

1 Title: National Institutes of Health Pathways to Prevention Workshop: Improving Rural Health
2 Through Telehealth-Guided Provider-to-Provider Communication
3 Running Title: Improving Rural Health Through Telehealth-Guided Provider-to-Provider
4 Communication

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28 Authors have no financial disclosures.

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30 **Abbreviations:** *RT* = rural provider-to-provider telehealth
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32 Many rural communities across the nation face chronic challenges in accessing and
33 sustaining health care services, with health professions workforce shortages a significant
34 contributing factor. Year after year more rural than urban locations are federally designated as
35 health professions shortage areas, particularly in communities with higher proportions of
36 minorities such as American Indians and Alaska Natives. While sparse populations and low
37 patient volumes make the local availability of specialists and high-level hospital care less
38 feasible, the absence of these and other services for rural populations is concerning given the
39 significantly higher rates of serious health conditions and a higher proportion of older residents.
40 For example, in 2019, rates for all 10 of the leading causes of death in the United States were
41 higher in rural than in urban areas, and differences in death rates for some health problems such
42 as heart disease and cancer have been widening over time (1). Meanwhile, 101 rural hospitals
43 have closed over the past seven years (2). The COVID-19 pandemic exacerbated this trendline
44 last year and contributed to further erosion in health care access for some communities. Aware of
45 these trends, federal and state policy makers have, over time, initiated policies and financial
46 investments designed to bolster rural health care infrastructure. One promising strategy to help
47 facilitate access to care is the use of telehealth technology.

48 Accelerated by the pandemic, telehealth—defined as the use of information and
49 telecommunications technology to provide care across time and distance—has been increasingly
50 adopted to extend the reach of health care services. A key component of this infrastructure is
51 telehealth-guided collaboration between health care providers; typically connecting rural-based
52 generalist providers with urban-based specialists across an array of disciplines, including
53 medicine, nursing, pharmacy, and behavioral health, and addressing health problems ranging
54 from care for people with Hepatitis C to trauma, geriatric pharmacology, and maternal morbidity.

55 Rural provider-to-provider telehealth (RT) encompasses consultations, mentoring, and
56 continuing education, among other services.

57 Through the provision of RT, specialty expertise can help rural providers manage care
58 locally rather than initiate referrals or transfers to urban settings. As such, RT collaboration is a
59 promising strategy for strengthening rural access to quality care, even while recognizing that its
60 use in rural health settings varies widely (3) and is often overlaid on long-standing disparities
61 and limited infrastructure. However, fully embracing an array of RT applications through
62 training, investment, and institutional and public policy should be predicated on evidence that
63 informs how RT affects patients, populations, health care providers, and payors in rural areas.
64 This needed information includes knowledge of barriers and facilitators that impact
65 implementation, dissemination, and sustainability. Such an evidence base can also support next
66 generation models that expand and improve RT.

67

68 **Methods**

69 Recognizing both the significant potential of RT and the need for more information, an
70 effort was cosponsored by federal agencies including the National Institutes of Health (NIH)
71 Office of Disease Prevention (ODP), the Health Resources and Services Administration (HRSA)
72 Federal Office of Rural Health Policy (FORHP), the Agency for Healthcare Research and
73 Quality (AHRQ), and the Centers for Disease Control and Prevention (CDC) to better understand
74 what is known about the effectiveness of RT and its impact on improving health outcomes in
75 rural settings. This initiative included a systematic review conducted by the Oregon Health and
76 Science University's Evidence-based Practice Center (4) under contract to AHRQ. The
77 systematic review was designed to assess the use, effectiveness, and implementation of RT for

78 the provision of health care services to rural populations. In October 2021, NIH convened a
79 Pathways to Prevention (P2P) Workshop entitled, “Improving Rural Health Through Telehealth-
80 Guided Provider-to-Provider Communication.” The workshop included summary presentations
81 of the systematic review and other invited experts presenting different domains of RT
82 applications, including local and regional efforts and various applications to specific populations,
83 health conditions, and medical specialties (5). An independent panel of individuals with rural
84 health expertise was convened to assess, deliberate, and draft a report reflecting key information
85 generated in both the systematic review and the workshop. Prior to publication, the report was
86 posted for public comment. Four key questions guided the systematic review, the workshop, and
87 the panel deliberations. The panel report, presented here, identifies what is known and
88 knowledge gaps associated with each key question as well as recommendations for moving RT
89 applications forward, which can inform deliberations by clinicians, health care administrators,
90 funders, and policymakers.

