients at OHSU Scappoose Clinic meeting eligibility criteria for the time period July 2020 to December 2020, with assistance with chart review and data collection provided by the Scappoose Clinic project coordinator. Upon final approval of survey content by the medical director of the clinic, the patient cover letter and survey link, via direct URL link and scannable QR code, were sent as a MyChart message to all eligible patients by this researcher. The direct link allowed the patient respondent to open the survey within the Epic EMR itself, whereas the scannable code allowed for increased accessibility for those using a smartphone. The project coordinator assisted

with sending the provider survey out to the group email list at the clinic, and updated staff regarding patient and provider survey distribution during clinic huddle to increase awareness and boost participation. Both survey links were verified by the project coordinator or medical director. The provider survey was resent at two weeks, and the patient survey resent after one month, as reminder alerts have been found to increase participation (Cope, 2014).

3.3 Measures:

3.3.1. Telehealth Usability Survey

The TUQ is a 21-question survey that measures five different components of telemedicine usability using a 7-point Likert scale with 1 indicating strongly disagree and 7 indicating strongly agree. Components of telehealth included are usefulness, ease of use, effectiveness, reliability, and satisfaction or acceptability. The TUQ was selected because it been shown to have independent content validity and internal consistency (Langbecker et al., 2017; Layfield et al., 2020), it has been used in similar studies looking at telehealth in the context of Covid-19, and because it was readily adaptable to this setting. From a theoretical standpoint, the TAM supports use of this questionnaire as it measures multiple attitudinal domains surrounding telehealth use; the addition of open-ended questions is also supported as this more directly investigates perceptions of and intentions to use this technology (Ayanlade, Oyebisi, & Kolawole, 2019). Use of the TUQ also allows for comparison with other studies and increases generalizability of results. Although adaptation of any survey can reduce this benefit, this option is preferred to creation of a novel survey (Langbecker et al., 2017), and the TUQ was intended to be modified to address varied telehealth systems (Parmanto, Lewis, Graham, & Bertolet, 2016).

3.3.2. Patient survey

The telehealth survey included two parts: demographic questions and the TUQ, which was adapted for use with permission from the authors (Appendix B). The survey was developed using the SurveyMonkey platform (SurveyMonkey Inc. San Mateo, California, USA. 2020), in collaboration with the medical director of the clinic. Adaptations were made to ensure consistency in language and to ensure questions were specific to virtual visits versus general virtual communication. While there is evidence regarding patient satisfaction with telemedicine in general as previously discussed, less is known about attitudes regarding increased telemedicine utilization in the context of Covid-19, with attitudes of patients with diabetes receiving these services as of yet unreported in the literature.

Patient respondents answered demographic questions regarding age, gender, race or ethnicity, insurance type, highest level of education, and type of internet access. The demographic portion also contained four questions to measure diabetes severity: length of time since diabetes diagnosis in years, how diabetes is managed (diet and exercise only, oral medication only, injectable medication only, combination of injectable and oral, or unsure/other), most recent hemoglobin A1c level, and whether they have experienced eye, kidney, or nerve damage due to diabetes. Measurement of disease severity via subjective patient report has the potential to be inaccurate, however A1c, duration of diabetes, the number and type of diabetes medications, and diabetes related complications are frequently used in the literature to objectively measure severity (Borries et al., 2019; Zghebi et al., 2019).

3.3.3. Provider survey

The provider specific survey also combined demographic questions and an adapted version of the TUQ, developed using the same survey platform and in collaboration with the medical director. To ensure anonymity, demographic questions were limited to type of provider,

time in practice, and prior experience with telehealth. TUQ adaptation was based on a survey developed by Madden et al. (2020) that measured provider attitudes toward telehealth as far as integration into practice, documentation burden, and degree of technological support, with permission from study authors (Appendix B). Measuring provider satisfaction with and attitudes surrounding telemedicine is essential as those who dislike this modality for any reason are less likely to use it (Bhandari et al., 2020), and evaluation of provider experiences with telemedicine use for in a rural clinic setting has not been reported in the literature. This adapted survey was revised per feedback from the medical director and designed to be easily completed within 5 minutes for convenience and to increase participation.

3.3.4. Perception of Covid-19

Additionally, the survey included two questions regarding Covid-19: one regarding general health concerns during the pandemic, and one regarding if telehealth is safer, with the aim of comparing to other studies and understanding if telehealth acceptability is associated with concerns regarding health and safety related to Covid-19. For patients, the first question was "I am worried about my diabetes care because of the pandemic," whereas for the provider survey it read "The Covid-19 pandemic has impacted diabetes management for my patients,"; the second question for both was "Using telehealth is safer for me during the pandemic."

