

Value Co-Creation in Telemedicine: A Qualitative Study of Pediatricians' Expectations Regarding Telehomecare Implementation in an Italian Pediatric Hospital

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Purpose: The widespread adoption of telemedicine tools poses new and little-known challenges for healthcare professionals, who are required to adapt their knowledge, skills, and work practices to this innovative scenario. Understanding healthcare professionals' expectations and concerns about adopting telemedicine can facilitate its effective integration. Therefore, drawing upon the Value Co-Creation in Healthcare model, the current study aims to investigate pediatricians' expectations regarding antecedents, outcomes, and management activities relevant to the implementation of a telehomecare service.

Methods: Interviews invitations were sent to all pediatricians (n=13) involved in a pilot study using the TytoCare device, a telehomecare tool that enables remote medical examinations, at an Italian pediatric hospital. All invited pediatricians agreed to participate. The semi-structured interviews, each lasting approximately 30 to 45 minutes, were conducted remotely via Microsoft Teams prior to the use of the TytoCare device. All interviews were recorded and transcribed verbatim. The content was subsequently analyzed through thematic analysis using MAXQDA software.

Results: Five overarching thematic areas emerged from the interviews: factors influencing the adoption of the telehomecare device, advantages of its use, impacts on work practices, changes in the patient-professional relationship, and management activities. While concerns exist about the adequacy of telehomecare compared to in-person visits, the device offers potential benefits, such as improving the hospital experience for children by shortening hospital stays. However, it may lead to an increased workload and necessitate stronger trust and communication in remote care. Successful integration requires dedicated support staff, regulatory adjustments, and effective leadership, with active involvement of healthcare professionals in decision-making.

Conclusion: By shedding light on healthcare professionals' expectations about telehomecare device, this study provides useful insights to healthcare leaders to tailor interventions to accompany technology within care practices to valorize its benefits and promote value co-creation processes.

Keywords: telehomecare, expectations about telemedicine, pediatricians, healthcare professionals, co-creation of value, qualitative

Introduction

Telemedicine represents the utilization of information and communication technologies by healthcare professionals to provide essential healthcare services, overcoming geographical and temporal barriers to exchange accurate information crucial for diagnosing, treating, and preventing diseases and injuries.¹ This umbrella term encompasses a broad range of applications, including, for instance, teleconsultation, remote home medical care, and telemonitoring.² The introduction of telemedicine in healthcare environments³ establishes intricate socio-technical systems,³ where the resource integration

of users and healthcare providers leads to processes of value co-creation.^{4,5} Among the various forms of telemedicine, telemonitoring is utilized for tracking patients' clinical data.² This service facilitates the transmission of patients' information from their homes to a specialist through a specific device,⁶ thereby enabling accurate and timely surveillance, improving patient management and care without the necessity for frequent hospital visits. Consistent with the recent switch from a passive to an active role recognized to patients, telemonitoring allows patients to actively control their health status and life habits, facilitating self-management.⁷ However, patients (and/or their caregivers) may exhibit different levels of involvement and participation in using telemonitoring devices, which, in turn, can impact the effectiveness and the quality of care provided through remote healthcare services.⁸

This study focuses on a specific type of remote monitoring known as telehomecare, which involves the use of a telecommunication device with medical peripherals. This allows patients and their caregivers to conduct home medical examinations under the remote guidance of a doctor.⁹ Telehomecare is widely recognized as one of the most effective telemedicine tools.¹⁰ It differs from other telemedicine approaches by fostering patient autonomy at home, rather than simply facilitating remote consultations.

Unlike traditional telemedicine, which focuses primarily on direct communication between patient and doctor, telehomecare involves a more hands-on role for patients and their caregivers in performing medical tasks. This shift offers significant benefits. Patients become more engaged and aware of how their actions impact their health, leading to improved self-management skills, treatment adherence, and lifestyle modifications.¹¹ By enabling patients to stay at home while being remotely monitored by a doctor, telehomecare improves their quality of life.¹² Additionally, it fosters a shared vision of patient care plan between caregivers and healthcare professionals, creating reassurance and comfort in patient care.¹³ For healthcare providers, telehomecare offers the primary advantage of cost savings, reducing the structural costs associated with hospital stays.¹⁴

However, the implementation of telehomecare remains limited due to several notable challenges. One major obstacle is the complexity of the technology, as users' perceptions of the usefulness and ease of use of these devices are critical in determining their adoption.^{15,16} Users' confidence in handling the devices,¹⁷ along with healthcare professionals' skills and attitudes toward telemedicine, is pivotal for its sustainable implementation.¹⁸ The introduction of telehomecare often alters healthcare professionals' roles,¹⁷ potentially leading to feelings of loss of control as clinical examinations are moved to the patient's home.

These challenges have broader implications. Resistance to change can arise when telemedicine systems are introduced in a top-down manner without proper communication, becoming a significant barrier to implementation.¹⁹ Previous research has shown that employees' perceptions of work-related changes can vary based on how these changes are communicated by management. Negative perceptions are more likely when changes are imposed without a clear communication plan.²⁰ Gaining a deeper understanding of healthcare professionals' perceptions of telemedicine could help managers and leaders develop an effective communication plan that foster genuine awareness of telemedicine devices.²¹ This is of the utmost importance as the integration of technology in the workplace is often accompanied by increased job demands.²² If these demands are not adequately addressed, they can trigger stress,²³ potentially interfering with the technological implementation process.

