Published in final edited form as:

Health Aff (Millwood). 2018 December ; 37(12): 1940–1947. doi:10.1377/hlthaff.2018.05134.

How Is Telemedicine Being Used In Opioid and Other Substance Use Disorder Treatment?

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Abstract

Only a small proportion of individuals with a substance use disorder (SUD) receive treatment. The shortage of SUD providers, particularly in rural areas, is an important driver of this treatment gap. Telemedicine could be a means of expanding access to SUD treatment. However, several key regulatory and reimbursement barriers to greater tele-SUD use exist, and both the Congress and the states are considering or have recently passed legislation to address these barriers. To inform these efforts, we describe how tele-SUD is currently being used. Using 2010–2017 claims data from a large commercial insurer, we identify characteristics of tele-SUD users and examine how

tele-SUD is being used in conjunction with in-person SUD care. Despite a rapid increase in tele-SUD over the period, we find low use rates overall, particularly relative to the growth in tele-mental health. Tele-SUD is primarily being used as a complement to in-person care and is disproportionately used by those with relatively severe SUD. Given the severity of the opioid epidemic, the low-rates of tele-SUD use that we observe represent a missed opportunity. As availability of tele-SUD is expanded, it will be important to monitor closely which tele-SUD delivery models are being deployed and their impact on access and outcomes.

Approximately 21 million Americans have a substance use disorder (SUD) related to alcohol, opioids, and/or other drugs,¹ and opioid overdose deaths nearly quadrupled from 1999 to 2016.² Drug overdoses are now the leading cause of death for adults age 25–64.³ SUD medications and psychotherapy or counseling are important components of SUD treatment.⁴ However, fewer than one in five individuals with SUD receive treatment.¹ Although many factors play a role in this treatment gap, the shortage of SUD providers, particularly in rural areas, remains an important one.⁵

Telemedicine using remote diagnosis and/or treatment via live video conferencing may be part of the solution. In the treatment of mental illness, telemedicine use is growing dramatically,^{6,7} and its efficacy has been shown to be comparable or even superior to in-person care in multiple randomized trials.^{8–10} While telemedicine's efficacy for treating SUD is less well-documented,^{8,11} the President's Commission on Combating Drug Addiction and the Opioid Crisis and groups including the American Society of Addiction Medicine believe that telemedicine can expand access to SUD treatment.^{12,13} Telemedicine for SUD ("tele-SUD") may facilitate access in areas with few SUD providers or for patients with lack of transportation or physical barriers. It also may help address privacy concerns for those with SUD.

Currently, regulatory and reimbursement barriers limit use of tele-SUD. For instance, Medicare regulations allow coverage of telemedicine visits only for those accessing care in rural areas, and patients receiving telemedicine must be hosted at a local clinic or other health care facility (i.e., patients cannot receive the visit in their homes). Perhaps more important, the Ryan Haight Online Pharmacy Consumer Protection Act of 2008 restricts the prescribing of controlled substances (including buprenorphine, which is one of the only evidence-based medications for treating opioid use disorders (OUD)) via telemedicine. Recognizing the potential role of telemedicine in combating the opioid epidemic, Congress has been considering several bills over the past few months that would address reimbursement and regulatory barriers to tele-SUD access.^{14,15}

Despite the potential for tele-SUD, little is known about how telemedicine is already being used for SUD treatment. Which populations is it reaching and are those who receive it primarily in rural areas? Is it being used by psychiatrists, primary care physicians, counselors, or psychologists? Is tele-SUD being used as an adjunct to in-person care or as the only way patients are getting SUD treatment? Are tele-SUD visits primarily for psychotherapy and counseling or for other purposes, such as initial evaluation or management of SUD medications? To fill this knowledge gap and to inform tele-SUD policy by state legislatures, Congress, health systems, and health plans, we describe the use of tele-

SUD among commercially-insured individuals with a diagnosis of SUD, compare its use to that of telemedicine for mental health (i.e., “tele-MH”), and discuss how tele-SUD is being used in conjunction with in-person SUD care.

