

# Hospital-Level Care at Home for Acutely Ill Adults in Rural and Ultra Rural Settings: Proof of Concept

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## Introduction

Approximately 65 million Americans, nearly 20 percent of US residents, live in areas the Census Bureau designates as rural.<sup>1</sup> Many rural communities face challenges that contribute to ongoing health disparities compared to urban areas. Compared to urban areas, on average, residents of rural communities have lower median income and are less likely to be insured. Rural populations have more adults aged 65 and older, and older individuals on average are more likely to suffer from chronic health conditions.<sup>2</sup> Rural communities face additional barriers to care such as access to transportation, challenges with mobility, persistent provider shortages, and travelling long distances to access care.<sup>2</sup> An acute illness that traditionally requires hospitalization represents a common critical moment in nearly every person's life. While some in rural areas face intense travel burdens to obtain acute care, others simply go without. Even those who receive care in a hospital may encounter an environment that is unsafe, of poor quality or experience, and expensive.<sup>3</sup> This may be particularly true of rural hospitals.<sup>4,5</sup> Our team has successfully designed and refined the rural home hospital (RHH) model.<sup>6</sup> We have also demonstrated that RHH care is technically feasible, well-received, and desired by clinicians and patients.<sup>7</sup>

Background Research

Workflow Mapping

Prototyping

Simulation Rapid Cycle Testing

Proof of Concept

## Objectives

In this study, we deployed RHH to care for acutely ill patients in rural and ultra-rural settings in north-west and south-east Utah as a proof of concept. We assessed the feasibility and acceptability of the RHH intervention with three acutely ill rural patients at home.

## Methods

We deployed RHH to admit, care for, and discharge three acutely ill patients in rural Utah. In the comfort of their homes and in the presence of their caregivers, patients were assessed, diagnosed, admitted, treated, and discharged by a RHH team. A remote RHH attending physician based in Salt Lake City, UT performed evaluation and management. A skilled nurse deployed to the home to provide and facilitate hospital-level care, including intravenous infusions, imaging, laboratory diagnostics, continuous monitoring, respiratory therapies, and other hospital level care. The study team conducted daily semi-structured check-ins with four RHH clinicians to assess RHH workflows for completion. We conducted a survey with one patient at admission and discharge to assess patient experience. We also conducted semi-structured interviews with the four clinicians and one patient to assess perceived acceptability, safety, and quality of care. We completed qualitative analysis of the interviews and coded qualitative data into domains and subdomains through an iterative process. In addition, we documented learnings to refine the model and inform an implementation strategy.

## References

1. Kozhimannil KB, Henning-Smith C. Improving health among rural residents in the US. *JAMA*. 2021;325(11):1033-1034. doi:10.1001/jama.2020.26372
2. Turrini G, Branham K, Chen L, et al. *Access to Affordable Care in Rural America: Current Trends and Key Challenges*. Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services.; 2021. <https://aspe.hhs.gov/reports/access-care-rural-america>. Accessed July 28, 2021.
3. Creditor MC. Hazards of hospitalization of the elderly. *Ann Intern Med*. 1993;118(3):219-223. doi:10.7326/0003-4819-118-3-199302010-00011
4. Joynt KE, Harris Y, Orav EJ, Jha AK. Quality of care and patient outcomes in critical access rural hospitals. *JAMA*. 2011;306(1):45-52. doi:10.1001/jama.2011.902
5. Joynt KE, Orav EJ, Jha AK. Mortality rates for Medicare beneficiaries admitted to critical access and non-critical access hospitals, 2002-2010. *JAMA*. 2013;309(13):1379-1387. doi:10.1001/jama.2013.2366
6. Levine DM, Desai MP, Ross J, Como N, Anne Gill E. Rural perceptions of acute care at home: A qualitative analysis. *J Rural Health*. 2021;37(2):353-361. doi:10.1111/jrh.12551
7. Levine DM, Desai MP, Ross JB, Como N, Holley S. Scoping and testing rural acute care at home: a simulation analysis. *BMJ Innov*. February 2021;bmjinnov-2020-000592. doi:10.1136/bmjinnov-2020-000592

## Results

RHH was successfully deployed to three acutely ill patients in rural Utah. RHH admission, daily care, and discharge processes were accomplished for each patient. From qualitative analysis we identified four domains: (1) Perceived comfort level during RHH admission, (2) Perceived safety during RHH admission (3) Perceived quality of care during RHH admission, and (4) Perception of RHH workflow.

Domain	Results
Perceived comfort level	The RHH physician expressed that there were variables that were hard to control in a rural setting (e.g., timing of lab orders, patient visits, and medication orders) that potentially impacted clinical decisions. The patient felt comfortable with RHH care, including the remote monitoring and remote physician visits. The RHH clinicians expressed that the RHH model was patient centered and the RHH nurses said they felt comfortable providing acute-level care in the home. While gratifying to provide care to a patient in their home, the RHH physician expressed a personal preference for in-person patient visits compared to remote visits.
Perceived safety	The RHH physician had concerns that patients could administer their own medicines without a clinician present. One RHH physician said they would recommend RHH to a family member or friend if the "psychosocial benefits of being at home outweighed the small risks of medication errors and delayed labs."
Perceived quality of care	The nurses had positive perceptions of the clinical quality of RHH. The nurses felt comfortable working with a remote physician and did not think that care was compromised. One nurse said the "one-on-one care is better" in the RHH model compared to traditional hospitalization, clinicians get to spend more time with the patient and witness patients in their home environment. Another nurse said she was "completely confident" in the care that was provided. All RHH clinicians felt that video quality was good during remote visits and liked the in-home continuous monitoring.
Perceptions of RHH workflow	Remote visits with the patient were feasible but required a strong working relationship between clinical team members. This is particularly important when the nurse facilitates the remote physical exam. Having multiple different systems to communicate, document patient notes and orders, daily tasks, and other important information was inefficient and challenging for the clinical team. This study demonstrates the potential benefits of more integrated technology.

## Discussion

In a small proof of concept mixed methods evaluation, we demonstrate that acute care can be delivered in rural homes with high patient and clinician experience. We found that team dynamics, technology build, robust clinical and operational workflows, and care coordination were important to a successful admission. This study also demonstrates the need for a RHH care coordination team to support RHH clinicians in the field and to efficiently manage operational workflows.

## Conclusions

The learnings from this study can inform training and startup for rural home hospital teams. We anticipate these findings will drive a paradigm shift in the delivery of hospital-level acute care in rural America.