3.3.5. Survey administration and data collection

The survey was administered via the Survey Monkey platform which allowed for anonymity, increasing data accuracy. Accuracy was further ensured by revision of surveys to best align with clinic standards and language, per feedback from the medical director, and by ensuring accuracy of manual data entry into SPSS. Survey data was exported from Survey Monkey to SPSS and Microsoft Excel for quantitative analysis and data analyzed by this

researcher. Two open-ended questions regarding telehealth versus in person visits and one question asking if the person was interested in video visits (if they had not already had a video visit) were included. Responses to open ended questions were exported to Microsoft Excel and coded and analyzed into themes though a combined deductive and inductive approach.

3.4 Costs:

Costs incurred consisted solely of the cost of a SurveyMonkey subscription.

3.5 Ethical Considerations:

As discussed previously, high speed internet coverage is still limited in rural areas, including in Columbia County, Oregon, or is cost prohibitive. Therefore, any study of telemedicine interventions based on real life exposure neglects those living in rural areas without access to high speed or reliable internet, or those with low computer literacy or disability preventing use of telemedicine platforms. This project will use an English language survey, which neglects non-English speakers and patients with low literacy.

4 | Implementation of Project

4.1 Unintended consequences and missing data:

Patient survey completion rate was 97% and provider completion rate was 100%. Missing data for the patient survey was replaced by the series mean when less than 5% of all data (Beck & Polit, 2021). Three questions regarding video visits specifically within the ease-of-use category and one question in the effectiveness category had high percentages of not applicable responses, presumably due to lack of experience with video visits; without these questions answered these respondents still met criteria for inclusion based on completion rate of 75%. The reliability category had the highest percentage of not applicable responses (37%), but as these

were often different respondents it did not affect inclusion overall. One patient respondent did not meet minimum completion criteria and this data was not included in quantitative analysis.

The survey may have unintentionally favored video visit users versus telephone visit only users, as only 20% (*n*=26) of the eligible population had participated in a video visit, while 74% (*n*=23) of respondents answered questions specific to video visits; whether this is due to participant specific factors such as computer literacy or survey question phrasing is unclear. For this reason, survey data for video visits versus telephone only groups were compared where possible to assess for trends, but results focus on the group as a whole.

4.2 Results:

4.2.1. Quantitative data—patient surveys

A total of 30 patients (mean age 50.5) completed the survey, for a response rate of 23%. Respondents were 61.3% female and 83.9% white/Caucasian (see Table 1 for complete demographic data). Diabetic severity, measured through 4 responses including most recent known A1c, indicated that 77.4% reported an A1c under 9.0%, which is fairly consistent with the overall diabetic population, where rate of A1c <9% was 63.45%.

Patients reported usability of telehealth to be 5.32 (SD=1.22) on a seven-point scale, indicating overall slight agreeance, with highest mean scores regarding ease of talking to provider during a telehealth visit (M=6.20), time saved driving to clinic (M=6.10), and ease of setting up a phone visit (M=6.07); telephone visit only respondents (*n*=7) had a higher overall mean score of 5.53. Mean score for usefulness was 5.40 (SD=1.33), ease of use 5.35 (SD=1.42), effectiveness 5.46 (SD=1.23, reliability 5.21 (SD=1.80), and acceptability 5.26 (SD=1.28). For questions related to concern regarding Covid-19, the mean score was 5.00 (SD=1.43), with patients more likely to agree that telehealth was safer during the pandemic (M=5.63) versus

specific worry regarding diabetes care during this time (M=4.10). Telephone visit only respondents had higher average scores in all categories, most notably in the usefulness category (M=6.14), but slightly lower concern regarding Covid-19 (M=4.36).

Patients reported overall neutrality regarding preference of telehealth visits over in person visits (M=4.13, SD=1.87), with high variability in response explained by 29.03% (*n*=9) indicating a strong preference for telehealth visits, and 25.80% (*n*=8) strongly preferring in person visits, suggesting that patient preference may be an important factor in determining appropriate telehealth utilization. Respondents expressed slight agreeance and less variation when asked about overall satisfaction with telehealth visits (M=5.30, SD 1.47), likelihood of using telehealth again (M=5.73, SD=1.49), and acceptability of telehealth as a way to receive diabetes care (M=5.37, SD=1.43), suggesting that telehealth may be generally acceptable as an adjunct to in person care for patients with diabetes. Regarding phone versus video visit ease of use, patients were more likely to agree that phone visits were easier to set up, as above (M=6.07, SD=.98), versus video visits (M=5.27, SD=1.78). This is better understood looking at standard deviation of scores, as there was much more variability regarding ease of setting up a video visit versus setting up a phone visit, indicating a possible need for targeted support of video-based visits. Additionally, there was significant deviation regarding reliability as far as being able to fix errors (SD=1.87) and get help to fix mistakes (SD=1.85), with some users seemingly not encountering any technological issues at all, and others strongly disagreeing that telehealth is reliable. Technological difficulties as part of a video visit may explain lower overall satisfaction amongst users of video or both telephone and video-based telehealth, versus those who use telephone only, but again this is difficult to interpret given missing data for this category.