To date, most telemedicine research has primarily focused on analysing the technological advancements, clinical applications, and the impact of these devices on patients. However, there is a dearth of research focusing on comprehending healthcare professionals' perceptions concerning the impact and necessary adjustments associated with the integration of telemedicine devices into their clinical practice.²⁴ While some studies have explored healthcare professionals' opinions on telemedicine,^{18,25} as far as our knowledge extends, only one study has been conducted to investigate the point of view of healthcare professionals (ie, nurses) on the implementation of a telehomecare device.²⁶

The Value Co-Creation in Healthcare model⁴ (see [Figure 1](#)) becomes particularly relevant in the context of telehomecare, where collaborative efforts between healthcare professionals, patients, and caregivers are essential for effective care. By fostering this partnership, healthcare professionals can empower patients to take a more active role in their treatment, ultimately leading to improved health outcomes. Building on this framework, the current study aims to explore pediatricians' expectations regarding antecedents, outcomes, and management activities relevant to the implementation of a telehomecare service in a pediatric hospital. By analysing the micro-level perceptions (facilitators and

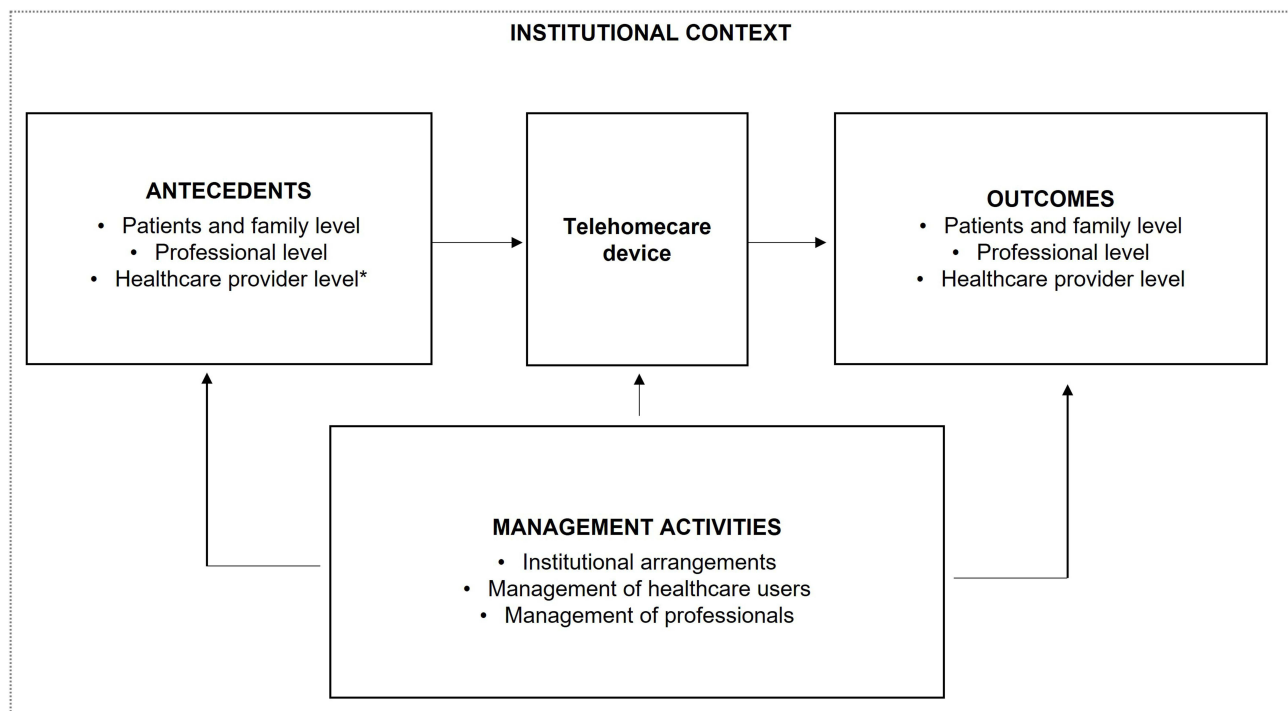


Figure 1 The Value Co-Creation in healthcare framework adapted from Fusco et al (2023).

Note: *Not emerged in our findings.

barriers at the individual level),²⁷ this study offers valuable insights to healthcare leaders on the strategic aspects necessary for the successful integration of telehomecare services. In addition, this research helps address a future challenge by guiding managers and practitioners in designing high-quality training programs for doctors and pediatricians.¹⁸

Methods

This study is part of a broader research project conducted by the University of Milan in collaboration with Buzzi Children's Hospital, a metropolitan healthcare facility located in Milan (Italy). The project aimed to explore the experience of a transitional care program utilizing a user-friendly mobile medical device (TytoCare™, TytoCare Ltd., Natanya, Israel) to facilitate early hospital discharges in pediatric care.

Part of this project, which analysed the experience of caregivers and healthcare professionals through quantitative surveys, has already been published, showing that 96.15% of physicians expressed satisfaction after using the device.²⁸ The current study differs by offering an in-depth analysis of pediatricians' perspectives prior to their experience with the device, through semi-structured interviews conducted before its adoption.

Tyto-Home™ is a comprehensive telehealth solution that enables remote medical examinations and consultations.²⁹ Parents can capture and transmit images of the ear, throat, and skin, record heart and lung sounds, measure heart rate and temperature, all via a smartphone app.³⁰ During the telemedicine visit, pediatricians can see the child and interact with both the parent and young patient to assess the clinical condition post-discharge. In real-time, parents are guided through the correct positioning of the device using images with reference points to optimize the examination.

