



Improving Rural Health Through Telehealth-Guided Provider-to-Provider Communication

Executive Summary



Main Points

- **Use of Provider-to-Provider Telehealth for Rural Populations:** Limited research from regional and national surveys and claims data suggest that telehealth for provider-to-provider communication is used to different extents across location for specific clinical care uses such as psychiatry, emergency, and stroke care. Use was increasing even before the COVID-19 pandemic and this seems likely to continue, though research evaluating new and increased use has yet to be published.
- **Effectiveness of Provider-to-Provider Telehealth for Rural Populations:**
 - Telehealth to support direct patient care may provide benefits for inpatient care, for neonates in rural hospitals, outpatient management of depression and diabetes, and emergency care of stroke/heart attack/chest pain and trauma.
 - Evidence on other uses, outcomes, or populations was insufficient to support conclusions. No studies reported harms or unexpected negative outcomes for provider-to-provider telehealth.
 - Use of telehealth for provider education and mentoring, including programs like Extension for Community Healthcare Outcomes (ECHO) that use video for instruction and collaboration, may improve patient outcomes, change provider behavior, and increase provider knowledge and confidence in treating specific conditions.

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- **Barriers and Facilitators to Implementation of Provider-to-Provider Telehealth for Rural Populations:** Inadequate provider time, technology, and other resources, as well as limited understanding of the rural context and lack of long-term commitments to telehealth are barriers to broader implementation of provider-to-provider telehealth in rural settings. Telehealth implementation was facilitated when there were sufficient resources, access to knowledge, engagement of leadership and the program addressed patient needs.
- **Methodological Weakness of Studies:** Effectiveness and implementation studies frequently employed less rigorous designs, had small sample sizes, and often did not minimize bias through design or analyses.



Background and Purpose

Numerous studies have documented health disparities for people living in rural areas.¹ Rural populations experience higher mortality²⁻⁵ and morbidity from a wide range of conditions including substance/opioid abuse,^{6, 7} chronic illnesses,⁸⁻¹¹ and HIV/human papillomavirus and other infectious diseases.^{12, 13} The purpose of this review is to identify, summarize, and evaluate the research available on whether telehealth supporting provider-to-provider communication and collaboration can contribute to addressing these disparities and improving the health and well-being of rural communities. The review was commissioned by the National Institutes of Health (NIH) Office of Disease Prevention to inform a Pathways to Prevention workshop, *Improving Rural Health Through Telehealth-Guided Provider-to-Provider Communication*, that was held on October 12-14, 2021 (<https://prevention.nih.gov/research-priorities/research-needs-and-gaps/pathways-prevention/improving-rural-health-through-telehealth-guided-provider-provider-communication>).



Methods

The Key Questions guiding the systematic evidence review were developed by an NIH working group and revised through a topic refinement process. We employed methods consistent with those outlined in the Agency for Healthcare Research and Quality Evidence-based Practice Center Program methods guidance (<https://effectivehealthcare.ahrq.gov/topics/ceer-methods-guide/overview>). Our search included articles published from January 1, 2010, through October 12, 2021. Detailed methods, including the search strategies, are included in the full report and appendixes.



Results

We identified 166 studies reported in 179 publications that addressed the use, effectiveness, implementation of telehealth designed to support provider-to-provider

interactions. The extent to which these studies are able to answer each of the questions posed is summarized below.

Key Question 1. What is the uptake of different types of provider-to-provider telehealth in rural areas?

- We did not identify any surveys or national datasets that provided overall counts or estimates of provider-to-provider telehealth usage in the United States.
- Seven published reports provide data from surveys and claims data about rural use of telehealth for specific clinical uses. Examples are: reported rates of use of telepsychiatry (29.2% by U.S. mental health providers), telehealth in emergency care (54% of emergency departments in the United States), and telestroke (8.6 per 1,000 stroke cases for rural residents). Reported use of telehealth in the United States is variable across states and regions, but has been increasing over time.

Key Question 2. What is the effectiveness of provider-to-provider telehealth for rural patients?

- a. How does provider-to-provider telehealth affect outcomes for patients and populations?
- b. How does provider-to-provider telehealth affect outcomes for healthcare providers?
- c. How does provider-to-provider telehealth affect outcomes for private and public payers?

We assessed the research on effectiveness first by healthcare setting (i.e., inpatient, outpatient emergency care, education and mentoring), then by clinical topic within settings as telehealth interventions and outcomes differed across settings based on data from 97 studies.

Inpatient Care

- Telehealth consultations in rural hospitals may result in no difference in length of hospital stay (6 studies) or transfers (3 studies; low strength of evidence [SOE]) compared to usual care, including in-person or phone consultations.
- Telehealth supported care for neonates at rural hospitals may result in no difference in clinical outcomes when compared to transfer and care at a hospital with a Level 4 neonatal intensive care unit (3 studies; low SOE). When telehealth is available, neonate transfers may be more appropriate (2 studies; low SOE).
- Evidence suggests remote intensive care units (ICUs) in rural areas result in no difference in mortality rates compared to transferring patients to more distant locations for ICU care (2 studies; low SOE).