Given the varying scores between respondents who presumably had experience with video visits, versus telephone visit only respondents, a t-test was completed to compare means between these groups. The results indicate no significant difference in attitudes regarding telehealth between telephone visit only and other respondents, t (11.04) = .743, p= .47. The average score of those who responded to video visit questions (M=5.23, SD 1.26) was not significantly different that those who did not respond to these questions (M= 5.61, SD 1.12); however, this analysis is likely under powered.

4.2.2. Quantitative data—provider surveys

A total of 10 providers (6 MDs, 2 NPs, 2 PAs) responded to the survey, a 30% response rate (demographic data is presented in Table 2). Providers reported neutrality to slight agreeance regarding usability of telehealth (M=4.93) on the seven-point scale, somewhat lower than patient respondents. Respondents agreed that telehealth is useful (M=6.23, SD=.67), slightly agreed that it is easy to use (M=5.00, SD=.57), and acceptable (M=5.80, SD=.74), but were closer to neutrality regarding reliability (M= 4.25, SD=1.16) and slight disagreement regarding effectiveness (M=3.80, SD=1.18). The disagreement and variability of responses regarding effectiveness is notable given that all respondents agreed or strongly agreed that they were motivated to continue using telehealth (M= 6.50, SD=.53), suggesting that these shortcomings are to some degree expected or tolerated. Respondents were neutral regarding rapport over the phone being the same as in person (M=4.10, SD=1.86), or rapport over video being the same (M=4.60, SD=1.43), and slightly disagreed that they could communicate as well over the phone (M=3.67, SD=1.58) or over video (M=4.40, SD=1.43). This data suggests that providers feel telehealth restricts ease and effectiveness of communication, with video only improving this

shortcoming to a small degree, but also that there is variability as far as how much different providers perceive this to be a limitation.

Amongst provider types, MDs reported the lowest scores for overall telehealth usability, closer to neutrality (M=4.64), with NPs (M=5.45) and PAs (M=5.31) both overall slightly agreeing that telehealth is useful. There was no significant difference in the means of overall scores for telehealth usability. Regarding effectiveness, MDs reported lower perceived effectiveness (M=3.05) as compared to both NPs (M=4.64) and PAs (M=5.21). Using an independent t-test to compare means, results indicate that the difference between MD and NP scores is not significant, t (6) = .941, p = .38. The difference between MD and PA scores is significant, t (6) = 5.30, p = .002, although any significance should be interpreted with caution given the small sample size. This difference could be explained by the small number of PA respondents (n=2) versus MDs (n=6), and/or response bias.

Regarding Covid-19 specific questions, providers expressed overall agreeance that the pandemic had affected diabetes management for their patients (M=6.30, SD=.68) and that telehealth was safer for them during the pandemic (M=6.10, SD=1.60). Providers disagreed that telehealth visits took more time (M=2.90, SD = 1.45) and slightly disagreed that they required more documentation (M=3.10, SD= 1.45) than in person visits, and overall reported slight agreement regarding efficiency (M=5.70, SD=1.06) but were closer to neutrality regarding the statement that telehealth visits "allow for the same quality of care as in person visits" (M=4.50, SD=1.51). Those who responded that telehealth visits take more time to complete tended to either indicate higher need for technological support or time spent learning the technology via reliability scores or mention technological concerns as part of their open-ended question

responses, which suggests that the excess time spent on telehealth visits may be due to these issues rather than patient care concerns.

4.2.3. Comparing patient and provider response data

While patient and provider surveys differed in some respects, multiple response data measured the same variable with minor language changes (at a lower reading level or separated by phone and video experience for patients) and thus could be compared using independent t-test analysis. Looking at access and convenience for patients, patient and providers slightly agreed that it improves access and agree that it is more convenient, with no significant difference between mean scores. As far as ease of use, namely setting up and completing a phone or video visit, patients and providers also reported similar experience, with patients more likely to agree (M=6.06) than providers (M=5.60), but this difference was not significant, t (38) = 1.23, p =.23. Both groups also rated effectiveness of telehealth for diabetes care similarly, with patients and providers slightly agreeing (M= 5.37 and 5.60, respectively). While patient respondents overall slightly agreed that they would use telehealth again (M=5.73), versus agree, as did providers (M=6.50), this was not a significant difference, t (33.12) = 1.35, p = .19. This difference may have been significant with larger samples, as this has been found to be the case in similar studies.

