

Respiratory Therapists' Perspectives on the Adoption of Remote Monitoring Technologies for Chronic Respiratory Conditions: A Qualitative Study

Wael H. Alanazi¹, Mohammed B. Alshahrani², Majed A. Alsaahli³, Ahmed A. Alanazi⁴, Fahad R. Alharbi⁵, Saja A. Almarhoun⁶, Mansour A. Alqahtani⁷, Abdulaziz S. Alaws⁸

Respiratory Therapist
Health affairs at the ministry of National Guard

Abstract

Objective: This qualitative study investigates respiratory therapists' perspectives on the adoption of remote monitoring technologies for managing chronic respiratory conditions, focusing on COPD and asthma. The study aims to explore perceived benefits, challenges, and the impact of these technologies on patient care and clinical workflows.

Methods: Semi-structured interviews were conducted with 15 respiratory therapists from various healthcare settings. Data were analyzed using thematic analysis to identify key themes and sub-themes related to the use of remote monitoring technologies.

Results: The study identified several benefits, including enhanced patient outcomes through real-time monitoring, increased patient engagement, and early intervention. However, challenges such as technological issues, data management, and integration into existing systems were also highlighted. Participants emphasized the need for improved device reliability and better training and support.

Conclusion: Remote monitoring technologies offer significant potential for improving chronic respiratory disease management. Addressing technological and integration challenges while investing in training can optimize their effectiveness and support respiratory therapists in providing high-quality care.

Keywords: Remote Monitoring Technologies, Respiratory Therapists, Chronic Respiratory Conditions, Patient Engagement, Healthcare Technology, Qualitative Study

Introduction

Chronic respiratory conditions such as Chronic Obstructive Pulmonary Disease (COPD) and asthma significantly impact patients' quality of life and healthcare systems worldwide (Global Initiative for Chronic Obstructive Lung Disease [GOLD], 2023). These conditions often require ongoing management and frequent monitoring to optimize treatment and improve patient outcomes. Recent advancements in remote monitoring technologies offer new opportunities for enhancing chronic disease management by providing real-time data and facilitating more proactive care (Aliverti et al., 2017).

Remote monitoring technologies, including wearable devices, mobile health applications, and telemedicine platforms, have the potential to revolutionize the management of chronic respiratory diseases. These tools enable continuous tracking of symptoms, medication adherence, and environmental factors, which can lead to timely interventions and personalized care (Stamenova et al., 2020). Despite these advantages, the integration of remote monitoring into routine practice poses several challenges, including technological barriers, data privacy concerns, and the need for changes in clinical workflows (Simblett et al., 2018).

Respiratory therapists (RTs) play a crucial role in managing chronic respiratory conditions, from conducting assessments and administering treatments to educating patients about their conditions and self-management

strategies (American Association for Respiratory Care [AARC], 2021). As the adoption of remote monitoring technologies increases, RTs are expected to be at the forefront of implementing these tools, requiring them to adapt to new practices and workflows. Understanding RTs' perspectives on these technologies is essential for addressing potential barriers and optimizing the implementation process (Jiang et al., 2022).

This study aims to explore respiratory therapists' experiences and perspectives on the use of remote monitoring devices for managing chronic respiratory conditions. By examining RTs' views on the benefits, challenges, and impact of these technologies, the research seeks to provide insights into how remote monitoring can be effectively integrated into clinical practice to enhance patient care.

Literature Review

Remote Monitoring Technologies in Chronic Respiratory Disease Management: Remote monitoring technologies have gained traction in the management of chronic respiratory diseases due to their ability to provide real-time data and facilitate early interventions. These technologies include wearable devices, mobile health applications, and telehealth platforms, which collectively offer a comprehensive approach to managing chronic conditions such as Chronic Obstructive Pulmonary Disease (COPD) and asthma (Stamenova et al., 2020). By continuously tracking physiological parameters and symptoms, these tools aim to improve disease management and enhance patient outcomes.

Wearable Devices and Mobile Health Applications: Wearable devices, such as smartwatches and fitness trackers, and mobile health applications are increasingly used to monitor respiratory symptoms and medication adherence. These devices can measure parameters like heart rate, oxygen saturation, and physical activity, providing valuable data that can be used to adjust treatment plans (Aliverti et al., 2017). Mobile applications also offer features for tracking symptoms, medication use, and environmental triggers, which can help patients manage their conditions more effectively (Jiang et al., 2022).

Telehealth Platforms: Telehealth platforms enable remote consultations between patients and healthcare providers, allowing for regular check-ins and adjustments to treatment plans without the need for in-person visits. This can be particularly beneficial for patients with chronic respiratory conditions who may have difficulty accessing traditional healthcare services due to mobility issues or geographic barriers (Simblett et al., 2018). Telehealth can also support remote monitoring by integrating data from wearable devices and applications into clinical consultations (Stamenova et al., 2020).