Study Design and Data Collection

After obtaining informed consent, which included permission for the publication of anonymized responses, all pediatricians involved in the pilot adoption of the device were invited via Email to voluntarily participate in individual semi-structured interviews. All invited pediatricians (n=13) agreed to participate. This sample size aligns with previous literature, which suggests that 7 to 17 interviews are typically sufficient to achieve data saturation.³¹

Table 1 Description of the Sample

ID	Gender	Age	Role	Ward	Job Tenure at the Buzzi Hospital	Overall Job Tenure	Previous Experience with Telemedicine
P1	F	37	Medical Director	Pediatric surgery	8	12	No
P2	F	51	Pediatric Endocrinologist	Pediatric	2	22	Yes
P3	F	28	Resident	Pediatric	1,5	1,5	No
P4	F	27	Resident	Pediatric	1,5	1,5	No
P5	F	52	Referent Pediatrician	Pediatric	1,5	21,5	No
P6	M	67	Pediatric Surgeon	Pediatric	14	42	No
P7	M	29	Resident	Pediatric	1,5	1,5	No
P8	F	28	Resident	Pediatric	0,5	1,5	No
P9	F	27	Resident	Pediatric	1,5	1,5	No
P10	F	43	Medical Director	Pediatric	3	11,5	No
P11	M	48	Pediatric Surgeon	Pediatric surgery	3	17	No
P12	F	40	Pediatrician	Pediatric	2	4	No
P13	F	27	Resident	Pediatric	0,5	2,5	No

Notes: F=Female; M=Male; Age and job tenure measured in years.

The remote semi-structured interviews were conducted using Microsoft Teams in June and July 2022. The majority of participants were female (n=10) with an average age of 39 (SD=12,82) years. All participants had professional background in pediatrics and its related specialties (Table 1).

Participants were first provided with a brief description of the study during a plenary session jointly led by the Head of the Department and the device provider supervisor. The interviews, each lasting approximately 30 to 45 minutes, covered various thematic areas aligned with the interests of both scholars and practitioners. Given the semi-structured format of the interviews, open-ended questions were crafted to allow participants ample room to articulate their individual observations and perceptions.

An interview guide was developed ad hoc based on the Value Co-Creation in Healthcare framework⁴ (see Appendix 1). To enhance content validity, the researchers consulted with the key stakeholders driving the pilot adoption of the device (ie, the head of the department and a pediatrician). The interview guide was further refined during the data collection process through an iterative process, incorporating feedback from healthcare professionals to ensure ecological validity.

To ensure participants' comfort, they were assured that honest responses based on personal experiences were expected, and that there were no correct or incorrect answers. Participation was voluntary and participants were free to withdraw from the study at any point. The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (Approval number n. 0033846).

Data Analysis

The interviews were audio-recorded and transcribed upon completion of data collection, with all personal information removed. A thematic analysis approach was employed to analyze the content,³² utilizing a combined inductive and deductive approach.³³ This involved balancing pre-existing categories based on the Value Co-Creation in Healthcare framework⁴ while identifying emerging codes. This was made to ensure that our analysis was theoretically robust and aligned with the perspectives of the target audience. This alignment is crucial for influencing key leadership decisions regarding the implementation of telemedicine, including policy adoption, informative programs, and training for healthcare professionals involved.

Following Braun and Clarke's methodology,³² a team of three researchers extensively reviewed the interview transcriptions to become familiar with the content. Initially, each researcher independently conducted the coding process by assigning initial codes to the data and then analyzing to explore how they could be grouped into potential themes. At this stage, categories were reinterpreted based on the Value Co-Creation in Healthcare framework (deductive) and emergent themes (inductive), which led to a reassessment of categories and the renaming of some codes. Subsequently, a collaborative session was held to compare and reconcile individual codes, leading to a consensus on the coded labels. Once this alignment was achieved, meaningful excerpts that best represented each code and theme were selected. MAXQDA software facilitated the process of analysis. Saturation was evaluated using the method validated by Guest et al.³⁴ Data saturation was reached after coding the fourth transcript. Detailed calculations are provided in the [Supplementary Materials](#).

Findings

The thematic analysis of interviews with pediatricians revealed five overarching thematic areas: (1) Expected factors influencing the approach to the use of the telehomecare device, (2) Expected advantages of adopting the telehomecare device, (3) Expected impacts of the telehomecare device on work practices, (4) Expected changes in the relationship between patients and professionals and (5) Expected management activities. Participants shared insightful perspectives through illustrative quotes, capturing the nuances of their expectations and concerns. [Figure 2](#) provides a graphical representation of our findings, which will be described in detail in the following sections.

Expected Factors Influencing the Approach to the Use of the Telehomecare Device

Our participants identified different factors that, in their opinion, can influence the adoption of the telehomecare device, encompassing the family and the professional level ([Table 2](#)).

Family Level

Several participants were concerned about potential technological difficulties of parents in understanding how to use the device. As P5 said:

