

Objectives: To understand factors associated with outcomes in a cluster-randomized controlled trial that evaluated a telemedicine specialty referral intervention for school hearing screenings in 15 rural Alaskan communities.

Design: Hearing Norton Sound was a mixed methods cluster-randomized controlled trial that compared a telemedicine specialty referral pathway (intervention) to a standard primary care referral pathway (control) for school hearing screenings. As a mixed methods trial, both quantitative and qualitative data were collected, analyzed, and integrated. Main trial results are published elsewhere, but integration of community-specific quantitative outcomes and qualitative results have not yet been reported. The constant comparative method was used to analyze qualitative data from semistructured interviews with six stakeholder groups across all 15 communities. Descriptive statistics were used to describe community-specific proportions of follow-up in both trial years. Qualitative and quantitative results were integrated to reveal relationships between contextual factors and follow-up outcomes across communities.

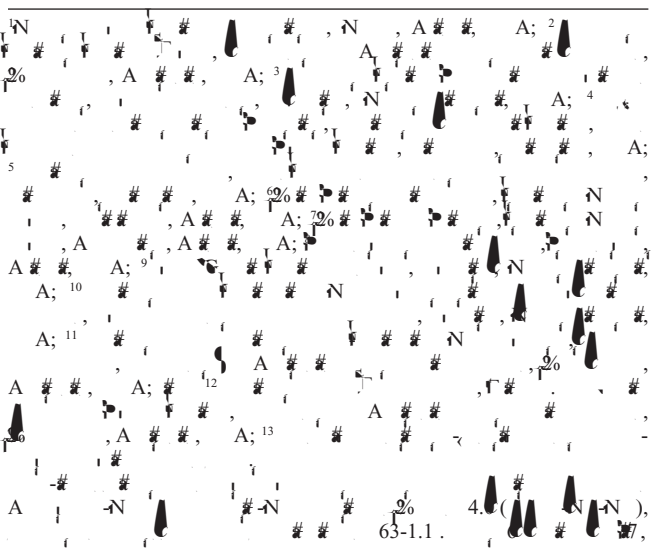
Results: The Hearing Norton Sound trial enrolled 1481 children from October 2017 to March 2019, with a total of 790 children requiring referral. Of the children who referred in the telemedicine specialty referral pathway communities (intervention), 68.5% received follow-up

(268/391), compared to 32.1% (128/399) in primary care referral communities (control)(previously reported). When broken down by community, the mean proportion receiving follow-up was 75.26% (SD 22.5) and 37.9% (SD 11.4) for the telemedicine specialty referral communities and primary care referral communities, respectively. For qualitative data collection, semistructured interviews were conducted with 101 individuals between December 2018 and August 2019. Six stakeholder groups participated: elders (n = 14), parents (n = 25), children (n = 11), teachers/school staff (n = 18), principals (n = 6), and healthcare providers/clinic staff (n = 27). Six overall factors related to the outcomes of the telemedicine specialty referral pathway emerged during analysis: *clinic capacity, personnel ownership and engagement, scheduling, telemedicine equipment/processes, communication, and awareness of the need for follow-up*. We integrated these factors with the community-specific follow-up percentages and found associations for four of the six qualitative factors: *clinic capacity, personnel ownership and engagement, communication, and awareness*. An association was not seen for *scheduling and telemedicine equipment/processes*, which had variable relationships with the follow-up outcome.

Conclusions: The Hearing Norton Sound trial demonstrated that a telemedicine specialty referral pathway can close the gap on children lost to follow up after school hearing screening. As a whole, the intervention profoundly increased the proportion of children receiving follow-up, but there was variability in outcomes within and between communities. To understand this variability, we analyzed community-specific intervention outcomes alongside community member feedback on factors related to the intervention. We identified four key factors that contributed to the success of the intervention. Attention to these factors will be essential to successful adaptation and implementation of this telemedicine specialty referral intervention and other similar interventions in future work in rural Alaska and beyond.

Key words: Community-based hearing research, Hearing Norton Sound, Joint display, Mixed methods integration, Qualitative methods, Rural Alaska.