Benefits of Remote Monitoring Technologies: The primary benefit of remote monitoring technologies is their ability to provide continuous, real-time data, which can lead to more timely and personalized care. For instance, studies have shown that remote monitoring can improve medication adherence, reduce hospital admissions, and enhance overall disease management in patients with chronic respiratory conditions (Stamenova et al., 2020). By enabling proactive management, these technologies help patients avoid exacerbations and maintain better control over their conditions.

Enhanced Patient Engagement: Remote monitoring technologies also promote greater patient engagement by empowering individuals to take an active role in their health management. Through features like symptom tracking and real-time feedback, patients can become more aware of their condition and more motivated to adhere to treatment plans (Aliverti et al., 2017). This increased engagement can lead to improved health outcomes and a better quality of life for patients.

Challenges and Barriers: Despite their advantages, the adoption of remote monitoring technologies faces several challenges. Technological barriers, such as device reliability and data accuracy, can impact the effectiveness of these tools (Simblett et al., 2018). Additionally, issues related to data privacy and security are critical concerns, as the collection and transmission of sensitive health information require stringent safeguards (Jiang et al., 2022).

Integration into Clinical Practice: Integrating remote monitoring technologies into existing clinical workflows can be challenging. Healthcare providers, including respiratory therapists, may need additional training to effectively use these tools and interpret the data they provide. Additionally, the integration of remote monitoring data into electronic health records and clinical decision-making processes requires careful planning and coordination (Stamenova et al., 2020).

Role of Respiratory Therapists: Respiratory therapists play a crucial role in the management of chronic respiratory diseases and are increasingly involved in the use of remote monitoring technologies. Their

responsibilities include interpreting data from these tools, adjusting treatment plans based on real-time information, and providing education and support to patients (AARC, 2021). Understanding their perspectives on the adoption and implementation of these technologies is essential for optimizing their use and enhancing patient care.

Methodology

Study Design: This qualitative study was conducted to explore respiratory therapists' perspectives on the adoption and use of remote monitoring technologies for managing chronic respiratory conditions. The research utilized semi-structured interviews to gather in-depth insights into RTs' experiences, challenges, and opinions regarding these technologies.

Participants: The study involved 20 respiratory therapists (RTs) working in various healthcare settings, including outpatient clinics, and home health care within a large tertiary hospital. Participants were selected through purposive sampling to ensure a diverse representation of RTs with varying levels of experience and exposure to remote monitoring technologies. Inclusion criteria required participants to have at least one year of experience in respiratory therapy and familiarity with remote monitoring devices used for chronic respiratory conditions.

Data Collection: Data were collected through semi-structured interviews, each interview lasted approximately 45-60 minutes and was conducted either in person or via secure video conferencing platforms, depending on participant availability and preference. The interview guide included open-ended questions designed to elicit detailed responses about participants' experiences with remote monitoring technologies, perceived benefits, challenges, and impact on patient care.

Sample Interview Questions:

1. How have remote monitoring technologies been integrated into your practice as a respiratory therapist?
2. What benefits have you observed from using these technologies in managing chronic respiratory conditions?
3. What challenges or barriers have you encountered when implementing or using these technologies?
4. How do you perceive the impact of remote monitoring on patient outcomes and your workflow?
5. What recommendations do you have for improving the use of remote monitoring technologies in respiratory care?

All interviews were audio-recorded with participants' consent and transcribed verbatim for analysis.

Data Analysis: Data analysis followed a thematic analysis approach, as outlined by Braun and Clarke (2006). The analysis process involved the following steps:

1. **Familiarization with Data:** The research team read and re-read the interview transcripts to become familiar with the content and context.
2. **Initial Coding:** Open coding was performed to identify key concepts and categories relevant to the research questions. Codes were applied to segments of text that represented distinct ideas or themes.
3. **Theme Development:** Codes were grouped into broader themes based on their similarities and relationships. Themes were reviewed and refined to ensure they accurately represented the data.
4. **Theme Finalization:** Final themes were developed and defined, capturing the core insights and experiences shared by participants.

To ensure the credibility and trustworthiness of the findings, member checking was conducted. Participants were provided with a summary of the key themes and asked to verify the accuracy of the interpretations.

Ethical Considerations

The study was approved by the ethics committee. Informed consent was obtained from all participants prior to data collection, ensuring they were aware of the study's purpose, procedures, and their right to withdraw at any time. Confidentiality was maintained by anonymizing interview data and securely storing all records.

Findings

The analysis of the semi-structured interviews with 20 respiratory therapists revealed several key themes and sub-themes related to their experiences with remote monitoring technologies for chronic respiratory conditions. The themes and sub-themes are detailed below, along with illustrative participant replies.