Interestingly, patients and providers seemed to have different experiences regarding effectiveness of communication during visits. Patients respondents overall agreed that they "could easily talk to [their] provider during the phone or video/virtual visit" (M=6.20), and slightly agreed that they were "able to express [themselves] as well during the phone or video/virtual visit as [they] would in person," (M=5.80). Providers reported overall neutrality to slight agreeance regarding ability to develop rapport during telehealth visits (M=4.35) and neutrality regarding ability to communicate as well with the patient (M=3.94). These differences

were significant for both ease of communication, t (10.82) = 4.56, p=.006 and effectiveness of communication t (38) = 3.65, p=.001, suggesting that providers perceive more difficulty surrounding communication during telehealth visits than patients. This may be due to interpretation of question phrasing, practice specific reasons such as lack of privacy or more day to day experience with telehealth visits, or difference in experience related to provider type, the effect of which is difficult to gauge.

4.2.4. Qualitative data

Responses to the questions regarding what patients and providers liked and disliked about telehealth visits in comparison to in person visits were wide ranging and indicated a variety of experiences with telehealth. While some responses were very straightforward regarding like or dislike for reasons of convenience or technology issues, respectively, some were more nuanced and reflective, highlighting the challenges around using telehealth for primary care visits.

4.2.5. Patient themes—convenience

Patients frequently identified convenience of telehealth visits as far as not having to travel to the clinic and less time spent waiting for appointments to begin, with 61.29% of responses reflecting this theme. One patient (P1) described the convenience of being able to "do the visit from anywhere" and "not have to take time off of work", while another (P14) said "I don't have to get ready and set up rides", also highlighting the issues of missed work and transportation, respectively. One patient (P11) noted that they could have "[their] planner available or my glucose meter handy to get my levels for the doctor" suggesting convenience regarding diabetes management specifically.

4.2.6. Patient themes—comprehensiveness

However, some patients also highlighted that virtual care seemed less comprehensive compared to in-person, with one stating that they were “concerned that the physical stuff that needs to be done wouldn't happen” (P20), and another that “I worry about them not being able to always address all the needs/issues I may have in the long term,” (P11). Others simply mentioned lack of routine measurement of vital signs or laboratory assessment, with 19% stating not being able get blood work done as a disadvantage. These concerns reflect both opposing inconveniences, such as an additional health care encounter for lab work or in office tests, as well as a broader concern about something being missed during a virtual visit.

4.2.7. Patient themes—patient-provider relationship

Respondents referenced the patient provider relationship in different ways, with one patient (P8) stating that “My doctor…cannot listen to other things that I say while they examine me,” and another (P19) feeling that they “lose a lot of the emotion and obligation from your visits…there is no “I’ll see you next time” to talk about how I have progressed or regressed.” Other responses are more reflective of missed socialization, such as for P27, who says in person visits “feel more personal,” or P26, who “enjoy[s] face to face visits since I have an excellent relationship with my Doctors…just want face to face occasionally,” or simply missing the hands-on care of in-person visits. Similarly, patients expressed lack of body language and not being able to see the provider’s face as a hindrance to virtual care with one patient (P17) stating that “sometimes it’s good and easier to talk when I can see the person’s face.” These responses reflect both a pragmatic difference between in-person versus virtual and also a more intangible loss related to missed socialization and the provider role as caregiver.

4.2.8 Patient themes—video visits

Patients were asked an additional question regarding their interest in video visits if they had not already participated in one. For some, response was positive and showed interest, as in "seems like a great idea…gives more flexibility" (P1), "it would add that personal touch," (P7), "I'd be willing to try it," (P13), and "I would like to try the video visit," (P17). For others, this option was either not feasible due to technology limitations: "I don't have a camera on my monitor," (P9), "I have no means to do it now," (P10), or not preferred for other reasons: "I don't like cameras looking at me for any reason. It's vanity, nothing more or less!" (P14); "cameras…make me feel subconscious about how I look, how my home looks," (P19). Several patients responded that they had tried to have a video visit that had to be converted to a phone visit due to technical reasons, and voiced frustration about this. Others responded that they had already had a video visit and liked it or preferred it to phone visits. Overall, responses indicate willingness or slight preference for video visits, and emphasize the importance of patient preference in the use of telehealth.

4.2.9. Provider themes—medical decision making

Most notable within provider responses to open ended questions was the practical loss of objective data used to make decisions regarding medical treatment. Respondents were nearly unanimous (90%) in noting that they were limited by inability to obtain vital signs, lab work, and perform a physical exam. This was noted to be more of a concern for new patients or those with complex problems, as it's "hard to get a sense of their current state of health," (Pr 9) or problems that may be clinically diagnosed, such as a rash, for which telehealth is not "appropriate or useful" (Pr 5). These statements suggest that an inability to comprehensively evaluate a patient is frustrating for providers and leads to a sense of reduced effectiveness regarding telehealth.