Abbreviations: BSSD = Bering Strait School District; CHA/P(s) = Community Health Aides/Practitioner(s); CTS(s) = Clinic Travel



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Data Analysis

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Quantitative and Qualitative Integration

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Clinic Capacity

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Personnel Ownership and Engagement

TABLE 3. A joint display of quantitative and select qualitative data from intervention communities in the Hearing Norton Sound cluster-randomized trial (2017–2020)

Community Code	A	B	C	D	E	F	G	H
Categorical follow-up								
Year 1 (percent that received follow-up), %	100.0	88.1	81.3	79.3	75.0	100.0	46.2	38.3
Year 2 (percent that received follow-up), %	100.0	100.0	95.2	82.7	72.7	40.0	56.0	49.3
Clinic Staffing, Capacity, and Coordination								
Factors	<p>1 "...we kind of worked out a flow—somebody handles walk-ins, somebody's seeing regular patients, and somebody could see the telemeds. We always—once we got lists, we always communicate with each other and you know, make it work." [Community Health Aide/Practitioner, Community A]</p> <p>2 "Right now, the clinic has been short staffed. It's been short staffed for years. We've been trying to hire health aides and get them hired and learned up but then they move on we're short staffed again..." [Community Health Aide/Practitioner, Community E]</p> <p>3 "We just need more staff, if we had more staff, then it would be a lot easier. Like in my other villages that are better staffed, those kids are current on their Well Child, immunizations—all that kind of stuff, because they have less volume and more people to help them. Versus the higher volume here, and less people..." [Advanced Practice Provider, Community H]</p>							
Personnel Ownership and Engagement								
Factors	<p>4 "I really enjoy [the follow-up appointments], actually... kept me busy... just going through one after the other. Just seeing the difference in each kid—it was neat to see all kinds of—the difference between person to person." [Community Health Aide/Practitioner, Community B]</p> <p>5 "...if it's not any one person's responsibility, I don't see it happening, you know? Because if someone thinks 'oh, maybe the school's taking care of it, oh, maybe the clinic's taking care of it, oh, maybe the Special Education teacher's taking care of it.' And if nobody knows and nobody's really assigned, then it's not getting taken care of." [Teacher, Community F]</p> <p>6 "...the school's willing to try, but the schools' not willing to take the ultimate responsibility for ensuring that every kid that needs hearing services got hearing services... I don't think that's our job... Are we responsible for getting these kids in and getting the permission slips signed for Norton Sound? I would say that that's a no. We are the helpers, assistants, supporters, nurturers, and all that kind of stuff—I think the school could take that role on." [Principal, Community H]</p>							
Scheduling								
Factors	<p>7 "The main part was the CTS keeping my schedule open, and making sure the kids get here. And were ready to come back as soon as they see another one leave...she didn't necessarily block it, but we discussed ahead of time that I'm not gonna be seeing patients from this time to this time. Until I get all the [referred screening] kids done." [Community Health Aide/Practitioner, Community B]</p> <p>8 The trickiest part was just trying to find a time that worked for everybody. That was the hardest. [Community Health Aide/Practitioner, Community C]</p> <p>9 The clinic initiating the conversation [about scheduling a follow-up appointment] could help parents—it'd be coming from a clinical source that's perceived as more of an authority on medical matters. [paraphrased from non-audio recorded interview, Teacher, Community D]</p> <p>10 "...sometimes they wouldn't bring them in, like you'd call them and tell them you need to come in for this, some people just never showed up...there are some people that will bring their kids in just if you say they need to come in, they'll bring their kid in. They'll be like okay. Some won't. Some are probably just too busy and the time doesn't work for them—I don't know." [Community Health Aide/Practitioner, Community H]</p>							
Telemedicine Equipment / Processes								
Factors	<p>11 "A lot of times [with specialty care telemedicine cases] parents think that they're only being seen by us is sent to Audiology and then sent to [CHA/PS]... and they want to be seen by someone who has experience for the problem, like if they're being seen for the ear or for the eyes, they want to be seen by a person that knows." [Community Health Aide/Practitioner, Community B]</p> <p>12 "Sometimes like when the case is sent to Audiology and then sent to ENT, especially on Fridays, you don't get a response back until Monday or Tuesday...I think patience is the biggest...like their waiting time...it's the biggest complication doing the telemed cases." [Community Health Aide/Practitioner, Community F]</p> <p>13 "I think the sooner we know about an issue and the sooner it's treated, the better it is. Anytime you can expedite something [via telemedicine] it's definitely better." [Community Health Aide/Practitioner, Community H]</p>							

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Telemedicine Equipment/Processes

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Awareness

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DISCUSSION

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