Methods

The study involves a retrospective analysis of 2010–2017 claims data from the OptumLabs® Data Warehouse (OLDW), which includes de-identified claims data for privately-insured and Medicare Advantage enrollees in a large, private, U.S. health plan.¹⁶ The plan provides comprehensive full insurance coverage for physician, hospital, and prescription drug services. We focused on individuals age 12 and older with a primary or secondary diagnosis of SUD (ICD-9 291–292, 303, 304, 305.0, 305.2–305.7, 305.9; ICD-10: F10-F19) during the study period (n=1,914,821 unique individuals). The person-year was the unit of analysis, and our analyses included all person-year observations in which the age and diagnostic criteria above were met (n=2,550,047 person-years). During the study period, tele-SUD and tele-MH visits were generally covered under the behavioral health benefit if delivered by a behavioral health specialist¹⁷ and under the medical benefit if delivered by a non-behavioral health specialist such as an internist or family medicine physician.¹⁸ There was no distinction in patient out-of-pocket cost requirements between telemedicine and in-person behavioral health visits.

Identifying Tele-SUD Visits.

We identified all telemedicine visits in two ways: First, we looked for Healthcare Common Procedure Coding System (HCPCS) codes for outpatient or inpatient visits that have a telemedicine specific modifier code (GT, GQ, or 95. Second, we identified telemedicine-specific procedural codes of G0425–7 (telehealth consultations emergency department or initial inpatient); G0406–8 (follow-up inpatient or skilled nursing facility consultations via telehealth); and G0459 (pharmacologic management service furnished via telehealth to inpatients). Claims with a GQ modifier indicate “asynchronous” interactions between the clinician and patient (i.e., interactions where the patient submits information and the provider responds when they have time), while the other codes mentioned above indicate “synchronous” (i.e., live video) interactions.

SUD treatment was judged to be the primary focus of a telemedicine visit (and thus the visit was a “tele-SUD” visit) if the telemedicine claim had a primary diagnosis of SUD; similarly, we considered a telemedicine visit to be primarily a tele-MH visit if the claim for the visit had a primary diagnosis of mental illness (ICD9 295–302, 306–309, 311–316; ICD10 F20–F69, F80–F99). In a sensitivity analysis, we broadened the definition of a tele-SUD visit to include all telemedicine visits with a SUD diagnosis in any diagnosis field. We used place of service codes to identify tele-SUD visits delivered in inpatient (including hospitals, skilled nursing facilities, and emergency departments) versus outpatient settings, and CPT codes to distinguish psychotherapy visits from other types of tele-SUD care.

Defining Enrollee Characteristics.

We defined several patient and regional characteristics of enrollees diagnosed with SUD, including: age category, sex, diagnosis of moderate or severe SUD, diagnosis of OUD, diagnosis of alcohol use disorder, diagnosis of SUD besides OUD or alcohol use disorder, diagnosis of co-occurring severe mental illness (defined by having at least one hospitalization or 2 ambulatory visits on different service dates and in any diagnostic field in the claims for schizophrenia and psychotic disorders, bipolar disorder, or major depression), rural residence (created using the Rural-Urban Commuting Area (RUCA codes), region (Northeast, South, Midwest, West), Medicare Advantage enrollee (yes/no), and quartile of U.S. median household income for ZIP code of residence. See Appendix for details on diagnostic coding.¹⁹

Identifying Non-Telemedicine SUD Services.

We also captured the following non-telemedicine SUD services: inpatient SUD care; “intermediate” care (i.e., partial hospitalization, which is a structured program of intensive outpatient treatment intended to serve as an alternative to inpatient care, and residential care, which provides a structured treatment program in a 24-hour residential setting); in-person ambulatory visits; and SUD-specific medications such as buprenorphine. We used HCPCS/ Current Procedural Terminology (CPT) codes to identify in-person ambulatory visits and revenue codes to identify intermediate services; if the claim for a service had a primary diagnosis of SUD, the service was considered a SUD service. We used National Drug Codes (NDCs) in pharmacy claims and HCPCS codes for medication administration for drugs administered in office settings in outpatient claims to identify medications approved by the FDA for SUD treatment: buprenorphine (OUD), methadone (OUD), naltrexone (OUD and alcohol use disorder), acamprosate (alcohol use disorder), and disulfiram (alcohol use disorder). We also identified claims with a diagnosis of SUD poisoning. See Appendix for additional information on codes used.¹⁹

Analyses.

We first calculated the number of tele-SUD visits, the number of tele-MH visits, and the share of all telemedicine visits that tele-SUD and tele-MH visits represented over the period 2010–2017. As a sensitivity analysis, we also calculated the number of tele-SUD visits using the broader definition of a SUD diagnosis in any diagnosis field (as opposed to the primary diagnosis only). Next, we compared characteristics of individuals diagnosed with SUD during a given year who did and did not use tele-SUD during that year, using chi-squared tests. To identify factors associated with tele-SUD use, we estimated a multivariable logistic regression model of the likelihood of using at least one tele-SUD visit during the calendar year among individuals diagnosed with SUD, clustering the standard errors to account for the fact that some enrollees had more than one calendar year with a SUD diagnosis (22% of person-years were for individuals who had a SUD diagnosis in more than one year).