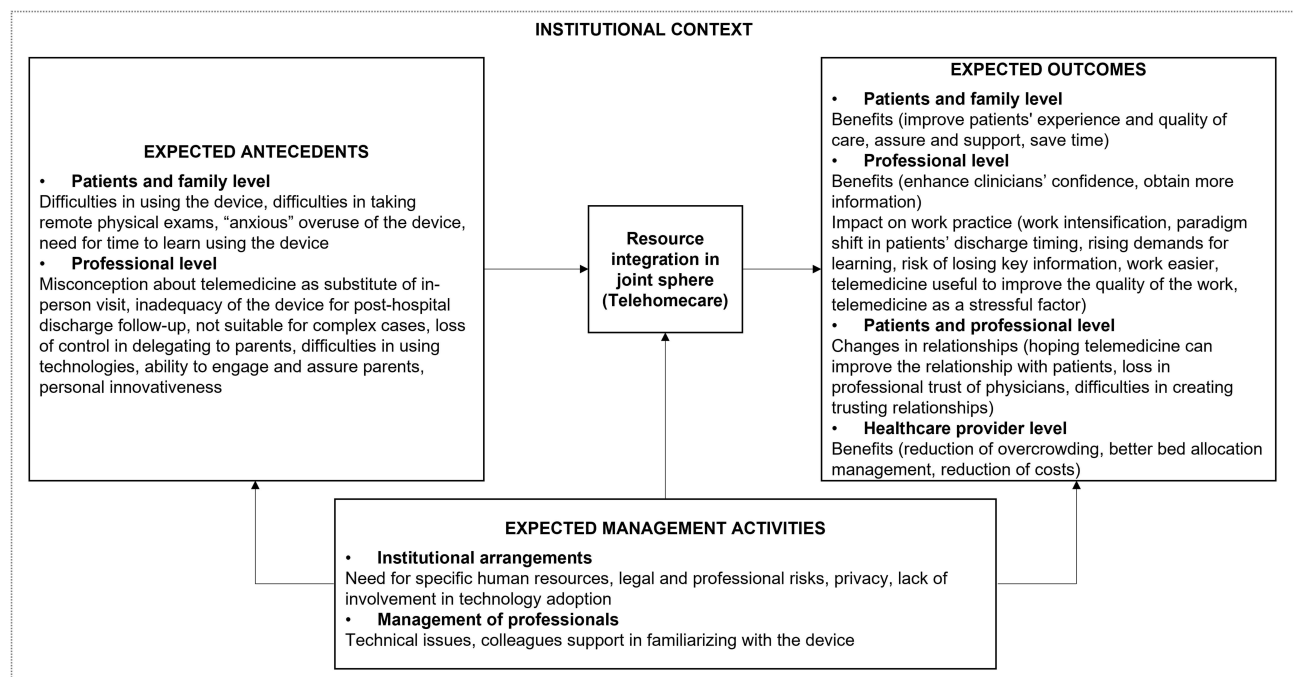


Figure 2 TytoCare healthcare professionals pre-experience expectations.

Table 2 Expected Antecedents – Factors Influencing the Adoption of the Telehomecare Device (n=13)

Categories	Codes	Freq.	Illustrative Quotes
Family level	Difficulties in using the device	n=7	“Another concern is that I hope to have a user on the other end who is capable of keeping up with me. A parent who knows how to use both the technological aspect and the tool in the right way, and position it correctly”. (P5)
	Difficulties in taking remote physical exams	n=4	“It’s important for parents to be able to engage the children in cooperation. It’s also crucial that the parent doesn’t perceive using the device on the child as a hassle, especially because it will require some patience”. (P9); “I fear that some measurements may not be of high quality not so much because of TytoCare, but rather due to the need to keep the child still”. (P4)
	Anxiety and overuse of the device	n=2	“Parents might find themselves in a situation where they take the parameters every half hour due to being overwhelmed by worry that something might be wrong”. (P1)
	Need for time to learn using the device	n=1	“It will depend on the type of family from two perspectives: their familiarity with technology and the amount of time they can dedicate to using the device”. (P3)
Professional level	Misconception about telemedicine as substitute of in-person visit	n=6	“I don’t think it’s appropriate to solely rely on telemedicine to follow a child with a condition. However, incorporating telemedicine alongside in-person care is definitely suitable”. (P2); “I believe that in-person assessment is not entirely replaceable with remote assessment”. (P9)
	Inadequacy of the device for post-hospital discharge follow-up	n=3	“I can certainly imagine it in an outpatient setting for follow-ups. I find it harder to use it in the ward: thanks to this study, we will see how applicable TytoCare will be to the ward”. (P9)
	Not suitable for complex cases	n=3	“TytoCare cannot be the mode of management of urgencies or emergencies”. (P1); “Considering using it for abdominal pathologies, for example, is not appropriate, just as for managing emergencies and therefore acute patients”. (P3)
	Loss of control in delegating to parents	n=4	“The fact that the parent becomes the tool through which the visit is conducted is a bit intimidating to me”. (P10); “I’m not at home with mom, we can do some tests, but you have to trust the person in front of you who positions the device in the right place”. (P5)
	Difficulties in using technologies	n=4	“I’m not very tech-savvy, so I hope I can manage it”. (P12); “We need to get the hang of it by gaining experience. Me and technology aren’t exactly ‘friends’”. (P10)
	Ability to engage and assure parents	n=5	“We’ll need to build a bond of trust with the patient in a shorter time, but also establish a collaborative relationship with the parent”. (P9); “We’ll have to be a bit capable of reassuring parents remotely”. (P3)
	Personal innovativeness	n=3	“I’m happy because it’s an innovative thing, and I’m curious to see how it will turn out”. (P3)

Abbreviations: P, Participant; Freq., number of interviewees who mentioned the code in their interview story.

Another concern is that I hope to have a user on the other end who is capable of keeping up with me. A parent who knows how to use both the technological aspect and the tool in the right way, and position it correctly.

Some pediatricians were also concerned about potential difficulties of parents in taking remote physical examination due to the need to effectively manage their children’s behavior during remote examinations to facilitate clinical consultations. For instance, P4 said:

I fear that some measurements may not be of high quality not so much because of TytoCare, but rather due to the need to keep the child still.

Professional Level

At the professional level, several factors emerged as potential antecedents influencing the adoption of the telehomecare device.

Participants expressed concerns about the notion that telemedicine could fully replace in-person care, particularly when managing ongoing conditions in children. Pediatricians, in particular, emphasized the irreplaceable value of face-to-face assessments. As P2 noted:

I don't think it's appropriate to solely rely on telemedicine to follow a child with a condition. However, incorporating telemedicine alongside in-person care is definitely suitable.