91

92 **Key Question #1: What is the uptake of different types of provider-to-provider telehealth**
93 **in rural areas?**

94 ***What is known***

95 Information from the systematic review and workshop presenters demonstrated that
96 research regarding the utilization of RT is extremely limited. RT modalities that have been
97 studied include education and clinical services—both live, and store and forward. Attempts to
98 capture uptake through quantification of billable services are acknowledged to be
99 understatements of true uptake as many providers do not bill for RT services. While there are
100 some robust studies of uptake regarding specific disease interventions or modalities, current data

101 sources are limited and do not cover all types of RT. For example, there have been some efforts
102 nationally to document Project Extension for Community Healthcare Outcomes (ECHO), which
103 is a specific model that uses video for instruction and case reviews. Few analyses of RT are
104 reported in the published literature.

105 ***What is not known***

106 It is challenging to quantify uptake without a consensus definition of the types of services
107 and supports that are considered RT, and no consensus-based definitions exist. While there are
108 small studies of local and regional rural programs, the extent to which RT is used nationally, in
109 terms of types and volume of services, has not been documented. How uptake varies across
110 diverse settings, organizational structures, and provider types is also not known. The extent to
111 which provider readiness for telehealth usage influences RT uptake has not been measured,
112 including interest in RT, access to devices and a variety of telehealth modalities, and adequacy of
113 broadband internet connectivity. Furthermore, confounding factors such as technology and
114 infrastructure limitations may be more prevalent across practices that serve disadvantaged
115 populations.

116 While quantifying billable services is the simplest way to understand uptake, the extent to
117 which payors reimburse for RT is not known. Workshop presenters emphasized that many
118 providers do not bill for telehealth-related services because reimbursement levels are too low.
119 The tipping point in reimbursement that would encourage more widespread billing, and
120 therefore, more accurate estimates of uptake is not known. When quantifying uptake through
121 analysis of billing data, it will also be important to know the extent to which flexibilities that
122 were issued through Public Health Emergency Declarations during COVID-19 will become
123 codified.

124 Payors stand to benefit significantly if these care modalities decrease the total cost of
125 care. More information is needed on how different RT business models (e.g., local, regional, or
126 national subscription-based hub and spoke models between providers) compare across rural
127 areas. As the U.S. health care system moves towards value-based purchasing (VBP), it is
128 unknown whether these models support or encourage RT uptake. It would be reasonable to
129 expect that providers participating in models such as Accountable Care Organizations (ACOs)
130 that integrate care across a service area would be more likely to implement RT, but to date no
131 research has been identified.

Recommendations for Key Question #1

1. Develop a consistent definition of different types of RT that can be applied across programs, providers, and organizations. A Telehealth Resource Center could serve as the convener of key stakeholders (including federal/state government and the private sector) to develop a consensus-based definition of RT.
2. Build insight regarding utilization by engaging payors as full partners in future research, identifying barriers to accurately quantifying relevant data from billing, and establishing methodologies to quantify unbilled services.
3. Once uptake across rural areas has been quantified, expand research to examine (1) the effect of hospital and practice consolidation on uptake, (2) whether VBP or other business models encourage uptake, and (3) if disparities exist related to smaller hospitals or providers left out of partnerships, integrated systems, ACO networks, or other value-based models of care.
4. Examine the extent to which lack of reliable broadband affects uptake and assess less robust methods such as audio-only and FaceTime.