4.2.10 Provider themes—patient-provider relationship

Reponses frequently mentioned less effective communication as well as a lack of physical contact. Providers noted that they are “not able to converse easily with patients,” (Pr1), they “miss the aspect of seeing folks in person,” (Pr2), and that there is “less depth of connection,” (Pr10) or the ability to “employ ‘laying on of hands’, which can have therapeutic benefit,” (Pr 6). These responses convey a sense of loss of human connection in addition to the practical losses of limited physical contact such as inability to perform an exam or obtain labs. These responses may explain lower effectiveness scores as providers may consider a loss of connection as equating to less effective care, regardless of other aspects of telehealth.

4.2.11. Provider themes—role of telehealth

As with patient responses, a theme of provider responses was the appropriate use of telehealth. One provider noted that telehealth is appropriate for “certain types of visits only, follow ups on chronic conditions, minor issues,” (Pr 10), and another that telehealth is “a lot of times equal to in person,” (Pr 8). Providers feel that telehealth can be beneficial for diabetes care specifically, as “for Diabetes, …sometimes it’s even better, because patients often forget to bring their meters or meds to clinic,” (Pr 2), or they are “able to have patients look at their pill bottles and ask any questions during med reconciliation,” (Pr 6). More generally, providers feel that “the visit agenda is often more focused…[patients] seem less likely to get distracted,” (Pr 3), and “patients are able to make use of their time while waiting…less irritated by any delays,” (Pr 6). These statements further highlight the potential benefit of telehealth when appropriately utilized.

5 | Outcomes

5.1 Comparison of findings to literature:

5.1.1. Patient survey results

The results of this exploratory study are largely consistent with those in the literature, with some differences that may be explained by sample size, survey adaptation, or time frame in regard to telehealth experience. Similar to other studies, patients reported general satisfaction or agreeance regarding usability for telehealth, especially regarding convenience, lower scores on the reliability section, in addition to commonly answering these questions as not applicable, and were less likely to agree that it is equivalent to in person care and to voice concerns over the idea of 'something being missed' during a virtual visit (Kalra et al., 2020; Layfield et al., 2020; Shenoy et al., 2020). Technical failures, glitches, and internet bandwidth issues were often cited in the literature as impacting telehealth effectiveness (Knierim et al., 2021), which was reported this study as well. Qualitative themes from this study are also echoed within the literature, including convenience, expressing a desire to be able to be seen in person for more urgent needs or as the patient feels is necessary, and loss of socialization (Banks et al., 2021).

Notably, patients in this study reported lower overall scores for telehealth usability as compared to the literature (Haider et al., 2020; Layfield et al., 2020), though this could be related to numerous factors, including severity of the pandemic at time of survey or type of care, i.e., specialty consult versus primary care visit. However, when compared to Layfield et al. (2020) and patient responses to the question of whether telehealth is as effective as in-person care, the patients at Scappoose Clinic were more likely to agree that it is. This may be due to a change in wording from "the same as" in the original TUQ to "as effective as" in the adapted version, which was done intentionally to avoid literal interpretation, or other differences in patient population or sample size. It is also important to note that many similar studies used immediate post visit surveys or a pre/post intervention type design that may have allowed more precise measurement of telehealth experiences.

5.1.2. Provider survey results

In line with previous studies measuring provider satisfaction with telemedicine during the Covid-19 pandemic, these providers rated telehealth less favorably than patients and were less likely to prefer it over in person visits (Banks et al., 2021; Haider et al., 2020), but had similar attitudes surrounding willingness or desire to continuing using telehealth (Buchalter et al., 2020; Madden et al., 2020). Providers expressed that telehealth was not appropriate for all patient visits, including new patient visits or visits that require more in depth physical examination or complex clinical decision making, but is appropriate for routine follow up visits, a position that is reflected in other survey-based studies and data regarding encounters that require physician presence (Banks et al., 2021; Casares, Wombles, Skinner, Westerveld, & Gireesh, 2020; Jabbarpour, Jetty, Westfall, & Westfall, 2021; Shenoy et al., 2020). When considering effectiveness of telehealth, providers in this study were less likely to view telehealth as equally effective or as adequate of care versus in person care for reasons related to patient relationship, a theme reinforced by a large multi discipline study which found that the transition to telemedicine is more challenging in primary care settings than more technical specialties given more emphasis on relationship building in primary care (Garcia-Huidobro, Rivera, Valderrama Chang, Bravo, & Capurro, 2020). Given such issues, how to best schedule telemedicine visits and ensure appropriate utilization in primary care and chronic disease management is a topic currently being explored through new research.

