BRIEF REPORT

Digital technologies in Pediatric Respiratory Medicine: insights from a preliminary survey by the Italian Pediatric Respiratory Society

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ABSTRACT

In early 2024, the Italian Pediatric Respiratory Society study group 'Pediatric Digital Technologies for Respiratory Care, PeDiTCare' conducted a survey to assess the awareness and utilization of digital health technologies (DHTs) in the management of pediatric respiratory diseases. The survey was disseminated online through the Society newsletter and social media platforms, collecting responses from 46 society members from most regions of Italy over a three-week period. A preliminary descriptive analysis of the data revealed notable use of electronic health records, telemedicine, and home ventilation systems, particularly for asthma management. Key barriers to broad DHTs adoption include limited resources, high costs, and complexity of use. Respondents emphasized the need for increased financial support and training to expand DHTs integration and improve pediatric respiratory care.

IMPACT STATEMENT: This study highlights the transformative potential of digital health technologies in pediatric respiratory care, while also emphasizing the need to overcome barriers such as limited financial resources and training to fully integrate these tools and improve outcomes.

INTRODUCTION

Digital health technologies (DHTs) are transforming healthcare systems worldwide, offering new opportunities to enhance clinical care, streamline patient management, and foster collaborative research. In pediatric respiratory medicine, where early detection, consistent monitoring, and timely interventions are crucial for managing chronic conditions like asthma and respiratory failure, DHTs have the potential to revolutionize patient outcomes. Despite these advancements, the adoption and integration of digital technologies in pediatric care, particularly within respiratory medicine, remain uneven across different regions and healthcare settings. The Italian Pediatric Respiratory Society has recognized the importance of addressing these challenges and promoting the use of DHTs in pediatric respiratory care. To this end, the study group named 'Pediatric Digital Technologies for Respiratory

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KEY WORDS

E-health; pediatric respiratory diseases; survey; digital health technologies.

Care, PeDiTCare' was launched in early 2024 as part of the Society broader effort to drive research and innovation in this area. PeDiTCare is a multidisciplinary initiative aimed at building a national network to advance the knowledge and application of digital healthcare for pediatric respiratory diseases. The initiative seeks to map current practices, identify barriers to adoption, and create a framework for expanding the use of DHTs in pediatric pulmonology. The primary goals of PeDiTCare group include evaluating the current landscape of digital technology use in pediatric pulmonology centers across Italy and identifying key enablers and obstacles to broader implementation. By understanding the level of awareness, application, and experience with digital tools such as telemedicine, electronic health records, and telemonitoring systems, the initiative aims to guide future efforts toward improving care quality for children with respiratory conditions. Furthermore, the project seeks to provide healthcare professionals with actionable insights on how to overcome the financial, technical, and educational challenges that currently limit the widespread adoption of DHTs in pediatric respiratory medicine.

MATERIAL AND METHODS

A survey was designed to collect data on the current levels of awareness, adoption, and practical experience with DHTs among pediatric respiratory specialists in Italy, while also identifying potential barriers and facilitators for their broad implementation in clinical settings. The survey was distributed online through the Society's newsletter and social media platforms, with responses collected over a three-week period. Following this, an initial descriptive analysis of the data was carried out to provide a preliminary understanding of the findings.

RESULTS

The survey included 46 participants, representing a significant proportion of the 53 pediatric pulmonology centers listed by the Italian Pediatric Respiratory Society. The geographical distribution covered most Italian regions, with notable participation from centers located in Piedmont, Lazio, Sicily, Lombardy and Emilia Romagna. The majority found to be women (76.1%) aged between 40 and 49 years (39.1%). Most respondents (84.8%) were pediatricians with over 10 years of experience, predominantly working in tertiary hospitals. The respiratory conditions most managed with DHTs were asthma (51.2%) and chronic respiratory failure (19.5%). DHT use was prevalent for patient monitoring, with a substantial proportion of respondents utilizing these tools regularly, while others employed them occasionally based on symptoms, and 24% using them primarily for research purposes (**Figure 1**). Additionally, a notable group of participants reported having extensive experience, exceeding five years, with DHTs. The most frequently used digital technologies were included electronic health record systems, telemedicine, and home ventilation systems, followed by telemonitoring systems, mobile health apps, and home polysomnography (**Figure 2**).

Over 60% of participants identified key barriers to DHT adoption, including limited resources (78.3%), high costs (74.5%), and the complexity of use, which necessitates specialized training (60.4%). More than 80% of respondents suggested that increasing financial support and

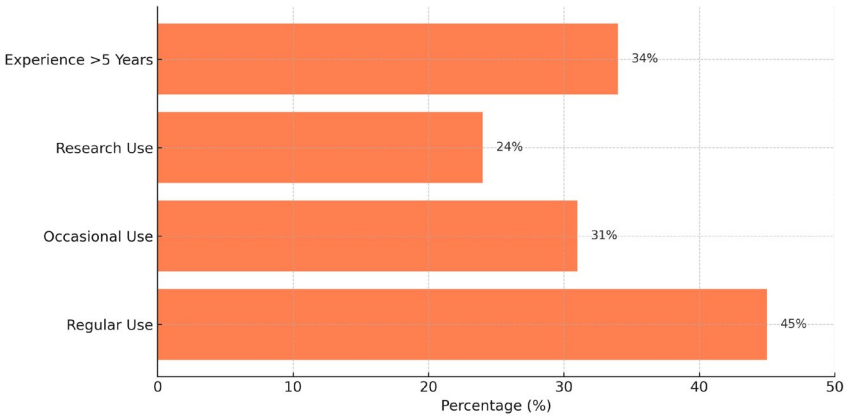

***Figure 1**. Preliminary results of the survey: DHT usage patterns among pediatric respiratory specialists in Italy.*

providing targeted training for healthcare staff would facilitate the wider implementation of DHTs, particularly in smaller hospitals and among general pediatricians.