5. Establish a national and/or regional database of models for the uptake of RT and needed infrastructure.

132

133

134 **Key Question #2: What is the effectiveness of provider-to-provider telehealth for rural**
135 **patients?**

136 *What is known related to patient outcomes*

137 Evidence from the systematic review highlighted the effectiveness of RT on health
138 outcomes of primarily chronic diseases, such as diabetes, cardiovascular problems, and strokes,
139 and a few studies demonstrated effectiveness in mental health outcomes. There is some evidence
140 of higher utilization of outpatient consultation for depression via RT e-consults, which should
141 translate to improved clinical outcomes.

142 Evidence indicated that RT collaboration may produce similar or better clinical results for
143 patients when compared to care without RT. Some evidence demonstrated improved
144 management of chronic disease, behavioral health, and speed to treatment. Ensuring that RT
145 includes pharmacy and other disciplines may improve medication adherence.

146 *What is known related to benefits to providers*

147 Workshop speakers highlighted benefits to providers primarily, though not exclusively,
148 from Project ECHO, including enhanced knowledge, increased satisfaction with training, and
149 improved skills and capacity to screen, counsel, prescribe, and treat patients. Other benefits
150 included improvements in provider confidence, efficacy, and scores on knowledge tests.

151 Workshop speakers highlighted evidence of improvement in provider wellbeing, especially
152 associated with the implementation of RT for behavioral health.

153

154 ***What is known related to outcomes for private and public payors***

155 The systematic review revealed a small number of studies showing that RT in rural
156 hospitals did not demonstrate a difference in transfers compared to usual care. RT by specialists
157 for critical care and trauma patients resulted in no difference in appropriate or inappropriate
158 transfers. RT maintained clinical outcomes at rural facilities when used to support care for
159 neonates and for emergency department (ED) care.

160 ***What is not known for patient, provider, and payor outcomes***

161 The lack of understanding on the scope of RT utilization presents challenges for
162 researchers evaluating the impact of RT on outcomes. Studies that examined the clinical impact
163 of RT in EDs showed that small improvements in quality and cost could translate to improved
164 performance for some rural providers in performance risk programs, but more information is
165 needed. The lack of rigorous evaluation of TeleICU and TeleED in rural communities is
166 surprising, given the extensive evidence that supports the effectiveness of remote intensive care
167 units in urban and suburban areas.

168 More research is needed to examine whether RT improves diagnosis, assessment, and
169 treatment of medical conditions. Further study is needed to examine different types of RT to
170 assess improved access and speed to treatment as well as the types of partnerships (e.g., which
171 professional disciplines) that may improve patient and provider outcomes. Little is documented
172 about whether the deployment of RT could combat professional isolation in rural practices and
173 promote the creation of professional communities that improve provider retention.

174

Recommendations for Key Question #2

1. Conduct evaluation studies to assess what works best for which patients in specific settings. Standardize organizational elements (e.g., technology, infrastructure, engagement processes) and outcomes (e.g., transfers, length of stay, episode cost of care, readmissions) across multiple sites to assess impact.
2. Assess the types of RT partnerships associated with improved patient and provider outcomes.
3. Evaluate processes through which RT partnerships are established and sustained to guide widespread dissemination, especially in underserved communities.
4. Evaluate whether RT impacts rural provider recruitment/retention.

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176

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

179 **What is known**

180 The systematic review examined barriers and facilitators to implementing/sustaining RT
181 and found similar constructs across different settings/purposes (inpatient, outpatient, ED,
182 education, training). While available resources were found to be a barrier or facilitator, the most
183 frequent facilitator was access to digestible information and knowledge about the innovation and
184 how to incorporate it into work tasks. Barriers to broader RT implementation and sustainability
185 included inadequate provider time, technology (e.g., lacking broadband internet), other resources
186 (e.g., no ongoing champion, physician leadership, support staff, equipment), poor understanding
187 of the rural context, and long-term commitment (e.g., no payment/reimbursement beyond start-
188 up).

189

190 ***What is not known***

191 Additional barriers/facilitators identified in the systematic review, workshop, and other
192 literature (6, 7) were not consistently evaluated, and therefore, lack demonstrated evidence
193 across various settings.