6 | Recommendations

Utilization of telemedicine in general and virtual visits specifically is of utmost importance in primary care, as it is the largest health care delivery platform with a discordantly low percentage of health care investment, and thus efficiency of care is critical (Devoe & Bazemore, 2021). The

findings from this study support the use of telemedicine in rural primary care, including for patients with diabetes, and highlight the need for some degree of standardization that ensures appropriate use in line with provider expectation while still allowing for incorporation of patient preferences. Given the data from this study and other primary practice setting experiences, policies outlining scheduling practices and self-triaging and scheduling through an EHR patient portal could increase appropriate use and self-efficacy, while also reducing the need to convert visits from virtual to face to face, which can be cumbersome and inefficient (Banks et al., 2021; Judson et al., 2020; Knierim et al., 2021). For patients with diabetes who need routine follow up without anticipated laboratory evaluation, results from these surveys indicate general patient and provider agreeance on utilizing telehealth for this purpose, as it is convenient and may increase ease of reporting glucometer readings and improve medication reconciliation efforts. Additionally, while general recommendations regarding telemedicine may assist development of guidelines, an examination of utilization of virtual visits within this individual practice setting and feasibility of using alternate laboratory services for routine lab work or remote patient monitoring devices, if necessary and appropriate, would likely be beneficial.

Response data and comparable findings within the literature suggest a benefit in increasing the reliability of telehealth in the clinical setting through technological training and support, including in person education or practice champions, which could eliminate or reduce some of types of issues mentioned by respondents; additional qualitative data, such as provider interviews regarding facilitators and barriers to use may be constructive (Knierim et al., 2021). Survey responses also support the use of telephone visits, with some patients preferring phone to video for various reasons or being limited to phone due to lack of equipment or reliable internet, and as such these visits should be reimbursed at the same rate to ensure equity of care. Providing

patients with webcams if they are interested in accessing care through video visits, being knowledgeable about free wireless internet resources, and supporting legislative efforts to expand broadband access and control cost of internet service can help increase availability of video visit feasibility for individual patients, communities, and rural and underserved communities as a whole (Westby, Nissly, Gieseker, Timmins, & Justesen, 2021).

6.1 Limitations:

This study was limited by small sample size and low patient response rates as compared to similar studies. Response bias may also have been a factor for those completing the survey. Additionally, this study did not include an intervention, so it is difficult to gauge impact on diabetes care or outcomes. As such, while patients and providers were asked specifically about disease severity and/or diabetes management, they may have answered questions regarding telehealth visits from a more general standpoint. Patients and providers were given different adapted versions of the TUQ to include patients with low literacy and address provider specific issues such as documentation and efficiency, however this limited comparison. Coding and interpretation of qualitative data was completed by this researcher alone, which reduces reliability of coding; direct quotes were used in this report to better support themes.

Additional limitations of this study include responses regarding usability that may have been influenced by the ongoing Covid-19 pandemic, with an average score of 5.79 for patients and 6.10 for providers when asked if they considered telehealth safer. If and when restrictions are completely lifted, this reason for continuing or preferring telehealth may diminish and affect overall attitudes. Lastly, this study does not examine the issue of inequity in telemedicine, which is particularly relevant for rural areas, and may in fact have included bias in patient selection by sending the survey via the EHR patient portal.

7 | Conclusion:

While there is a growing evidence base suggesting the potential for telehealth to reduce cost and improve outcomes, including for patients with diabetes, much less is known about how to best integrate this modality or how patients and providers have experienced the rapid shift to telemedicine platforms during the Covid-19 pandemic. Given the urgency of the pandemic, large scale transitions to telemedicine that otherwise would have been preceded by pilot studies and extensive planning and organization were implanted rapidly and without the ability to consider which patients or visit types are best served through telemedicine. Understanding how best to provide this care is a means to strengthen the delivery of primary care, although the ideal approach to utilizing this modality may differ based on practice specialty, location, and patient preference.

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Table 1

Demographics Characteristics of Patient Survey Respondents

Gender	Frequency	Percent	Cumulative Percent
Female	18	60.0	60.0
Male	11	36.7	96.7
Non-binary	1	3.3	100.0
Age			
25-34	3	10.0	10.0
35-44	3	10.0	20.0
45-54	7	23.3	43.3
55-64	9	30.0	73.3
65-74	8	26.7	100.0
Race or ethnicity			
AI/AN	1	3.3	3.3
Hispanic	2	6.7	10.0
White/Caucasian	25	83.3	93.3
Prefer not to answer	1	3.3	96.7
Multiple ethnicity/other	1	3.3	100.0
Health Insurance			
Medicaid or OHP	10	33.3	33.3
Medicare	8	26.7	60.0
Private insurance	12	40.0	100.0