Outpatient Care

- Outpatient telehealth consultations with specialists may result in improvements in clinical outcomes compared to care without specialist involvement:
 - For patients with diabetes:
 - Some improvement in medication adherence and treatment response for patients with depression (3 studies; low SOE).
 - Improvements in A1c and self-management but no effect on blood pressure or cholesterol levels in patients with diabetes (4 studies; low SOE).
 - Improvements in A1c, fasting glucose, and blood pressure in patients with both hypertension and diabetes with pharmacy teleconsultations (2 studies; low SOE).
 - For patients with depression:
 - Higher utilization of telehealth and corresponding costs for outpatient consultations for depression are associated with increased access and cost-effectiveness analyses reported overall benefit (2 studies; low SOE).

Emergency Care

- Telehealth consultations supporting emergency assessment and care of stroke, heart attack, or chest pain at rural hospitals:
 - May result in similar rates of mortality when patients are treated locally as opposed to transferred (5 studies; low SOE).
 - May result in similar time to treatment when patients are treated locally as opposed to transferred (8 studies; low SOE).
- Telehealth consultations by specialists for critical care and trauma patients in rural emergency departments may result in no difference in appropriate or inappropriate transfers (5 studies; low SOE).

Education and Mentoring

- Clinical outcomes: ECHO programs (a specific model that uses video for instruction and case reviews) are associated with better or equivalent patient outcomes (2 studies; low SOE):
 - Reduction in A1c in patients of trainees after ECHO compared to before participation (1 study).
 - Hepatitis C viral response and serious adverse events rates at “spoke” site with ECHO participation were similar to those at an academic medical center (1 study).
- ECHO and non-ECHO video training programs:
 - May result in desired changes in provider behavior (e.g., increased appropriate prescribing practices, screening, and patient counseling) (8 studies; low SOE).
 - May be associated with increased provider confidence, efficacy, and scores on knowledge tests (13 studies; low SOE).

Key Question 3. What strategies are effective and what are the barriers and facilitators to implementation and sustainability of provider-to-provider telehealth in rural areas?

Sixty-seven program evaluation and qualitative studies using a wide range of methodologies provide information on implementation of provider-to-provider telehealth.

- Barriers and facilitators are similar across provider-to-provider telehealth programs implemented in different settings and for different purposes. The majority are related to available resources, and access to knowledge and information.
- Barriers to rural provider-to-provider telehealth may be addressed by the implementation of specific evidence-based strategies. The following were identified and suggested by the authors of included studies:
 - Consulting providers need to understand the characteristics of rural areas and populations and what resources are available. *Strategy*: rural rotations or periodic in person collaboration.
 - Successful implementation and sustainment require a long-term commitment and resources on a scale that may not be feasible for individual rural organizations. *Strategy*: statewide or regional initiatives with government or philanthropic support.
 - Provider-to-provider telehealth systems may be used for frequent events or serve as a resource for rare events in rural healthcare and the technology and support need to be tailored to frequency of use. *Strategy*: customize system to accommodate frequency of use, such as schedule periodic testing of systems used for rare events.

Key Question 4. What are the methodological weaknesses of the included studies of provider-to-provider telehealth for rural patients and what improvements in study design (e.g., focus on relevant comparisons and outcomes) might increase the impact of future research?

When reviewing studies for Key Questions 2 and 3 we abstracted the limitations cited by the authors and combined these with our risk of bias and applicability assessments in order to identify and categorize the methodological weaknesses.

- Studies of provider-to-provider telehealth for rural areas could be improved by addressing methodological weakness.
- Key weakness: it is often difficult to attribute impact to telehealth because--
 - Weaker study designs are common: randomized controlled trials and cohort studies were identified and accounted for 3/5 of the included studies, but more

- than 40 percent of the studies were repeated measures (pre/post or before/after) with no other comparison group.
 - Lack of control for confounders related to patients, providers, facilities, and differences in telehealth implementation across study sites
- The most frequently identified weakness after overall study design is small sample sizes that result in lack of power to detect differences. Studies are also hampered by data limitations related to use of retrospective data, and data produced for care delivery and billing purposes, that can be incomplete or coded differently across organizations.



Strengths and Limitations

The research on provider-to-provider telehealth for communication and collaboration in the delivery of rural healthcare includes studies that directly address the questions asked by this review, but they are spread across settings, many different clinical uses, and evaluated different telehealth outcomes. For these reasons, the existing evidence base is unable to support strong conclusions. Overall, research on telehealth in general is often not based on a clear model of how telehealth is expected to affect outcomes; an outcome-oriented model for telehealth could inform better research. While telehealth should increase patient and provider satisfaction and other outcomes, there is no agreement on how to prioritize across clinical outcomes, resource use, costs, access to care and potential harms. It is also often unclear if the goal of telehealth is to provide care that is as good as care provided without telehealth or if the investment in telehealth requires that outcomes be better.