Theme 1: Perceived Benefits of Remote Monitoring Technologies

Sub-theme 1.1: Improved Patient Outcomes

- **Participant 1:** "Remote monitoring has really helped in tracking patients' symptoms in real time. We can intervene earlier if there's a deterioration, which has led to fewer hospitalizations."
- **Participant 4:** "Patients appreciate the continuous monitoring. It gives them a sense of security knowing that their condition is being watched closely."

Sub-theme 1.2: Enhanced Patient Engagement

- **Participant 7:** "With remote monitoring, patients are more engaged in their own care. They see their data regularly and are more likely to adhere to their treatment plans."
- **Participant 10:** "Patients have mentioned that seeing their progress through the remote devices motivates them to stick to their prescribed therapies."

Theme 2: Challenges and Barriers

Sub-theme 2.1: Technological Issues

- **Participant 2:** "We often face issues with device malfunctions or connectivity problems. It can be frustrating trying to resolve these technical issues quickly."
- **Participant 5:** "Some of the devices are not very user-friendly, especially for older patients who might not be tech-savvy."

Sub-theme 2.2: Data Management and Integration

- **Participant 8:** "Integrating data from remote monitoring devices into our existing systems can be cumbersome. We need more streamlined processes for data management."
- **Participant 12:** "The sheer volume of data can be overwhelming. Sorting through it to find actionable insights is a challenge."

Theme 3: Impact on Workflow and Clinical Practice

Sub-theme 3.1: Changes in Workflow

- **Participant 3:** "Remote monitoring has changed how we allocate our time. We spend more time analyzing data and less on direct patient care."
- **Participant 6:** "While it adds an extra layer of tasks, it also helps in prioritizing patients who need immediate attention, which is a positive change."

Sub-theme 3.2: Training and Support Needs

- **Participant 9:** "Proper training on using these technologies is crucial. We need more support and resources to ensure we're using them effectively."
- **Participant 11:** "Ongoing training and technical support would make a significant difference in how smoothly these systems are integrated into our daily routines."

Theme 4: Future Recommendations

Sub-theme 4.1: Improved Device Design and Usability

- **Participant 13:** "Future devices should be more user-friendly and designed with both patients and healthcare providers in mind."
- **Participant 14:** "Simplified interfaces and better integration with other healthcare systems would be highly beneficial."

Sub-theme 4.2: Enhanced Support and Resources

- **Participant 15:** "There should be more resources allocated to troubleshooting and support for these technologies."
- **Participant 16:** "We need better guidelines and support for integrating remote monitoring data into clinical decision-making."

Discussion

This study explored respiratory therapists' perspectives on the adoption and use of remote monitoring technologies for managing chronic respiratory conditions. The findings offer significant insights into the perceived benefits, challenges, and areas for improvement associated with these technologies.

Benefits of Remote Monitoring Technologies: The study found that respiratory therapists perceive several key benefits of remote monitoring technologies. First, there is a consensus that these technologies enhance patient outcomes by enabling real-time monitoring and early intervention. This aligns with previous research suggesting that remote monitoring can lead to fewer hospitalizations and improved disease management for chronic conditions like COPD and asthma (Castelyn et al., 2021). Participants noted that continuous monitoring allows for timely adjustments to treatment plans, which is critical in preventing exacerbations and optimizing patient care (Hernandez et al., 2014).

Additionally, remote monitoring technologies were reported to improve patient engagement. Therapists observed that patients who regularly interacted with their monitoring devices were more motivated to adhere to their treatment regimens. This finding supports existing literature that emphasizes the role of self-management and patient involvement in chronic disease management (Su et al., 2019). By providing patients with visible feedback on their health status, remote monitoring fosters a proactive approach to managing their condition.

Challenges and Barriers: Despite the benefits, several challenges were identified. Technological issues, such as device malfunctions and connectivity problems, were frequently cited by participants. This mirrors concerns raised in other studies, which highlight the need for reliable and user-friendly technology to ensure effective implementation (Farias et al., 2020). Device failures and connectivity issues can disrupt patient monitoring and undermine the effectiveness of these technologies.

Data management and integration also emerged as significant barriers. Participants reported difficulties in integrating data from remote monitoring devices into existing healthcare systems and managing the large volumes of data generated. These challenges are consistent with findings from research on health information systems, which emphasize the importance of developing streamlined processes for data handling and integration (Albahri et al., 2018). Effective data management is crucial for translating raw data into actionable insights that can inform clinical decision-making.

Impact on Workflow and Clinical Practice: The integration of remote monitoring technologies has had a noticeable impact on clinical workflows. Participants described a shift in their responsibilities, with increased time spent analyzing data and less direct patient interaction. This shift requires balancing the benefits of enhanced monitoring with the potential strain on workflow and direct patient care (Albahri et al., 2018).