DISCUSSION

The findings from this survey provide valuable insights into the current landscape of DHT use in pediatric respiratory care across Italy. A significant proportion of the respondents, primarily pediatricians working in tertiary hospitals, demonstrated a moderate to high level of engagement with DHTs, particularly in the management of asthma and chronic respiratory failure. However, the results also highlight a considerable gap in the widespread adoption of these technologies, underscoring important barriers that need to be addressed to fully realize the potential of DHTs in pediatric pulmonology.

The high percentage of respondents using DHTs for patient monitoring (45% regularly, 31% occasionally) is suggestive of a solid foundation for integrating digital tools into clinical practice. This is consistent with previous studies that have shown DHTs to be effective in improving patient outcomes, particularly through continuous monitoring and early detection of exacerbations in chronic conditions such as asthma (1); the fact that a quarter of participants use DHTs exclusively for research purposes reflects the uneven integration of these technologies into routine care. This could be partly due to the relatively high percentage (34%) of professionals with over five years of experience using DHTs, indicating that while a subset of clinicians is familiar with these tools, they may still be seen as niche solutions rather than standard practice.

≤The reported barriers to broader adoption of DHTs − primarily lack of resources, high costs, and the complexity of using these technologies − are consistent with those found in other studies on the challenges of integrating digital health solutions into clinical practice (3). This evidence underscores the importance of addressing both financial and educational hurdles to foster broader DHT adoption. The fact that over 80% of participants identified increased financial resources and staff training as key facilitators for DHT use suggests that targeted investments in these areas could significantly enhance the integration of digital tools into pediatric respiratory care.

Moreover, the emphasis on training reflects a critical need to equip healthcare professionals with the skills to navigate and optimize DHTs in clinical settings. Given the complexity of some technologies, such as telemonitoring systems and home polysomnography, providing specialized training could alleviate concerns regarding the usability and effectiveness of these tools. In addition, expanding the use of DHTs to smaller hospitals and general pediatricians, as suggested by survey respondents, could improve access to these technologies and promote a more standardized approach to care across different healthcare settings.

This study has some limitations that should be acknowledged. First, the survey sample, while representative of pediatric respiratory specialists within IPRS, may not fully capture the diversity of practices and experiences across Italy. Additionally, the self-reported nature of the data may introduce bias, as respondents with more favorable views on DHTs might have been more inclined to participate.

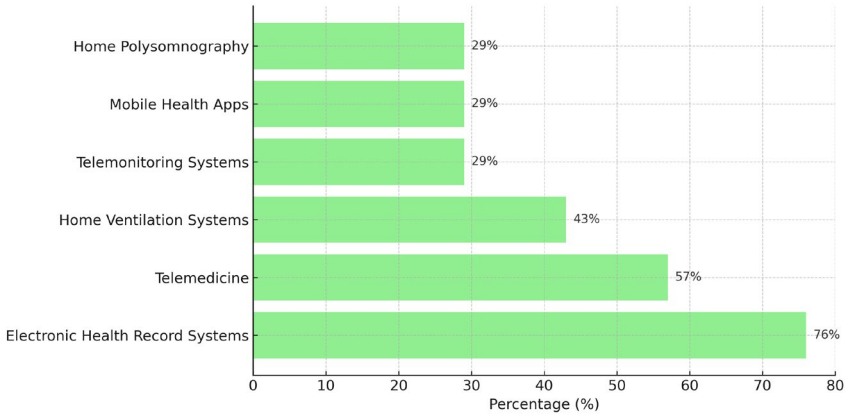

***Figure 2**. Preliminary results of the survey: DHT usage statistics among pediatric respiratory specialists in Italy.*

CONCLUSIONS

The results of this survey provide a clear snapshot of the current use and perception of DHTs among pediatric respiratory specialists in Italy. While there is a promising level of engagement with DHTs, particularly for patient monitoring and telemedicine, the integration of more advanced digital tools remains limited. Key barriers such as resource constraints, high costs, and the complexity of these technologies continue to hinder their wider adoption. However, the strong consensus among respondents on the need for increased financial resources and targeted training underscores the significant potential for expanding DHT use in pediatric respiratory care. By addressing these barriers, particularly through strategic investments and education, healthcare systems can better equip pediatric specialists to utilize DHTs, ultimately improving the quality of care and outcomes for children with respiratory diseases. Further research and action are needed to facilitate this digital transformation, ensuring that both tertiary and community healthcare settings can fully benefit from these innovative tools.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interests

The Authors have declared no conflict of interests.

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Author contributions

Conceptualization and study design: GF, SLG, VM and AL; methodology development, data collection and analysis: AP; drafting of the manuscript: GR, BA, CC, VAF, SM, MN, RN, AO, GFP, MP, LV and AL; Supervision of the project, and final approval of the version to be submitted: GF, SLG, VM, and AL. All Authors have read and approved the final manuscript and agree to be accountable for all aspects of the work.

Ethical approval

Human studies and subjects

This study was conducted in accordance with the ethical standards set forth by the Italian Pediatric Respiratory Society. All participants were informed about the purpose of the study, and their consent was obtained before participation. The data collected were anonymized to ensure confidentiality and privacy.

Data sharing and data accessibility

The survey data supporting the findings of this study are available upon reasonable request from the corresponding author, subject to ethical considerations and the approval of the Italian Pediatric Respiratory Society to ensure the confidentiality and privacy of participants.

Publication ethics

Plagiarism

Authors declare no potentially overlapping publications with the content of this manuscript and all original studies are cited as appropriate.

Data falsification and fabrication

All the data corresponds to the real.

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