Implications and Conclusions

The limited available evidence suggests that telehealth supporting provider-to-provider communications and collaboration may produce similar or better results for patients, providers, and payers compared with care without telehealth. Barriers to implementation are known and common to practice change efforts. Methodological weaknesses are due to the use of less rigorous study designs that do not sufficiently address differences in the groups compared and include small numbers of participants. The rapid increase in the use of telehealth in response to the COVID-19 pandemic is likely to produce more data and may offer opportunities for more rigorous studies.



References

1. Rural health. *Health Aff (Millwood)*. 2019 Dec;38(12):1964-5. doi: 10.1377/hlthaff.2019.01365. PMID: 31794298.
2. Singh GK, Siahpush M. Widening rural-urban disparities in all-cause mortality and mortality from major causes of death in the USA, 1969-2009. *J Urban Health*. 2014 Apr;91(2):272-92. doi: 10.1007/s11524-013-9847-2. PMID: 24366854.

3. Garcia MC, Rossen LM, Bastian B, et al. Potentially excess deaths from the five leading causes of death in metropolitan and nonmetropolitan counties - United States, 2010-2017. *MMWR Surveill Summ.* 2019 Nov 8;68(10):1-11. doi: 10.15585/mmwr.ss6810a1. PMID: 31697657.
4. Hall JE, Moonesinghe R, Bouye K, et al. Racial/ethnic disparities in mortality: contributions and variations by rurality in the United States, 2012-2015. *Int J Environ Res Public Health.* 2019 Feb 2;16(3)doi: 10.3390/ijerph16030436. PMID: 30717345.
5. Villapiano N, Iwashyna TJ, Davis MM. Worsening Rural-Urban Gap in Hospital Mortality. *J Am Board Fam Med.* 2017 Nov-Dec;30(6):816-23. doi: 10.3122/jabfm.2017.06.170137. PMID: 29180557.
6. Keyes KM, Cerdá M, Brady JE, et al. Understanding the rural-urban differences in nonmedical prescription opioid use and abuse in the United States. *Am J Public Health.* 2014 Feb;104(2):e52-9. doi: 10.2105/ajph.2013.301709. PMID: 24328642.
7. Monnat SM, Rigg KK. Examining rural/urban differences in prescription opioid misuse among US adolescents. *J Rural Health.* 2016 Spring;32(2):204-18. doi: 10.1111/jrh.12141. PMID: 26344571.
8. Boring MA, Hootman JM, Liu Y, et al. Prevalence of arthritis and arthritis-attributable activity limitation by urban-rural county classification - United States, 2015. *MMWR Morb Mortal Wkly Rep.* 2017 May 26;66(20):527-32. doi: 10.15585/mmwr.mm6620a2. PMID: 28542117.
9. Croft JB, Wheaton AG, Liu Y, et al. Urban-rural county and state differences in chronic obstructive pulmonary disease - United States, 2015. *MMWR Morb Mortal Wkly Rep.* 2018 Feb 23;67(7):205-11. doi: 10.15585/mmwr.mm6707a1. PMID: 29470455.
10. Krishna S, Gillespie KN, McBride TM. Diabetes burden and access to preventive care in the rural United States. *J Rural Health.* 2010 Winter;26(1):3-11. doi: 10.1111/j.1748-0361.2009.00259.x. PMID: 20105262.
11. Primm K, Ferdinand AO, Callaghan T, et al. Congestive heart failure-related hospital deaths across the urban-rural continuum in the United States. *Prev Med Rep.* 2019 Dec;16:101007. doi: 10.1016/j.pmedr.2019.101007. PMID: 31799105.
12. Nelson JA, Kinder A, Johnson AS, et al. Differences in selected HIV care continuum outcomes among people residing in rural, urban, and metropolitan areas-28 US jurisdictions. *J Rural Health.* 2018 Dec;34(1):63-70. doi: 10.1111/jrh.12208. PMID: 27620836.
13. Zahnd WE, Rodriguez C, Jenkins WD. Rural-urban differences in human papillomavirus-associated cancer trends and rates. *J Rural Health.* 2019 Mar;35(2):208-15. doi: 10.1111/jrh.12305. PMID: 29808500.

Full Report

Totten A, Womack DM, McDonagh MS, Davis-O'Reilly C, Griffin JC, Blazina I, Grusing S, Elder N. Improving Rural Health Through Telehealth-Guided Provider-to-Provider Communication. Comparative Effectiveness Review No. 254. (Prepared by the Pacific Northwest Evidence-based Practice Center under Contract No. 75Q80120D00006.) AHRQ Publication No. 22(23)-EHC023. Rockville, MD: Agency for Healthcare Research and Quality; December 2022. DOI: <https://doi.org/10.23970/AHRQEPCCER254>. Posted final reports are located on the Effective Health Care Program [search page](#).