To understand how tele-SUD is used in conjunction with other SUD services among individuals with SUD, we compared the use of non-telemedicine SUD services among those who did and did not use tele-SUD. Because of the different regulatory environment for telemedicine care of OUD (due to the Ryan Haight Act) and the opioid epidemic, we

conducted a secondary analysis that examined use of these non-telemedicine SUD services just for the subset of individuals diagnosed with OUD during the year. We also used provider specialty codes in the claims to identify the types of clinicians delivering tele-SUD.

Limitations.

There are several limitations to our analysis. First, although we study tele-SUD among members of one of the largest insurers in the U.S., our results may not be generalizable to other insured populations, such as those enrolled in Medicaid or other forms of public insurance. Second, because SUD is often under-coded in administrative claims data, we have likely underestimated the provision of tele-SUD and other SUD services in this population. Similarly, because we relied on diagnosis codes in claims data to identify individuals with SUD, we are unable to examine individuals with SUD whose disorder was not identified and coded in claims. Third, due to our reliance on claims data to identify tele-SUD use, we are unable to observe any tele-SUD visits that were not submitted by the provider for reimbursement or were miscoded as an in-person visit. Fourth, due to 2013 changes in CPT codes for outpatient visits, we cannot determine the proportion of tele-SUD visits that focused on medication management throughout the study period. We distinguish between psychotherapy visits and other provider visits, but we do not know at which non-psychotherapy visits medication management occurred. Finally, because claims data do not include information on whether an illness is disabling, our definitions of severe SUD and severe mental illness rely on diagnostic coding by clinicians and may underestimate the number of enrollees with more severe presentations of these conditions.

Results

The number of tele-SUD visits used by enrollees from a large national health plan who were diagnosed with SUD increased quickly over the period, from 97 in 2010 (or 0.62 visits per 1000 individuals diagnosed with SUD) to 1,989 (or 3.05 visits per 1000 individuals diagnosed with SUD) in 2017 (Exhibit 1). However, despite the rapid increase, tele-SUD visits accounted for a very small share (just 1.4%) of all telemedicine visits (i.e., for any health condition) reimbursed over the eight-year study period, and an even smaller share of all SUD (i.e., tele-SUD and non-tele-SUD) visits (0.1%) (data not shown). In contrast, the total number of tele-MH visits ranged from 2,039 (or 0.91 visits per 1000 individuals diagnosed with a mental illness) in 2010 to 54,175 (or 16.59 visits per 1000 individuals diagnosed with a mental illness) in 2017, accounting for 34.5% of all telemedicine visits over the study period. In a sensitivity analysis that broadened the definition of a tele-SUD visit to include telemedicine visits with a SUD diagnosis in any diagnosis field, tele-SUD visits still accounted for just 2.6% of all telemedicine visits over the period (see Appendix Exhibit A.2 for results).¹⁹

Of the tele-SUD visits, 81.3% were delivered in outpatient settings (data not shown). Approximately 14.5% of tele-SUD visits were psychotherapy visits, 41.7% were initial evaluations for a new patient, 32.9% were established patient visits, and 10.9% were unspecified services (data not shown). Only 0.2% of tele-SUD visits were asynchronous interactions (data not shown).

Among individuals who used tele-SUD, most (54.8%) were men and just over half (54.3%) were under age 40 (Exhibit 2). Tele-SUD users were more likely to have a more severe SUD diagnosis than individuals with SUD who did not use tele-SUD visits (87.8% vs. 38.7% had moderate or severe SUD, respectively, $p<0.01$). Tele-SUD users were also more likely to have an OUD diagnosis (46.1% vs. 18.4% of non-tele-SUD users, $p<0.01$) and a diagnosis of severe mental illness (55.7% versus 19.5% of non-tele-SUD users, $p<0.01$). Tele-SUD users were more likely to live in rural areas than non-tele-SUD users (7.7% vs. 5.7%, respectively, $p<0.01$) and more likely to live in areas with a median household income in the upper two quartiles than non-tele-SUD users ($p<0.01$). These differences between tele-SUD users and non-users were largely echoed in our multivariable logistic model (see Appendix Exhibit A.3 for multivariable regression results).¹⁹