194 It is not understood how the different RT delivery models (e.g., local, regional, or
195 national subscription-based hub and spoke business model with two or more providers; VBP,
196 public-private, or ACO models) align across providers and within workflows to facilitate RT
197 sustainability. One potential facilitator identified for future study is leveraging available RT-
198 related infrastructure resources affiliated with academic medical centers (e.g., via Practice-Based
199 Research Networks (PBRN) or the Center for Translational and Science Awards (CTSA)
200 Program) to reduce inequity, enhance existing relationships, and build research capacity.

201 Little is known about the effectiveness of RT sustainability, including through long-term
202 statewide or regional initiatives with government or philanthropic start-up support that pool
203 resources. Workshop presenters emphasized that more information is needed on how available
204 and alternative reimbursement, policies, procedures, and incentives facilitate long-term RT
205 sustainability, including coverage provided through COVID-19 Public Health Emergency
206 Declarations (7), state telehealth payment parity laws (8), reimbursement expansions to different
207 provider types (i.e., physician assistants, nurses, pharmacists), payment levels adequate to offset
208 workflow changes and infrastructure investments, type of reimbursements (e.g., visit time or
209 value-based), public or private payor mechanisms, easy-to-bill procedures, and providers'
210 knowledge about related reimbursement opportunities.

211 Research is very limited on provider engagement and retention strategies that facilitate
212 RT such as certification, cultural and geographic contextual competency training, rotations or
213 periodic in-person interactions with rural providers for consultants (to better understand the rural

214 context, characteristics, resources, and populations and to build interpersonal trust, collaboration,
215 and communication), ease of licensing to practice across state lines, easy-to-use telehealth
216 platforms, Project ECHO to implement specific evidence-based strategies, and interprofessional
217 care teams.

Recommendations for Key Question #3

1. Engage providers in shaping and evaluating RT to better meet community and population needs.
2. Study the impact of leveraging infrastructure resources and implementing strategies to reduce known barriers to facilitate RT sustainability.
3. Ensure that studies capture and assess the impact of environmental factors (e.g., telehealth parity laws, state licensure requirements) that may facilitate RT sustainability.
4. Examine socio-cultural factors (e.g., understanding of the rural context, interpersonal trust amongst providers) that may facilitate uptake, outcomes, and sustainability.

218
219 **Key Question 4:** What are the methodological weaknesses of studies of provider-to-provider
220 telehealth for rural patients and what improvements in study design (e.g., focus on relevant
221 comparisons and outcomes) might increase the impact of future research?

What is known

223 Most studies in the systematic review used observational cohort designs and were
224 multisite, likely producing generalizable results (i.e., high external validity)—a methodological
225 strength. About one-quarter of reviewed studies were randomized controlled trials (RCTs) with
226 high internal but low external validity findings. Methodological weaknesses identified through

227 the systematic review and workshop included same subjects pre-post, or same organization,
228 different subjects before-after designs without comparators or historical changes. Further issues
229 related to bias and generalizability make it difficult to attribute changes in outcomes to RT
230 interventions across heterogeneous settings, interventions, clinical indications, providers, and
231 patients. The appropriateness and feasibility of certain study designs were constrained by real-
232 world variability (e.g., RCTs not feasible with a small number of rural ED patients). Most studies
233 are limited by small sample size, lacking power to detect differences, and by incomplete,
234 erroneous, or inconsistently coded retrospective data collected for care delivery and billing.
235 Other known limitations arise from selection bias (i.e., non-blinded allocation to groups as
236 certain providers may prefer RT to no RT); performance bias (i.e., influences of researcher
237 changes over time), attrition bias (i.e., missing data); detection bias (i.e., short-term follow-up,
238 non-validated measures, lack of multiple intervention components' or telehealth platforms'
239 assessment); and analysis bias (i.e., observational studies that do not control for patient, provider,
240 facility, and RT implementation confounders).

241 ***What is not known***

242 Workshop speakers highlighted additional methodological limitations that increase risk
243 of bias and reduce strength of evidence in RT-related research. There was inconsistent use of
244 conceptual frameworks (e.g., Implementation Science (9); the Reach, Effectiveness, Adoption,
245 Implementation, and Maintenance (ReAIM) framework (10); Diffusion of Technology (11); and
246 medication use process) or adaptations to identify key variables for data collection and analyses
247 of RT.