Some pediatricians also highlighted the challenges of conducting assessments remotely and reported discomfort regarding the need to depend on the parent's ability to correctly position the device. For instance, P5 stated:

I'm not at home with mom, we can do some tests, but you have to trust the person in front of you who positions the device in the right place.

Finally, the ability to engage and reassure parents by building strong, collaborative relationships with both the patient and the parents emerged as a key factor for the successful use of the telehomecare device. As P9 said:

We'll need to build a bond of trust with the patient in a shorter time, but also establish a collaborative relationship with the parent.

Expected Advantages of Adopting the Telehomecare Device

This thematic area encompasses the advantages that pediatricians anticipate from adopting the telehomecare device. These benefits emerged at three levels: patient and family, professional, and healthcare provider (Table 3).

Patient and Family Level

At the patient and family level, pediatricians identified numerous advantages related to the adoption of telehomecare device. Specifically, they acknowledged telemedicine's potential to significantly improve the overall hospital experience for children by shortening hospital stays and reducing the risk of hospital-acquired infections. As P9 remarked:

Hospital experience for a child is never pleasant, so if TytoCare could actually shorten the hospital stay, it would be a significant step forward.

Additionally, most pediatricians emphasized that the telehomecare device can act as a safety net for families, providing reassurance to parents. As P4 explained:

In my opinion, parents are more at ease knowing that the hospital discharges the child but still maintains a connection through telemedicine.

Professional Level

At the clinician level, pediatricians anticipate that the telehomecare device could provide enriched patients information. As P1 noted:

I believe TytoCare could be a tool capable of increasing the clinical information obtained during a brief visit.

Additionally, some participants suggested that their confidence in patient care would improve with the ability to monitor patients remotely. As P6 explained:

I think it's a tool that can allow the operator to have a daily overview of certain conditions.

Table 3 Expected Outcomes – Advantages of Adopting the Telehomecare Device (n=13)

Level	Codes	Freq.	Illustrative Quotes
Patient and family level	Improve patients' experience	n=6	"Hospital experience for a child is never pleasant, so if TytoCare could actually shorten the hospital stay, it would be a significant step forward". (P9); "(If I were a parent), I personally would agree because you'd get home earlier and have all your comforts there. The symptoms in the child are connected to the environment". (P4)
	Improve the quality of care	n=7	"(...) I always have a concern about hospital-acquired infections. Many times, these children could be discharged, but they are not due to various reasons. Then fever reappears, gastroenteritis emerges, and thus they gain more days of hospitalization. That's why I always advocate for sending them home as soon as possible, when there's no longer an acute need for hospitalization. Therefore, I expect protection for patients from this perspective". (P12); "For the parent, it could be an advantage to conduct the visit from home without having to go to the hospital, especially during more critical periods for illnesses like the flu". (P7)
	Assure and support families	n=8	"I get the impression that for them (parents), it's enough to know that there's someone on the other end in case of need. It's still a connection to the hospital and a tool of great reassurance". (P2); "In my opinion, parents are more at ease knowing that the hospital discharges the child but still maintains a connection through telemedicine". (P4)
	Save time for families	n=4	"In my opinion, parents feel advantaged in terms of time". (P12); "Timesaving for families". (P3)
Professional level	Obtain more information about the patients	n=5	"I believe TytoCare could be a tool capable of increasing the clinical information obtained during a brief visit". (P1); "I think TytoCare allows for a more objective detection of parameters". (P10)
	Enhance clinicians' confidence	n=4	"By keeping the patient monitored, we feel much more at ease". (P4); "I think it's a tool that can allow the operator to have a daily overview of certain conditions". (P6)
Healthcare provider level	Better bed allocation management	n=3	"It seems very useful for our ward management because we can free up a bed sooner, which is always much needed". (P13); "The benefit for the company, in my opinion, could be a faster turnover of beds". (P6)
	Reduction of costs	n=2	"There's a saving on hospitalization days: we know how much each day costs". (P12); "By reducing hospitalization days, it also reduces costs". (P1)
	Reduction of overcrowding	n=1	"This would also lead to a reduction in overcrowding in the wards". (P7)

Abbreviations: P, Participant; Freq., number of interviewees who mentioned the code in their interview story.

Healthcare Provider Level

At the healthcare provider level, pediatricians recognized several benefits related to ward management. One of the key advantages is improved bed allocation, as P13 noted:

It seems very useful for our ward management because we can free up a bed sooner, which is always much needed.

Expected Impacts of the Telehomecare Device on Work Practices

This theme includes the impacts that pediatricians expect from the adoption of the telehomecare device at the professional level, leading to various work-related outcomes (Table 4).

Professional Level

Most pediatricians expressed concerns about a potential intensification of their workload due to the added responsibility of remotely monitoring patients alongside standard patient care, leading to a fear of insufficient time, as P8 explained:

Table 4 Expected Outcomes - Expected Impacts of the Telehomecare Device on Work Practices (n=13)