Among individuals who used tele-SUD during a calendar year, the median number of tele-SUD visits was 1 (mean=1.6) (data not shown). Almost all tele-SUD users (99.0%) also had at least one in-person SUD ambulatory visit in the year that they used tele-SUD (Exhibit 3). The median number of in-person SUD ambulatory visits for tele-SUD users in a given year was 10, compared with 4 for non-tele-SUD users ($p<0.01$); 23.2% of tele-SUD users had any SUD medication use during the year, versus 6.7% of non-tele-SUD users ($p<0.01$). Almost two-thirds (64.1%) of tele-SUD users used SUD inpatient care (versus 26.1% for non-tele-SUD users, $p<0.01$), 27.7% used SUD intermediate care (vs. 5.5%, $p<0.01$), and 3.0% had a poisoning claim (versus 1.5%, $p<0.01$).

Among the subset of individuals diagnosed with OUD, the median number of tele-SUD visits was also 1 (mean=2) (data not shown). The median number of in-person SUD ambulatory visits for tele-SUD users with OUD was 11, compared with 5 for non-tele-SUD users with OUD ($p<0.01$) (Exhibit 3). Tele-SUD users diagnosed with OUD also had higher rates of using other SUD services than non-tele-SUD users with OUD. For instance, more than half (64.2%) of tele-SUD users had SUD inpatient use during the year relative to 31.3% of non-users ($p<0.01$), 33.1% had intermediate SUD service use versus 12.2% of non-tele-SUD users ($p<0.01$), and 38.1% of tele-SUD users received an OUD medication versus 26.7% of non-users ($p<0.01$).

A variety of clinician types provided tele-SUD services, with 29.2% of visits delivered by psychiatrists, 45.6% by family practice/internal medicine physicians, 1.4% by psychologists, and 11.8% by social workers (Exhibit 4). The clinicians for in-person SUD visits were different, with 18.3% of non-telemedicine SUD visits delivered by psychiatrists, 25.5% by family practice/internal medicine physicians, 15.0% by psychologists, and 27.3% by social workers. The clinical mix for tele-MH visits was also different, with almost half (49.4%) of tele-MH visits delivered by psychiatrists (Exhibit 4).

Results were generally similar for the sensitivity analysis that broadened the definition of tele-SUD to include all telemedicine visits with a SUD diagnosis in any diagnosis field (See Appendix Exhibits A.4–A.6 for results).¹⁹

Discussion

We found rapid growth – increasing by almost a factor of 20 – in the number of tele-SUD visits used in a commercially-insured population over the period 2010–2017. However, the rate of tele-SUD visits per 1000 patients with SUD in 2017 was quite low and much lower than the use of tele-MH, the most common form of live video telemedicine.⁶

While there has been much attention focused on the potential for tele-SUD to increase access to care, how exactly tele-SUD should be used is often not articulated. There are several possible models, and our results help inform which are currently more common in this commercially-insured population. In one model, a patient who cannot access any local SUD treatment uses telemedicine to receive all SUD care. This is currently rare in our data. Almost all (99.0%) individuals who used tele-SUD care also used in-person SUD ambulatory visits. Also, the median number of telemedicine visits among tele-SUD users was 1, suggesting that most tele-SUD users were not receiving intensive services via telehealth.

In a second model, a primary care physician (PCP) prescribes SUD medications and monitoring during in-person visits while the patient receives SUD counseling from a non-physician located outside the community via telemedicine.²⁰ We found only 14.5% of tele-SUD visits were for psychotherapy, suggesting that this is less common currently.

In a third model, a physician with expertise in addiction treatment may perform an initial assessment and/or initially prescribe SUD medication via telemedicine, while local clinicians provide counseling and follow up in person. We found that 75% of tele-SUD visits were provided by a physician versus just 44% of non-telemedicine SUD ambulatory visits, suggesting this model might be more prevalent. There is also the question of which patients are targeted. It appears that tele-SUD may often be used to facilitate follow-up or support patients in recovery after intensive inpatient or outpatient treatment for SUD. Tele-SUD users as a group appeared to be more severely ill, with higher rates of more severe SUD and of severe mental illness, than individuals diagnosed with SUD who do not use tele-SUD. Tele-SUD users were more also likely to use intensive levels of SUD care, including inpatient and intermediate services, than non-tele-SUD users. Given the rapidly changing policy environment, with both for-profit and non-profit providers among those considering the implementation of tele-SUD, new models of tele-SUD might emerge quickly. It will be important to closely monitor patterns of tele-SUD patterns as this care option evolves.