248 Definitions of RT and associated study characteristics ((e.g., whether RT communication
249 involves individual providers or interprofessional teams and is asynchronous (store and forward)

250 or synchronous), comparators, and patient (e.g., demographics, health care needs) and provider
251 factors (e.g., training, certification), health system (e.g., access/supply, equity, care quality), and
252 geographic/community factors (e.g., local resources, spatial accessibility and travel times for
253 patients and providers)) are often not specified. Agreement is lacking on ways to prioritize and
254 operationally define outcomes across various RT constructs (e.g., provider attitudes, knowledge,
255 motivation, relational trust, support, self-efficacy, satisfaction, burnout, barriers, facilitators, and
256 patients' clinical, economic (e.g., resource use, cost), and quality of life outcomes, as well as
257 impact on institutional resources and payors).

258 Quality of various public/private payor claims (missing documentation of RT) and/or
259 prospective data sources may produce problems and underestimates when multiple data sources
260 are used to increase the sample size and generalizability of national/regional RT evaluations.
261 Limited data exists on the impact of evolving technologies (e.g., fatigue associated with
262 increased complexity of patient wearables, diagnostics, big data, artificial platforms) on RT and
263 associated patient outcomes. Lastly, research incorporating mixed methods, multistakeholder
264 evaluations, and methods to control for temporal changes and confounder bias in comparing
265 outcomes are very limited.

Recommendations for Key Question #4

1. Consider alternative study designs (e.g., observational, multisite, regional, comparative) when rigorous study designs like RCTs are not feasible. Use statistical approaches (e.g., propensity score, regression-based matching, and instrumental variables) to minimize selection bias and address confounding effects. Analyses augmented by sensitivity analyses can provide insights into the variability of model estimates and results associated with specific types of bias.

2. Use qualitative and mixed methods to understand difficult-to-quantify providers' attitudes, perceptions, constraints, and behaviors that affect RT implementation.

Limitations of qualitative studies (e.g., small sample sizes, selection bias) can be reduced by using well-designed sampling procedures and employing mixed methodologies to triangulate qualitative and quantitative results.

3. Adopt appropriate methods to characterize and model the institutional context (e.g., provider/hospital resources, capacity, network relationships, broadband) and geographic/community context of RT implementation. Consider using multilevel, spatial, and panel methods to account for the complex covariance structures associated with contextual effects.

266

267 **Conclusion**

268 Despite efforts at local to national levels, access to health care has been a complex and
269 long-standing challenge for rural communities. However, the emerging use of technology
270 coupled with innovative partnerships that connect rural and urban providers illustrates the
271 potential to meaningfully bridge some of these access gaps. With research to inform RT, wider
272 utilization could be systematically supported through workforce training, institutional and public
273 policy, as well as through reimbursement. Developing this body of research is particularly
274 timely, given the rapid adoption of RT during the COVID-19 pandemic. Today, there is an
275 unprecedented opportunity to understand temporal and contextual effects on an array of issues
276 ranging from barriers, adoption, and impact of RT on patient outcomes to its impact on retention
277 of rural providers. However, as has been described in this report, to fully understand the value
278 and effects of RT, new research efforts are needed including the development of standardized
279 definitions, refined data sources, and more consistent use of rigorous research methods. Given

280 the potential contribution that RT can make to ensuring access to quality health care for rural
281 populations and its potential to favorably impact the economic health of rural health care
282 organizations, the workshop panel believes that a focused research agenda to fill gaps identified
283 in this report should be a priority for policymakers, payors, and others, with the intent of
284 developing evidence-informed RT practice, policy, and payment. Comparing and consistently
285 documenting best practices of the adoption and sustainability, or lack thereof, of RT across
286 settings and analyzing how provider interactions and associated impacts on patient (and
287 population) health and wellbeing unfold over time offers exciting opportunities for future
288 research investigations and, most importantly, the opportunity to address some of the nation's
289 chronic gaps in rural access to care.

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