Training and support emerged as critical factors in the successful adoption of these technologies. Participants highlighted the need for comprehensive training and ongoing technical support to effectively utilize remote monitoring tools. This finding underscores the importance of investing in education and resources to support healthcare professionals in adapting to new technologies (Chan et al., 2022).

Future Recommendations: Based on the findings, several recommendations can be made to enhance the use of remote monitoring technologies. Improving device design and usability is crucial to address the technological issues identified. Devices should be designed with both patient and provider needs in mind, incorporating user-friendly interfaces and reliable performance (Or et al., 2022).

Furthermore, enhancing support and resources for troubleshooting and data integration can mitigate some of the challenges faced by respiratory therapists. Providing adequate training and technical assistance will facilitate smoother integration of remote monitoring into clinical practice (Albahri, et al., 2018).

Conclusion

This study provides valuable insights into the role of respiratory therapists in using remote monitoring technologies for managing chronic respiratory conditions. While these technologies offer significant benefits in terms of patient outcomes and engagement, challenges related to technology reliability, data management,

and training must be addressed. By focusing on these areas, healthcare systems can optimize the use of remote monitoring technologies and improve care for patients with chronic respiratory conditions.

References

1. Albahri, O. S., Zaidan, A. A., Zaidan, B. B., Hashim, M., Albahri, A. S., & Alsalem, M. A. (2018). Real-time remote health-monitoring Systems in a Medical Centre: A review of the provision of healthcare services-based body sensor information, open challenges and methodological aspects. *Journal of medical systems*, 42, 1-47.
2. Aliverti, A. (2017). Wearable technology: role in respiratory health and disease. *Breathe*, 13(2), e27-e36.
3. American Association for Respiratory Care (AARC). (2021). *AARC Clinical Practice Guidelines*. Retrieved from <https://www.aarc.org>
4. Braun, V., & Clarke, V. (2006). *Using thematic analysis in psychology*. *Qualitative Research in Psychology*, 3(2), 77-101
5. Castelyn, G., Laranjo, L., Schreier, G., & Gallego, B. (2021). Predictive performance and impact of algorithms in remote monitoring of chronic conditions: A systematic review and meta-analysis. *International Journal of Medical Informatics*, 156, 104620.
6. Chan, A., Cohen, R., Robinson, K. M., Bhardwaj, D., Gregson, G., Jutai, J. W., ... & Fekr, A. R. (2022). Evidence and user considerations of home health monitoring for older adults: scoping review. *JMIR aging*, 5(4), e40079.
7. Farias, F. A. C. D., Dagostini, C. M., Bicca, Y. D. A., Falavigna, V. F., & Falavigna, A. (2020). Remote patient monitoring: a systematic review. *Telemedicine and e-Health*, 26(5), 576-583.
8. Global Initiative for Chronic Obstructive Lung Disease (GOLD). (2023). *Global strategy for the prevention, diagnosis, and management of COPD*. Retrieved from <https://goldcopd.org>
9. Hernandez, C., Mallow, J., & Narsavage, G. L. (2014). Delivering telemedicine interventions in chronic respiratory disease. *Breathe*, 10(3), 198-212.
10. Jiang, Y., Sun, P., Chen, Z., Guo, J., Wang, S., Liu, F., & Li, J. (2022). Patients' and healthcare providers' perceptions and experiences of telehealth use and online health information use in chronic disease management for older patients with chronic obstructive pulmonary disease: a qualitative study. *BMC geriatrics*, 22, 1-16.
11. Simblett, S., Greer, B., Matcham, F., Curtis, H., Polhemus, A., Ferrão, J., ... & Wykes, T. (2018). Barriers to and facilitators of engagement with remote measurement technology for managing health: systematic review and content analysis of findings. *Journal of medical Internet research*, 20(7), e10480.
12. Stamenova, V., Liang, K., Yang, R., Engel, K., van Lieshout, F., Lalingo, E., ... & Bhattacharyya, O. (2020). Technology-enabled self-management of chronic obstructive pulmonary disease with or without asynchronous remote monitoring: randomized controlled trial. *Journal of medical Internet research*, 22(7), e18598.
13. Su, D., Michaud, T. L., Estabrooks, P., Schwab, R. J., Eiland, L. A., Hansen, G., ... & Siahpush, M. (2019). Diabetes management through remote patient monitoring: the importance of patient activation and engagement with the technology. *Telemedicine and e-Health*, 25(10), 952-959.
14. Or, C. K., Holden, R. J., & Valdez, R. S. (2022). Human factors engineering and user-centered design for mobile health technology: enhancing effectiveness, efficiency, and satisfaction. In *Human-Automation interaction: mobile computing* (pp. 97-118). Cham: Springer International Publishing.