Policy implications

The Ryan Haight Act was implemented to regulate online internet pharmacies in response to the death of a teenager who died of an overdose from an opioid pain medication that he obtained online without meeting with a clinician. The law generally requires a physician to examine a patient in person before prescribing a controlled substance, such as buprenorphine. There are currently several exceptions to this requirement that allow for prescribing via telemedicine such as if the patient is located in a Drug Enforcement Agency (DEA)-registered hospital or clinic and the prescribing clinician is interacting with the patient at another location through a live video feed, or, under certain circumstances, if a

local clinician writes the prescription under the supervision/recommendation of a clinician conducting the evaluation via telemedicine. However, given reports of clinicians and the low rates of tele-SUD use we observe, this requirement may remain a key barrier to treatment of OUD via telemedicine.^{21,22}

Over the past several months, there has been considerable legislative interest in the Congress in expanding tele-SUD. Both the House of Representatives and Senate recently passed the Substance Use-Disorder Prevention that Promotes Opioid Recovery and Treatment (SUPPORT) for Patients and Communities Act, which is awaiting the President's signature. SUPPORT allows telemedicine providers to register with the DEA to prescribe controlled substances such as buprenorphine without an in-person exam first. The legislation would eliminate current Medicare requirements that patients receiving telemedicine be hosted at a rural clinical site, allowing patients to receive such services in their home. Finally, the Center for Medicare and Medicaid services must provide guidance to states on how tele-SUD can be used within the Medicaid program.

Our results have implications for this and other similar efforts to increase access to tele-SUD. First, the low rates of tele-SUD use among individuals diagnosed with SUD in this population are in contrast to the much higher rates (more than five times higher in 2017) of tele-MH use among individuals diagnosed with mental illness. The low tele-SUD rates represent a missed opportunity in the context of the opioid epidemic and support the need for legislation such as SUPPORT to address regulatory barriers for use of tele-SUD.

Second, many policymakers and clinicians hope that tele-SUD will expand access to SUD services for individuals without SUD services in their community, with a particular interest in rural communities.^{12,13,23} We had mixed findings on whether tele-SUD is reaching these underserved patients. While rates of tele-SUD use were higher among rural residents than non-rural residents, the vast majority of patients who received tele-SUD lived in urban areas. Further, tele-SUD was also more common in areas with relatively higher median household income than areas with lower median household income. This is in contrast to prior research on tele-MH use, where tele-MH use was greatest in poorer communities.^{6,7} These findings emphasize that we should not assume that expanding access to tele-SUD will preferentially help underserved populations. Close monitoring of who receives tele-SUD is important, and targeted interventions to increase access in rural areas may be needed.

Third, inherent in the idea that tele-SUD will increase access to treatment in communities with few SUD treatment resources is that some patients may receive SUD treatment only through telemedicine. However, we find that tele-SUD is currently being used almost exclusively to complement in-person SUD care and not as a full substitute in this commercially-insured population. This does not imply it is not of value, however. Tele-SUD may ease access to follow up for disadvantaged populations or provide access to a specific type of SUD treatment that may be unavailable in person in their community. Nevertheless, tele-SUD alone may be insufficient to meet the need for SUD treatment in many communities, and it may be important to have local providers with some expertise in SUD treatment who can work closely with distant providers.

Fourth, expanded access to tele-SUD alone is unlikely to address the fact that there are not enough addiction medicine specialists. Our finding that PCPs make up a larger fraction of tele-SUD visits (46%) than in-person SUD visits (26%) is therefore encouraging in that it suggests that PCPs can play a key role in the provision of tele-SUD. Care models that incorporate tele-SUD care may depend on having primary care physicians deliver SUD treatment, in particular prescribing medications. Models like Project ECHO (Extension for Community Healthcare Outcomes), which use teleconferencing to facilitate training and support from addiction medicine specialists to primary care physicians in underserved areas, may be needed to expand the addiction workforce even if barriers to tele-SUD are lessened.