Categories	Codes	Freq.	Illustrative Quotes
Professional level	Work intensification	n=9	"One thing that concerns me is that while I'll be monitoring a patient with TytoCare at home, in the ward, another patient will come in. So, the visits I'll conduct with TytoCare are additional". (P8); "Between standard visits and other tasks, I'm afraid I won't be able to find the time to dedicate". (P13)
	Rising demands for learning	n=8	"I anticipate that it will take about an hour to conduct a visit, given that it will be a novelty for us at the beginning. The more we do it, the more accustomed we'll become, and the timing will decrease". (P4); "I think at the beginning, it will definitely be a bit tough because it's a new tool, we need to get used to using it, and consequently, the first visits will take longer. Once we become more skilled, it could be a helpful tool". (P8)
	Risk of losing key clinical information	n=7	"(...) the operator, having to assess through a tool and thus not having direct contact with the patient, may find it challenging to conduct a comprehensive evaluation of the patient". (P7); "We need to gain as much experience as possible to avoid missing diagnostic information". (P3)
	Paradigm shift in patient discharge timing	n=4	"I tend to discharge patients as soon as I have the certainty that I can do so, so it will be difficult for me to send the patient home a few days earlier. It's a fear I'll have to overcome because it goes against the goal". (P10); "(I'm concerned about) the idea of discharging the patient earlier". (P8)
Work-related outcomes	Work easier	n=4	"The fact that the child is not afraid of the parent somewhat facilitates the examination". (P13); "In my opinion, the child is also less inhibited, less scared: in the end, I only approach the parent, so even that barrier that children often have towards the doctor can be bypassed". (P12)
	Telemedicine useful to improve the quality of the work	n=1	"I see TytoCare as a way to improve my job, not to reduce it". (P1)
	Telemedicine as a stressful factor	n=1	"I believe that in these cases [parents with low technological literacy or difficulty understanding the language], using TytoCare will be more a source of stress than a help". (P6)

Abbreviations: P, Participant; Freq., number of interviewees who mentioned the code in their interview story.

One thing that concerns me is that while I'll be monitoring a patient with TytoCare at home, in the ward, another patient will come in. So, the visits I'll conduct with TytoCare are additional.

Another shared concern was the anticipated rise in learning demands, with pediatricians foreseeing a learning curve and the need for training to effectively use TytoCare, as P8 noted:

I think at the beginning, it will definitely be a bit tough because it's a new tool, we need to get used to using it, and consequently, the first visits will take longer. Once we become more skilled, it could be a helpful tool.

Work-Related Outcomes

Some participants acknowledged that the telehomecare device could have a positive impact on their work. For instance, some pediatricians noted that telehomecare visits could create a more comfortable environment for patients, which in turn would facilitate their job, as P13 remarked:

The fact that the child is not afraid of the parent somewhat facilitates the examination.

Expected Changes in the Relationship Between Patients and Professionals

This theme focuses on how the adoption of the telehomecare device may alter the dynamics between pediatricians and patients and their families (Table 5).

Table 5 Expected Outcomes - Expected Changes in the Relationship Between Patients and Professionals (n=13)

Categories	Codes	Freq.	Illustrative Quotes
Joint patient and professional level	Hoping telemedicine can improve relationship with patients	n=4	"I would like it to be a tool to get closer to patients in their daily lives because that's sometimes lost in the hustle of our work". (P1); "The video helps facilitate communication because it also shows non-verbal communication, which certainly helps the clinician a lot". (P3)
	Loss in professional trust of physicians	n=4	"It's possible that patients may be skeptical about a remote visit conducted by the doctor, therefore less trusting of the clinician's opinion". (P3); "It could have the opposite effect. They might say, 'But if they're sending me home and still want to see me through telemedicine, why did they discharge me?'. (P8)
	Difficulties in creating trusting relationships	n=2	"I'm concerned that a fundamental element, namely the human connection, is being lost". (P9); "I find it challenging to establish empathetic relationships between doctor and patient/parent. Trying it on patients with whom a relationship with the family has already been established will definitely be an advantage. In the future, we will need to better understand this dynamic in order to use it in initial visits". (P11)

Abbreviations: P, Participant; Freq., number of interviewees who mentioned the code in their interview story.

Joint Patient and Professional Level

When discussing potential changes in relationships with patients and their families, differing views emerged. Some pediatricians expressed positive expectations, hoping that telemedicine could strengthen their relationships with patients. As P1 stated:

I would like it to be a tool to get closer to patients in their daily lives because that's sometimes lost in the hustle of our work.

However, other pediatricians voiced concerns about a potential decline in professional trust, as P3 explained:

It's possible that patients may be skeptical about a remote visit conducted by the doctor, therefore less trusting of the clinician's opinion.

Expected Management Activities

This thematic area revealed some aspects that participants believe must be managed to allow successful integration of telemedicine into clinical practice (Table 6), including institutional arrangements and management of professionals.

Institutional Arrangements

It is worth noting that participants did not express significant concerns about the management of patient data, prioritizing patient health over data privacy, as P13 remarked:

Safety comes before privacy, so it's a secondary concern.

Regarding involvement in the project, some pediatricians shared that they did not personally choose to adopt the telehomecare device, as P10 explained:

I personally didn't have the idea of telemedicine, but I had to accept it with the team.

Management of Professionals

Regarding the management of professionals, colleagues' support emerged as a crucial social resource in helping pediatricians become familiar with the device, as P7 reported:

I have seen that it is a fairly reliable tool, doing tests both on myself and on colleagues.

Table 6 Expected Management Activities (n=13)