Highest level of education			
Some high school, but no degree	2	6.7	6.7
High school diploma or GED	5	16.7	23.3
Some college, no degree	14	46.7	70.0
2-year college degree	4	13.3	83.3
4-year college degree	4	13.3	96.7
Graduate level degree	1	3.3	100.0
Type of internet access			
Broadband	18	60.0	60.0
DSL	7	23.3	83.3
Satellite	2	6.7	90.0
Smartphone only	3	10.0	100.0
Duration of diabetes			
3 mos-1 year	3	10.0	10.0
1-5 years	11	36.7	46.7
>5 years	15	50.0	96.7
unsure	1	3.3	100.0
Diabetes management			
Diet and exercise	3	10.0	10.0
Oral diabetes meds only	16[a]	53.3	63.3
Insulin or injectable meds only	2	6.7	70.0

Oral and injectable meds	9	30.0	100.0
Most recent A1c (if known)			
<7.5	14	46.7	46.7
7.5-9.0	10	33.3	80.0
9.0-11.0	1	3.3	83.3
>11	2	6.7	90.0
Unsure	3	10.0	100.0
Complications of diabetes?			
Yes	9	30.0	30.0
No	16	53.3	83.3
Unsure	5	16.7	100.0

[a] Three participants noted that they took Metformin in addition to diet and exercise.

Table 2

Practice Characteristics of Provider Respondents

Credentials	Frequency	Percentage	Cumulative Percent
MD	6	60	60
NP	2	20	80
PA	2	20	100
Time in Practice, years			
<5	3	30	30
5-10	5	50	80
>10	2	20	1003
Previous telehealth experience			
None at all	3	30	30
A little	6	60	90
A great deal	1	10	100

Appendix A

Eligibility

Patient eligibility was based on age over 18, active diagnosis of diabetes, and active use of MyChart, the patient portal as part of the Epic electronic health record. Beyond chart review to establish eligibility, two patients directly contacted this researcher and decline to participate.

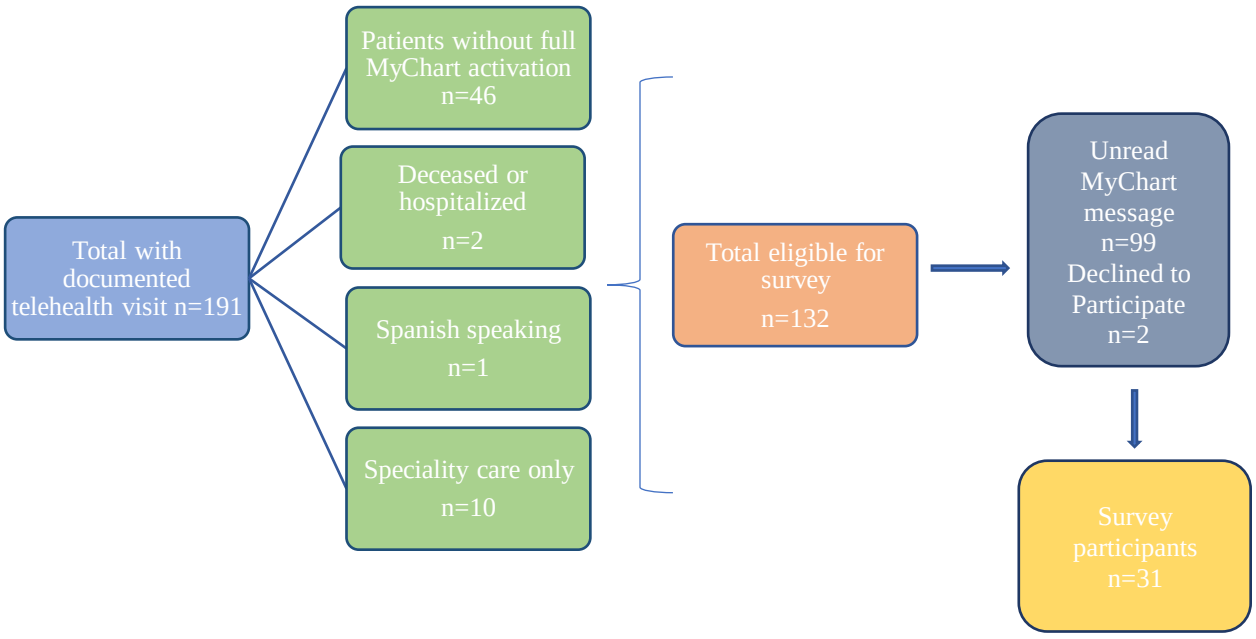

Figure A1. Patient eligibility flowchart

Appendix B

Telehealth Usability Questionnaire Adaptations

The patient version of this survey was adapted from Parmanto et al. (2016), with permission. It was adapted to contain language specific to Scappoose Clinic (e.g., virtual visits, telehealth), omit questions that were not relevant to the setting, to include acceptability of care for diabetes specifically, and to attempt to measure acceptability more accurately. The patient survey was accompanied by a cover letter explaining the purpose of the survey and informing the patient of anonymity of responses and choice to participate. The provider version combines elements of the TUQ with survey questions specific to providers from Madden et al. (2020), also used with permission. The final question from the provider survey regarding interest in video visits was omitted from analysis as all participants had used this technology and thus it did not generate any analyzable data.