It remains unclear whether expanded use of tele-SUD will improve outcomes and/or decrease spending. While there are some data from individual programs that suggest that tele-SUD may save money by substituting for inpatient SUD spending,²⁵ no large-scale or rigorous studies have examined the cost-effectiveness of tele-SUD as used in real-world settings. Easing restrictions on tele-SUD could lead to overuse of this technology, resulting in increased SUD spending without sufficient clinical benefit.²⁶ Studies of the effectiveness and cost-effectiveness of different SUD treatment models that incorporate tele-SUD are needed to guide state and federal policymakers as they consider future legislation and regulation, and to guide clinicians and health systems considering adoption of tele-SUD. Also, additional study of the different care models that incorporate telehealth into SUD treatment across a range of study populations (i.e., not just those with private insurance) is needed to fully understand the implementation and diffusion of this new treatment technology.

Conclusion

Despite the enormous unmet need for SUD treatment, we find relatively low use of tele-SUD in this commercially-insured population. This is in contrast to tele-MH, which is used much more commonly. Our findings suggest that tele-SUD does not currently serve as a substitute for in-person care that expands the number of individuals receiving SUD treatment in the population studied. However, such care could improve treatment engagement and outcomes by providing additional sources or types of SUD treatment that could help patients overcome transportation, distance, or stigma barriers. Legislative and regulatory changes being considered by Congress, particularly those that could facilitate prescribing of OUD medications via telemedicine, could alter care models that incorporate tele-SUD and expand access to SUD care particularly in rural areas.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Ahrnsbrak R, Bose J, Hedden SL, Lipari RN, Park-Lee E. Key substance use and mental health indicators in the United States: Results from the 2016 National Survey on Drug Use and Health [Internet]. Rockville MD: Substance Abuse and Mental Health Services Administration

- (SAMHSA); 2017 9 [cited 2018 Jun 22]. Available from: <https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR1-2016/NSDUH-FFR1-2016.htm#tx>
2. Centers for Disease Control and Prevention. Overview of an epidemic [Internet]. Atlanta GA: Centers for Disease Control and Prevention; 2017 7 18 [cited 2018 Jun 22]. Available from: <https://www.cdc.gov/drugoverdose/data/index.html>
 3. Centers for Disease Control and Prevention. 10 Leading Causes of Injury Deaths by Age Group Highlighting Unintentional Injury Deaths, United States – 2016 [Internet]. Atlanta GA: Centers for Disease Control and Prevention; 2016 [cited 2018 Sep 21]. Available from: https://www.cdc.gov/injury/images/lc-charts/leading_causes_of_death_highlighting_unintentional_2016_1040w800h.gif
 4. American Society of Addiction Medicine (ASAM). The ASAM National Practice Guideline for the Use of Medications in the Treatment of Addiction Involving Opioid Use [Internet]. Chevy Chase MD: American Society of Addiction Medicine; 2015 [cited 2018 May 24]. Available from: <https://www.asam.org/docs/default-source/practice-support/guidelines-and-consensus-docs/asam-national-practice-guideline-supplement.pdf>.
 5. Browne T, Priester MA, Clone S, Iachini A, DeHart D, Hock R. Barriers and facilitators to substance use treatment in the rural south: a qualitative study. *J Rural Health*. 2016 Winter; 32(1): 92–101. [PubMed: 26184098]
 6. Mehrotra A, Huskamp HA, Souza J, Uscher-Pines L, Rose S, Landon BE, et al. Rapid growth in mental health telemedicine use among rural Medicare beneficiaries, wide variation across states. *Health Aff (Millwood)*. 2017 5 1; 36(5):909–17. [PubMed: 28461359]
 7. Barnett ML, Ray KN, Souza J, Mehrotra A. Diffusion of telemedicine in a large commercially insured population [working paper]. 2018.
 8. Chakrabarti S Usefulness of telepsychiatry: A critical evaluation of videoconferencing-based approaches. *World J Psychiatry*. 2015 9 22; 5(3):286–304. [PubMed: 26425443]
 9. Hilty DM, Ferrer DC, Parish MB, Johnston B, Callahan EJ, Yellowlees PM. The effectiveness of telemental health: A 2013 review. *Telemed J E Health*. 2013 6; 19(6):444–54. [PubMed: 23697504]
 10. Fortney JC, Pyne JM, Mouden SB, Mittal D, Hudson TJ, Schroeder GW, et al. Practice-based versus telemedicine-based collaborative care for depression in rural federally qualified health centers: a pragmatic randomized comparative effectiveness trial. *Am J Psychiatry*. 2013 4; 170(4): 414–25. [PubMed: 23429924]
 11. Eibl JK, Gauthier G, Pellegrini D, Daiter J, Varenbut M, Hogenbirk JC, et al. The effectiveness of telemedicine-delivered opioid agonist therapy in a supervised clinical setting. *Drug Alcohol Depend*. 2017 7 1; 176:133–38. [PubMed: 28535455]
 12. The President’s Commission on Combating Drug Addiction and the Opioid Crisis. Final Report [Internet]. Washington DC: The White House; 2017 [cited 2018 Jun 22]. Available from: https://www.whitehouse.gov/sites/whitehouse.gov/files/images/Final_Report_Draft_11-1-2017.pdf
 13. Barton C Telemedicine and Addiction Medicine [internet]. Rockville MD: American Society of Addiction Medicine; 2018 2 5 [cited 2018 Sept 27]. Available from: <https://www.asam.org/advocacy/news/asam-advocacy-blog/2018/02/05/telemedicine-and-addiction-medicine>
 14. Wicklund E Congress turns to telemedicine to take on substance abuse epidemic [internet]. *mHealth Intelligence*; 2018 3 5 [cited 2018 Jun 22]. Available from: <https://mhealthintelligence.com/news/congress-turns-to-telemedicine-to-take-on-substance-abuse-epidemic>
 15. Wicklund E Senators target Medicaid in telehealth bills tackling opioid abuse [internet]. *mHealth Intelligence*; 2018 5 23 [cited 2018 Jun 22]. Available from: <https://mhealthintelligence.com/news/senators-target-medicare-in-telehealth-bills-tackling-opioid-abuse>
 16. OptumLabs. OptumLabs and OptumLabs Data Warehouse (OLDW) Descriptions and Citation [PDF. Reproduced with permission from OptumLabs]. Cambridge MA: n.p.; 2018 2.
 17. Optum. Telemental Health Portal [Internet]. Optum; 2017 [cited 2018 Sep 21]. Available from: <https://www.providerexpress.com/content/dam/ope-provexpr/us/pdfs/clinResourcesMain/tmh/tmhFAQ.pdf>
 18. UnitedHealthcare. Telehealth and Telemedicine Policy [Internet]. United HealthCare Services, Inc; 2018 [cited 2018 Sep 21]. Available from: <https://www.uhcprovider.com/content/dam/provider/docs/public/policies/comm-reimbursement/COMM-Telehealth-and-Telemedicine-Policy.pdf>