Categories	Codes	Freq.	Illustrative Quotes
Institutional arrangements	Privacy	n=4	"Safety comes before privacy, so it's a secondary concern". (P13); "I think these are relative problems, in the sense that the advantage for the patient and the parent still wins out. I think they'd prefer being at home rather than in the hospital, so I don't see privacy issues". (P12)
	Lack of involvement in technology adoption	n=3	"I personally didn't have the idea of telemedicine, but I had to accept it with the team". (P10); "Actually, it wasn't proposed, but the doctors, including myself, who would stay longer at Buzzi (our training path requires rotating through various hospitals) were chosen. So, it can be said that we were automatically candidates for the trial". (P3)
	Legal and professional risks	n=3	"It's important, in the event that TytoCare becomes established, to clearly define the rules related to professional risk". (P3); "I think every time you visit a child, there's a risk, so you never know what to expect. If I had a doubt, I would discuss it with colleagues, and when I see the same patient the next day during the visit, we will understand if it was my mistake or the tool's". (P4)
	Need for specific human resources	n=2	"If telemedicine becomes significantly prevalent in Italy, it will be necessary to create a dedicated staff." (P9); "I believe that we need a structure with people working in it, and therefore a well-defined organization". (P2)
Management of professionals	Colleagues support in familiarizing with the device	n=7	"I have seen that it is a fairly reliable tool, doing tests both on myself and on colleagues". (P7); "We tried among ourselves, with the help of the residents". (P10)
	Technical issues	n=2	"The most complex part was the setup because once the network is functioning, everything becomes easier and faster". (P5); "We did everything with our hotspot, and the slowdown in the trials was due to connection issues". (P8)

Abbreviations: P, Participant; Freq., number of interviewees who mentioned the code in their interview story.

Some pediatricians recognized the complexity of setting up telemedicine devices and the necessity of having an appropriate infrastructure and a stable internet connection, as P5 argue:

The most complex part was the setup because once the network is functioning, everything becomes easier and faster.

Discussion

Drawing on the Value Co-Creation in Healthcare framework,⁴ this study investigated pediatricians' expectations regarding the antecedents, management activities and outcomes of value co-creation processes during the implementation of a telehomecare service in a pediatric hospital. In doing so, this study adds to the limited literature examining healthcare professionals' perceptions of integrating telehomecare into clinical practice.²⁴

The thematic analysis revealed five thematic areas reflecting pediatricians' prefiguration related to telehomecare adoption. Sub-themes were identified at different levels (ie, patient and family, professional and healthcare provider), allowing a multilevel comprehension of the key aspects involved in implementing the telehomecare device.

At the family level, caregivers' proficiency in using the device properly emerged as a critical concern. Previous literature pointed to technological challenges as significant barriers to effective telemedicine use,²⁵ emphasizing the pivotal role of users' knowledge and skills in either facilitating or hindering value co-creation.⁴ Addressing these challenges is paramount, as improper device use could affect the quality of remote examinations, raising concerns about diagnostic accuracy and potentially reducing caregiver satisfaction with the technology.

At the professional level, pediatricians showed a misconception of telehomecare as a substitute for face-to-face consultations, viewing it as inadequate compared to traditional in-person visits. However, the telehomecare device is designed to offer extensive functionality aimed at enhancing care by bridging geographical distance. This observation underscores the common mistaken beliefs and limited knowledge that healthcare professionals have about

telemedicine,¹⁸ highlighting the importance of prepare them through effective user trainings to dispel misconceptions and facilitate the co-creation of value. Pediatricians also noted the challenge of transferring control over physical examinations to caregivers, potentially leading to a perceived loss of control over their work. This suggests that the increased dependence on parents during remote consultations may introduce uncertainties and discomfort for healthcare professionals, which may lead to increased stress levels and job demands,^{35,36} echoing drawbacks of telemedicine highlighted in prior research.³⁷ An interesting point that emerged from the analysis is the absence of references to antecedents at the healthcare provider level. Indeed, none of the pediatricians interviewed mentioned specific factors related to healthcare provider characteristics or organizational factors as influencing the adoption process. A potential explanation for this could be that the participants primarily concentrated on antecedents directly related to their own experience and interactions during the use of telehomecare (ie, those concerning healthcare professionals and patients). This focus may have led them to overlook broader organizational or provider-level factors.

Despite the reservations, pediatricians believe that the telehomecare device can be useful in reaching positive outcomes for all users involved, promoting the co-creation of value. While some advantages, such as infection control and time savings, are common outcomes across various telemedicine modalities (eg, teleconsultations³⁸), the unique aspect of telehomecare lies in its ability to foster continued contact between pediatricians and caregivers during the critical post-discharge phase, offering reassurance and support to patients and families. This also provide pediatricians with increased confidence and access to more patient information. Additionally, as highlighted by previous literature,³⁷ telehomecare emerged as particularly useful for reducing the burden on healthcare facilities by enhancing care delivery efficiency, in addition to offering significant cost-saving advantages for healthcare providers.

However, beside the anticipated benefits, pediatricians foresee challenges in managing increased workload, as they must balance in-person and remote care, and apprehension about the need to deal with rising demands for learning to use the new digital tool. Previous research has recognized that such job demands can lead to job-related stress when integrating technology in the workplace.²² Moreover, concerns about earlier discharge timing and potential loss of key clinical information during remote examinations could affect pediatricians' perceptions of care adequacy, potentially leading to morally distressing experiences and posing risks to professionals' well-being.^{39,40} Taken together, these findings suggests that telehomecare, while beneficial, may introduce new job demands that need to be managed to prevent professional burnout and value co-destruction.⁴¹

Among the expected outcomes, pediatricians mentioned potential changes in the dynamics of relationships between patients and healthcare professionals. More specifically, some pediatricians foresee closer relationships with patients due to the daily contact facilitated by the telehomecare device. Conversely, other participants expressed concerns about trust-building during virtual interactions. However, the premise with telehomecare devices is that a foundation of trust has already been established during the hospitalization period, facilitating easier maintenance during remote consultations.⁴²

Effective management within healthcare organizations is vital for value co-creation⁴ and to ensure a successful integration of telemedicine into clinical practice. However, pediatricians highlighted their lack of involvement in decision-making regarding telemedicine adoption as a significant concern. This top-down approach, common in telemedicine initiative,³ can foster resistance to change among staff,³ which has been recognized as one of the main causes of e-health implementation failure.⁴³ Such resistance can significantly hinder the value co-creation process.¹⁹

