Dual-Purposed NICU mHealth Support: A Multi-Stakeholder Study in Switzerland Combining Utilitarian and Hedonic Design Principles

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Abstract

Preterm infants usually require hospitalization in a Neonatal Intensive Care Unit (NICU), which leaves parents stressed and anxious. In Switzerland, digital support for these parents is insufficient, and applications developed abroad are poorly adapted to the local context. This paper presents a user-centered design study in a Swiss NICU, where we iterated on two application prototypes with parents and healthcare professionals (HPs). We conducted interviews and think-aloud sessions with parents ($n = 18$) and HPs ($n = 17$), followed by subsequent in-depth interviews with parents ($n = 10$). Initial findings suggest that intended use varies by time and situation: it is most frequent during hospitalization and becomes occasional at home, shifting between emergency and routine moments. We translate these insights into five design principles: focused on sense-making, shared awareness, context-sensitive support, parental self-efficacy, and gradual disengagement.

CCS Concepts

• **Applied computing** → **Health care information systems**; • **Human-centered computing** → **User studies**.

Keywords

User-centered design, mHealth, Prematurity

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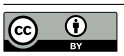

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1 Introduction

In Switzerland, approximately 6% of all births are preterm, or more than 4 500 births annually [38]. Compared to term infants, preterm infants face significantly higher health risks [11, 43]. Therefore, they often require hospitalization in the Neonatal Intensive Care Unit (NICU), where healthcare professionals (HPs) provide care and monitor infant health. NICU hospitalization is stressful and overwhelming for parents, who report anxiety, uncertainty, helplessness, and a perceived loss of parental role and control [5, 8, 22]. These difficulties often persist after discharge, as the transition from hospital to home adds challenges in terms of continuity of care, parental confidence, and stress [5].

During and after hospitalization, parents of preterm infants seek online support and information despite difficulties evaluating content quality [2, 25]. In this context, mobile health (mHealth) applications are increasingly considered to offer accessible and personalized support [10, 45]. However, existing mHealth apps do not meet high-quality standards regarding evidence-based content and patient data protection [12]. Furthermore, existing initiatives remain insufficient to fully address parents' needs [39, 45, 47, 52], which may explain the low user engagement in mHealth apps [34]. To address this issue, this paper explores the following research question: *What principles should guide the design of an mHealth app to support parents in their NICU-to-home journey?*

To answer this question, we conducted two iterative design rounds in a Swiss NICU with 18 parents and 17 HPs, following a patient-centered design approach [13]. Based on the collected data, we find that parental engagement depends not only on utilitarian support but also on how apps address evolving emotional and situational needs. Building on these insights, we conceptualize

NICU-to-home apps as dual-purposed systems combining utilitarian and emotional support, and propose five design principles to guide their design. More broadly, our findings contribute to understanding how mHealth engagement evolves across care contexts and hospital-to-home transitions.

2 Background

Several mHealth apps have been developed to support parental education, communication, self-efficacy, and discharge preparation [12, 45]. For example, the *Babble* app in New Zealand provides accessible and portable parental education that extends beyond home discharge [49]. By improving parental competence and confidence, the app has been shown to increase the likelihood of secure parent-infant bonding [49]. In the United States, the *NICU2HOME* app targets parental self-efficacy and preparedness for the transition home [18, 19, 27]. However, reviews of NICU apps have identified recurring issues in terms of credibility and evidence-based content [12, 45], alongside low engagement due to a lack of content and features tailored to parents' needs [34, 45]. In existing NICU apps, post-discharge content is also limited and frequently omits topics important to parents, including daily infant care and parental well-being [23]. This contrasts with recommendations for a multilayered approach combining psychosocial support and family-centered care for both parents during and after hospitalization [52].

In Switzerland, some NICU apps were unavailable. Among the available apps, none of those evaluated achieved the highest level in all three dimensions: quality, evidence-based content, and data protection [12]. Adapting existing solutions to Switzerland is further complicated by the country's multilingualism and the federally organized health system [3, 37]. In addition, Swiss users may be cautious about sharing medical information through health-tracking applications due to strong data privacy concerns [6]. These limitations show that existing initiatives do not fully meet parents' needs [45, 47].

2.1 Emergency and Routine Situations

Parents in the NICU experience sharp fluctuations between high-stakes emergency moments—when clinical crises demand immediate attention—and prolonged periods of routine waiting and administrative tasks. Digital support systems should account for these contextual variations by adapting support to both urgent clinical concerns and routine care situations [28, 31, 36]. Such evolving needs are reflected in baby-tracking practices, where tracking intensity tends to vary according to childcare transitions and infants' developmental milestones [40]. Beyond contextual differentiation, digital support for emotional needs remains crucial but understudied in NICU interventions [10, 21]. More broadly, Human-Computer Interaction (HCI) research suggests that sustaining NICU mHealth use requires timely and context-sensitive support rather than "maximization of information" approach [20]. Designs that take into account practical constraints (e.g., cost, time) and offer actionable support (e.g., reminders, personalization) are more likely to maintain use over time [50]. Beyond practical and informational support, emotional and social support may also contribute to sustained engagement. For instance, social networks can facilitate peer-to-peer interaction and exchange of encouraging and reassuring messages between NICU parents [16, 26, 29]. However, the design of emotionally supportive features requires careful consideration, as some tracking or interaction mechanisms may unintentionally induce pressure, guilt, or infantilization, potentially diminishing parents' perceived competence and reducing engagement [10].