19. To access the Appendix, click on the Appendix link in the box to the right of the article online.
20. Forman E Telemedicine for addiction treatment? Picture remains fuzzy [Internet]. Kaiser Health News; 2017 12 14 [cited 2018 Jun 22]. Available from: <https://khn.org/news/telemedicine-for-addiction-treatment-picture-remains-fuzzy/>
21. Yang YT, Weintraub E, Haffajee RL. Telemedicine's role in addressing the opioid epidemic. Mayo Clin Proc. 2018 9; 93(9): 1177–1180. [PubMed: 30097301]
22. American Society of Addiction Medicine (ASAM). Testimony of David Kan before the Energy and Commerce Subcommittee on Health, 2018 2 28 [internet]. American Society of Addiction Medicine; 2018 [cited 2018 Sep 27]. Available from: <https://docs.house.gov/meetings/IF/IF14/20180228/106915/HHRG-115-IF14-Wstate-KanD-20180228.pdf>
23. Substance Abuse and Mental Health Services Administration (SAMHSA). Rural Behavioral Health: Telehealth Challenges and Opportunities [internet]. Rockville MD: Substance Abuse and Mental Health Services Administration; 2016 [cited 2018 Sep 27]. Available from: <https://store.samhsa.gov/shin/content/SMA16-4989/SMA16-4989.pdf>
24. Arora S, Thornton K, Murata G, Deming P, Kalishman S, Dion D, et al. Outcomes of treatment for Hepatitis C virus infection by primary care providers. N Engl J Med. 2011 6 9; 364(23):2199–207. [PubMed: 21631316]
25. Snyder K TeleSUD [webinar slides].SAMHSA-HRSA Center for Integrated Health Solutions Webinar on Enhancing Tele-SUD Treatment in Rural Areas; 2018 5 22 [cited 2018 Jun 22].
26. Medicaid and CHIP Payment and Access Commission (MACPAC). Report to Congress on Medicaid and CHIP [Internet]. Washington DC: Medicaid and CHIP Payment and Access Commission (MACPAC); 2018 3 [cited 2018 Jun 22]. Available from: <https://www.macpac.gov/wp-content/uploads/2018/03/Report-to-Congress-on-Medicaid-and-CHIP-March-2018.pdf>

Exhibit 1.