Peer support and shared experiences played a crucial role in facilitating telehomecare integration into clinical practice, emphasizing the importance of peer support during organizational changes. As noted in previous literature, support from colleagues is a valuable resource, particularly useful to manage stress during organizational changes⁴⁴ and, more specifically, when implementing telemedicine tools.⁴⁵ While peer support is beneficial for gaining experience with the device, healthcare management should establish a dedicated staff for technical assistance with the telehomecare device. According to the Value Co-Creation model,⁴ adequate organizational support is essential for facilitating co-creation processes; without it, there is a risk of value co-destruction.⁴¹

Recommendations for Healthcare Leaders

The findings of our study offer practical insights for healthcare leaders in designing a fit-for-purpose method to manage the changes associated with the adoption of telehomecare devices.⁴⁶ Firstly, telemedicine courses should be integrated into medical curricula, along with advanced training on communication techniques for healthcare professionals, such as

maintaining eye contact with the camera during patient interactions.^{3,21} Pediatricians must also recognize and empathize with patients' comfort levels with telemedicine, ensuring "the right treatment, to the right patient, at the right time".⁴⁷

Healthcare leaders should manage workload adjustments to prevent work intensification and provide training on time management to help pediatricians balance in-person and remote visits. A supportive environment, characterized by open discussion on telemedicine adoption and supervisor support, is crucial for effective change management.²⁰

To address resistance to change, healthcare leaders should implement an effective communication strategy that informs pediatricians of the changes and include round table to involve them in decision-making.²⁰

Lastly, specific human resources should be allocated to support telehomecare services, including technical staff to guide pediatricians and patients.

Strengths of the Study

This study significantly contributes to the growing body of research on telemedicine and telehomecare in several ways. First, by applying the Value Co-Creation in Healthcare model,⁴ this research offers a comprehensive framework that integrates both organizational and professional perspectives.

Second, the focus on pediatricians' expectations offers unique insights into a population that has been under-represented in existing literature. By highlighting the specific attitudes and perceptions of pediatricians regarding telehomecare, this research fills a critical gap and emphasizes the importance of understanding healthcare professionals' views in implementing new technologies.

Moreover, the study adopted a rigorous qualitative methodology, combining inductive and deductive approaches to thematic analysis. This ensures that the findings are both theoretical aligned and grounded in empirical data, enhancing their reliability and validity. Given the key role of healthcare professionals' expectations in influencing technology acceptance,⁴⁸ the insights gained from pediatricians' attitudes towards the telehomecare device can inform healthcare managers on how to design tailored interventions aimed at supporting professionals during the transition to telemedicine.

Finally, this study extends the application of the Value Co-Creation model to the context of telemedicine, addressing a call for further research investigating professionals' perspectives.⁴

By doing so, it not only contributes to academic literature but also provides actionable recommendations for enhancing healthcare practices.

Limitations and Future Research Directions

This qualitative study offers an in-depth examination of pediatricians' expectations regarding the implementation of a telehomecare service in a pediatric hospital, providing several contributions to the emerging literature on telemedicine and offering practical recommendations. However, the study's generalizability is limited due to the small number of interviews conducted with pediatricians involved in a single pediatric telemedicine service. Future research should involve a larger sample of healthcare professionals implementing various types of telemedicine services to compare perspectives across different contexts. Additionally, extending data collection to other countries could provide a cross-cultural perspective. Notably, our study aimed to explore pediatricians' preconceptions before their actual experience with the telehomecare device. To analyze the effective outcomes related to the use of the device, future studies should collect data after its implementation and use. Building on the findings and recommendations of this study, future research could explore how the proposed solutions contribute to enhancing telehomecare services.

Conclusion

The integration of telehomecare devices in pediatric healthcare settings presents opportunities for enhanced patient care and outcomes, albeit with implications for the evolving roles of healthcare professionals. Drawing upon the Value Co-Creation framework, this study identified key factors that can facilitate or hinder the successful integration of telemedicine into clinical practice, thereby representing the basis for value co-creation processes. While concerns exist regarding the adequacy of remote care compared to traditional in-person visits, numerous potential benefits of

telehomecare devices have been identified. Telehomecare devices offer a unique advantage in maintaining contact with caregivers during post-discharge, providing reassurance and support. However, the adoption of telemedicine tools may lead to work intensification among clinicians, necessitating a balance between physical and remote patient care. Concerns about increased workload, demands for learning, and potential loss of critical clinical information during remote examinations highlight the importance of comprehensive user training and support systems. The dynamics of patient-professional relationships may shift with telemedicine adoption, emphasizing the need for trust-building and effective communication in remote care settings. To ensure successful integration, dedicated support staff, regulatory adaptations, and improved leadership plans are crucial. Involving healthcare professionals in decision-making processes and addressing technical issues through peer support are essential for overcoming resistance to change and ensuring the effective implementation of telehomecare devices in pediatric healthcare settings.

Data Sharing Statement

The data material is available on request from the corresponding author.

Ethics Approval

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee Milano Area 1 (Protocol number n. 0033846, date 3 August 2022).

Funding

Project performed within the MUSA—Multilayered Urban Sustainability Action—project, funded by the European Union—NextGenerationEU, under the National Recovery and Resilience Plan (NRRP) Mission 4 Component 2 Investment Line 1.5: Strengthening of research structures and creation of R&D “innovation ecosystems”, set up of “territorial leaders in R&D”.

Disclosure

The authors declare that they have no competing interests for this work. Additionally, the authors declare there are no conflicts of interest or economic advantages associated with the mobile medical device (TytoCare™) used in the study. Furthermore, the participants are not in any way connected to the mobile tool being evaluated.

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