Ambulatory Remote Patient Monitoring Beyond COVID-19: Engagement and Sustainment Considerations

See also page 2215

Care delivery innovations in response to the COVID-19 pandemic, particularly digital health solutions, have been wide ranging and impactful. The spectrum of such innovations includes, for example, technology-based screening tools, electronic health record—based protocols, rapid provider onboarding and education, clinical decision support and diagnostics, large-scale data collection with real-time dashboards for tracking and surveillance to monitor outcomes and hospital capacity, and rapid adoption and expansion of telehealth services and remote monitoring to improve safe access to health care and to optimize resource utilization.[1] The novel nature of SARS-CoV-2 infection and rapid evolution of health care delivery during the pandemic require robust evaluation of these implementations. In particular, we continue to face a number of evidence gaps in the optimal role and deployment of virtual care services, including telehealth and remote patient monitoring (RPM) programs for COVID-19 and beyond.

In this issue of *Mayo Clinic Proceedings*, Haddad et al[2] present their retrospective matched cohort analysis of a high-intensity RPM program in SARS-CoV-2 test—positive patients with 1 or more Centers for Disease Control and Prevention—defined risk factors for severe COVID-19 illness. The digital care solution collected vital sign measurements and symptom assessments by questionnaires several times per day using standardized care pathways. Alerts were generated by the technology using the care pathways and were reviewed by a team of registered nurses, who also had access to a COVID-19 care team of advanced practice providers and physicians for escalation of care, as needed.

The authors evaluated outcomes of those enrolled in the RMP who did and did not engage with the program, defined by submission of at least 1 set of vital signs through the provided digital solution. Of 5796 patients evaluated, 80% of patients engaged with the RPM program technology. Whereas sex, race, ethnicity, and primary language were similar between cohorts, nonengaged patients were generally older, had more comorbidities, and were diagnosed with COVID-19 while they were inpatients. Patients engaged in the RPM program had significantly lower rates of hospitalization, hospitalization of 7 or more days, and intensive care unit admission compared with nonengaged patients. In addition, engaged patients had significantly shorter hospital length of stay and lower overall 30-day costs of care as well as lower all-cause 30-day mortality rates. Although rates of at least 1 emergency department visit were similar between groups, engaged patients were more likely to have 2 or more visits compared with those who were nonengaged, perhaps indicating that these patients had clinical worsening that required seeking and receiving additional care.

The study has as strengths its use of a large, well-matched cohort and its real-world nature, which did include minority, elderly, and rural populations. Limitations of this report include its retrospective nature and its lack of a true comparable control group managed without RPM and associated risk of participation bias, given the inability to perform intention-to-treat analysis. How a particular patient may lack engagement in an RPM program may reflect a lack of engagement with health care more generally or other factors that were not evaluated.

Mayo Clin Proc. ■ December 2022;97(12):2184-2185 ■ https://doi.org/10.1016/j.mayocp.2022.10.016
www.mayoclinicproceedings.org ■

Overall, the experience and outcomes with COVID-19 and RPM share similarities to the reported experience of others with a range of RPM programs as well as some distinctions. Similar to other groups, RPM for COVID-19 is feasible and acceptable to patients but demonstrates variable rates of engagement.[3-5] Haddad and coauthors similarly demonstrate a reduction in health care utilization associated with RPM, including reduced length of stay[4] and less intensive care use and lower hospitalization.[6] Optimizations to increase the benefits and to minimize the risks of RPM programs require refining the target population. For example, Lupei et al[7] developed and implemented a machine learning prognostic model triaging patients with increased risk for COVID-19 severity. Whereas this algorithm was aimed at support of emergency department physicians' clinical decision-making, use of such a model for precise identification of patients who could benefit from an RPM solution such as this or may need tailoring of resources should be considered.

Interestingly, in considering equitable access and reducing barriers to access for RPM, the authors found that racial and ethnic minority populations were as likely to engage with the RPM program as non-Hispanic White populations. Studies in other populations with COVID-19 and RPM have demonstrated more nuanced findings regarding engagement, with preferences for telephone over app-based monitoring among Black, male, older patients as well as those from disadvantaged neighborhoods or with chronic medical conditions.[8] Similarly, in another study of patients with type 2 diabetes enrolled in an RPM program, a larger share of Black patients and those older than 65 years demonstrated regular engagement, whereas those with lower incomes had less engagement.[9]

The experience of Haddad and coauthors contributes to our understanding of RPM feasibility as well as its potential as an adjunct to traditional clinical care. It is clear that RPM programs such as these will continue to mature over time, as will our understanding of patient engagement, digital technology and care delivery design, and ultimately sustainability of these solutions.

POTENTIAL COMPETING INTERESTS

The authors report no competing interests.

Melissa Gunderson, MD
Department of Surgery, University of Minnesota, Minneapolis, MN
Institute for Health Informatics, University of Minnesota, Minneapolis, MN

Genevieve B. Melton, MD, PhD
Department of Surgery, University of Minnesota, Minneapolis, MN
Institute for Health Informatics, University of Minnesota, Minneapolis, MN
Center for Learning Health Systems Sciences, University of Minnesota, Minneapolis, MN

Correspondence: Address to Genevieve B. Melton, MD, PhD, Mayo Mail Code 450, 420 Delaware St SE, Minneapolis, MN 55455 (gmelton@umn.edu; Twitter: @meltonmeaux).

REFERENCES

1. Reeves JJ, Pageler NM, Wick EC, et al. The clinical information systems response to the COVID-19 pandemic. *Yearb Med Inform*. 2021;30(1):105-125.
2. Haddad TC, Coffey JD, Deng Y, et al. Impact of a high-risk, ambulatory COVID-19 remote patient monitoring program on utilization, cost, and mortality. *Mayo Clin Proc*. 2022;97(12):2215-2225.
3. Annis T, Pleasants S, Hultman G, et al. Rapid implementation of a COVID-19 remote patient monitoring program. *J Am Med Inform Assoc*. 2020;27(8):1326-1330.
4. Grutters LA, Majoor KI, Pol-Mattern ES, Hardeman JA, van Swol CF, Vorselaars AD. Home-monitoring reduces hospital stay for COVID-19 patients. *Eur Respir J*. 2021;58(5):2101871.
5. Oliver J, Dutch M, Rojek A, Putland M, Knott JC. Remote COVID-19 patient monitoring system: a qualitative evaluation. *BMJ Open*. 2022 May 4;12(5):e054601.
6. Crotty BH, Dong Y, Laud P, et al. Hospitalization outcomes among patients with COVID-19 undergoing remote monitoring. *JAMA Netw Open*. 2022;5(7):e2221050.
7. Lupei MI, Li D, Ingraham NE, et al. A 12-hospital prospective evaluation of a clinical decision support prognostic algorithm based on logistic regression as a form of machine learning to facilitate decision making for patients with suspected COVID-19. *PloS One*. 2022;17(1):e0262193.
8. Fritz BA, Ramsey B, Taylor D, et al. Association of race and neighborhood disadvantage with patient engagement in a home-based COVID-19 remote monitoring program. *J Gen Intern Med*. 2022;37(4):838-846.
9. Kirkland EB, Marsden J, Zhang J, et al. Remote patient monitoring sustains reductions of hemoglobin A_{1c} in underserved patients to 12 months. *Prim Care Diabetes*. 2021;15(3):459-463.