Number of Tele-SUD Visits Per 1000 Individuals Diagnosed with SUD and Number of Tele-MH Visits Per 1000 Individuals Diagnosed with Mental Illness, By Year

SOURCE: Authors' analysis of 2010–2017 claims data from the OptumLabs® Data

Warehouse (OLDW). Note: Tele-SUD visits had a primary diagnosis of SUD and tele-MH visits had a primary diagnosis of mental illness.]

Exhibit 2**Characteristics of Persons Diagnosed with SUD who Did and Did Not Receive a Tele-SUD Visit, 2010–2017**

	Received Tele-SUD Visit (N=3,171)	Did Not Receive Tele-SUD Visit (N=2,550,047)	P-Value
Age category			
12–19	5.9%	6.0%	
20–29	27.9%	18.0%	
30–39	21.0%	16.1%	
40–49	20.4%	17.0%	
50–59	15.5%	19.9%	
60–69	7.1%	14.2%	
70+	2.3%	8.8%	< .01
Female	38.8%	43.1%	<.01
Any Opioid Use Disorder Diagnosis	46.1%	18.4%	< .01
Any Alcohol Use Disorder Diagnosis	61.2%	36.3%	< .01
Any SUD Diagnosis besides Alcohol or Opioid Use Disorder	53.4%	24.9%	< .01
Any moderate/severe SUD Diagnosis	87.8%	38.7%	< .01
Any Severe Mental Illness Diagnosis	55.7%	19.5%	< .01
Rural	7.7%	5.7%	< .01
Region			
Northeast	3.9%	13.0%	
Midwest	18.7%	27.3%	
South	62.2%	45.0%	
West	15.2%	14.8%	< .01
Household Income categories			
Q1 (Low)	19.0%	22.2%	
Q2	22.9%	28.0%	
Q3	29.9%	23.5%	
Q4 (High)	28.2%	26.3%	< .01
Medicare Advantage Enrollee	10.5%	20.2%	< .01

Source: [Authors' analysis of 2010–2017 claims data from the OptumLabs® Data Warehouse (OLDW).]

Note: [Unit of analysis is person-year and as noted in the text, a small fraction of individuals are seen in data in multiple years. Tele-SUD visits had a primary diagnosis of SUD.]

Exhibit 3:

During a Given Year, Use of Non-Telemedicine SUD Services among Individuals Diagnosed with Any Substance Use Disorder (SUD) and Individuals Diagnosed with Opioid Use Disorder Who Did and Did Not Receive Tele-SUD Visits

	Individuals with Any Substance Use Disorder (SUD)		Individuals with Opioid Use Disorder (OUD)	
	Received Tele-SUD Visit (N=3,171)	Did Not Receive Tele-SUD Visit (N=2,550,047)	Received Tele-SUD Visit (N=1,376)	Did Not Receive Tele-SUD Visit (N=417,758)
Used any in-person SUD ambulatory visits	99.0%	51.3%	99.9%	73.6%
Among those with any in-person SUD ambulatory visits, median number of those visits	10 (5,19)	4 (2, 11)	11 (6, 21)	5 (2, 12)
Used any tele-MH visits	11.3%	0.4%	11.4%	0.3%
Used any SUD intermediate care	27.7%	5.5%	33.1%	12.2%
Used any SUD inpatient care	64.1%	26.1%	64.2%	31.3%
Had any claims for poisoning	3.0%	1.5%	4.7%	3.4%
Used any SUD medications *	23.2%	6.7%	38.1%	26.7%

Source: [Authors' analysis of 2010–2017 claims data from the OptumLabs® Data Warehouse (OLDW).]

Note: [Unit of analysis is person-year and as noted in the text, a small fraction of individuals are seen in data in multiple calendar years. All differences between the group of individuals who received a tele-SUD visit and the group of individuals who did not were statistically significant at the $p < 0.01$ level.]

* for patients with OUD, we focused only on medications specific to OUD disorder

Exhibit 4:

Types of Clinicians Delivering Tele-SUD Visits, Tele-MH Visits, and Non-Telemedicine (Non-TM) SUD Ambulatory Visits, 2010–2017

Source: [Authors' analysis of 2010–2017 claims data from the OptumLabs® Data Warehouse (OLDW).]

Note: [Tele-SUD visits and non-telemedicine SUD ambulatory visits have a primary diagnosis of SUD; tele-MH visits have a primary diagnosis of mental illness.]