Appendix B1. Patient cover letter

Hello,

I am a Nurse Practitioner (NP) and a Doctor of Nursing Practice (DNP) student at Oregon Health and Science University. I am doing a project to see how people with diabetes feel about telehealth visits with their health care provider (Doctor/Physician, Nurse Practitioner, or Physician Assistant) at Scappoose Clinic. Telehealth is when you have your health care visit with your provider over the telephone or video/virtual. This project will help Scappoose Clinic know how to better meet the needs of patients.

You were chosen to join this project because you are a person with diabetes who gets care at Scappoose Clinic, and you have had at least one visit with your provider over the phone or using video within the last six months. The survey linked from this message is anonymous, meaning the answers you give cannot be traced back to you. The survey has three parts and should only take about 10 minutes of your time.

Your choice to join the study is up to you and will not affect your health care in any way. If you would like to complete the survey, please follow this link:
https://www.surveymonkey.com/r/J52CRNY

Thank you very much for your help with my project at Scappoose Clinic.

Sincerely,

Liz Varley, FNP-BC
Doctor of Nurse Practice (DNP) Student
Oregon Health and Science University

Appendix B2. Patient Survey

Usefulness:

1. Telehealth improves my access to diabetes care
2. Telehealth saves me time driving to a hospital or a clinic
3. Telehealth provides for my diabetes care needs

Ease of use:

4. It was simple to set up a phone visit
5. I like using phone or video/virtual visits
6. It was simple to set up a video visit
7. It was easy to learn to use the video visit technology
8. Video visit technology is simple and easy to understand

Effectiveness:

9. I could easily talk to my provider during the virtual visit
10. I felt I was able to express myself as well during the phone or video/virtual visit as I would in person
11. I think a visit provided over the phone is as effective as in person visit
12. I think a visit provided over video is as effective as in person visit

Reliability:

13. If I made a mistake during a phone or video/virtual visit, I could recover easily and quickly

14. I could easily get help to fix problems

Acceptability:

15. I felt comfortable communicating with my provider during my phone or video/virtual visit

16. Phone or video/virtual visit visits are an acceptable way to receive diabetes care

17. I would use phone or video/virtual visits again

18. I prefer phone or video/virtual visits to in person visits

19. The care I receive over phone or video is as good as in person

20. Overall, I am satisfied with phone or video/virtual visits

Covid-19:

21. I am worried about my diabetes care because of the Covid-19 pandemic

22. Using virtual visits is safer for me during the pandemic

Open ended questions:

What do you like about virtual visits, in comparison to in person visits?

What do you dislike about virtual visits, in comparison to in person visits?

If you have not had a video visit, is this something you would like to try? Why or why not?

Appendix B3. Provider Survey

Demographic questions:

Provider type: MD; NP; PA; other (credentials?)

Time in practice*:* <5 years; 5-10 years; >10years

How much experience with telehealth (phone or video/virtual visits) did you have prior to the Covid-19 pandemic?

Usefulness:

1. Telehealth improves access to diabetes care for my patients
2. Telehealth is convenient for my patients
3. Telehealth is convenient for my practice

Ease of use:

4. It is easy to complete a video visit
5. It is easy to complete a phone visit
6. I spent a significant amount of time learning how to use video visit technology
7. I received sufficient technological support regarding use of telehealth visits
8. I needed significant technological support to learn to use video visits technology
9. Phone or video visits require significant preparation time

Effectiveness:

10. My rapport with the patient over phone was the same as it would be in person
11. My rapport with the patient over video was the same as it would be in person
12. I was able to communicate as well with the patient over phone as I would in person
13. I was able to communicate as well with the patient over video as I would in person
14. Using video, I could see the patient as well as if we met in person
15. I think a phone visit is as effective as in person visits
16. I think a video visit is as effective as in person visits

Reliability:

17. Whenever I made a mistake using video, I could recover easily and quickly
18. I could easily get help to fix problems

Satisfaction:

19. Telehealth visits are as efficient as in person visits

20. Telehealth visits allow for the same quality of care as in person care

21. Telehealth visits are an acceptable way to manage diabetes

22. Telehealth visits require more time to complete than in person visits

23. Telehealth visits require more documentation time than in person visits

24. I am motivated to continue using telehealth visits in my practice

Covid-19

25. The Covid-19 pandemic impacted diabetes management for my patients

26. Using telehealth is safer for me during the pandemic

Open ended questions:

27. What do you like about telehealth visits, in comparison to in person visits?

28. What do you dislike about telehealth visits, in comparison to in person visits?

29. If you have not completed a video visit, is this something you would like to incorporate into your practice? Why or why not?