2.2 Dual-Purposed Digital Support

A digital NICU support app can be conceptualized using Wu and Lu's framework, which distinguishes utilitarian, hedonic, and dual-purposed information systems. Utilitarian use is mainly driven by extrinsic motivations such as perceived usefulness, whereas hedonic use is mainly driven by intrinsic motivations such as perceived enjoyment. Dual-purposed systems combine both forms of use. Motivational purpose depends more on users' intentions and context than on technology alone [56]. This framework is relevant for mHealth because perceived usefulness influences both emergency and routine use intentions, whereas perceived enjoyment influences routine use intention [28]. Hedonic experiences can also improve user engagement with mHealth apps [48]. A purely utilitarian perspective may therefore overlook motivations that contribute to routine and continued use. For NICU parent-support apps, this is particularly important because support must remain useful during ongoing care and follow-up after discharge [33]. In this context, Wu and Lu's framework provides a lens for examining whether parents' expected uses are primarily associated with extrinsic motivations, intrinsic motivations, or both.

Existing recommendations for mHealth apps emphasize evidence-based, jargon-free information to support health education and informed decision-making [12, 45], along with usability principles such as intuitive design and comprehensibility [51]. For NICU parent-support apps, key utilitarian features include tailored informational resources, infant progress monitoring (e.g., weight) [30], and timelines to visualize milestones (e.g., first bath, removal of respiratory support) [7]. However, tracking features should be carefully designed (e.g., breastfeeding tracking) such that monitoring enables follow-up while emphasizing reassurance rather than amplifying pressure [10, 54]. Baby-tracking should also support flexible and evolving use over time, as reduced tracking may reflect established routines and increased parental confidence rather than disengagement or system failure [40]. Coordination features can support information sharing and co-parental involvement during extended hospitalizations and hospital-to-home transitions, when parents must coordinate information among multiple healthcare professionals and family members [29, 35, 57]. In these situations, information asymmetries may emerge between parents, with one parent becoming the primary receiver and relay of medical information, increasing coordination burden and the risk of fragmented communication [35]. Designing for co-parental support by default can help reduce this burden by supporting shared awareness, shared access to information, and collective decision-making between both parents [41, 52, 57].

Prior research has emphasized utilitarian and hedonic motivations in mHealth systems [28, 56], but has paid less attention to how these motivations change across healthcare phases. We know little about how mHealth systems should support parents during

emergencies, routine care, hospital-to-home transitions, and possible readmissions. In the NICU, families' trajectories are emotionally intense and non-linear, leaving limited understanding of how mHealth apps can address evolving informational, coordination, and emotional needs throughout the NICU-to-home journey.

3 Method

We conducted an iterative multi-stakeholder study using interviews and think-aloud sessions, grounded in a user- and patient-centered design approach [1, 13, 58]. The study took place in a Swiss tertiary NICU and intermediate care unit. Parents were eligible if their preterm infant was admitted to a participating unit and if they could communicate in one of the study languages. We recruited 18 parents (mothers, $n = 12$; fathers, $n = 6$) with diverse NICU trajectories. The sample included both first-time ($n = 10$) and experienced parents ($n = 8$), with infants born between 25 and 36 weeks of gestational age. We also recruited 17 neonatal HPs to cover different roles involved in the care pathway (nurse, $n = 7$; physician, $n = 3$; psychosocial personnel, $n = 2$; parent-association volunteer, $n = 2$; midwife, $n = 1$; chaplain, $n = 1$; pediatric physiotherapist, $n = 1$).

3.1 Data Collection, Analysis and Ethical Considerations

Data collection consisted of semi-structured interviews, think-aloud sessions [58], and follow-up interviews after discharge. Interviews were conducted by two qualitative researchers, audio-recorded, and transcribed verbatim. Quotes were pseudonymized with identifiers indicating stakeholder group and role (e.g., Mother M03, Nurse N05). We used a reflexive thematic analysis following Braun and Clarke's six-step framework [9]. Initially, two researchers independently coded the data using MAXQDA®, followed by iterative discussions to refine themes. Parent and HP accounts were compared to identify convergences and divergences relevant for prototype refinement. This study complied with the Swiss Human Research Act (HRA) and did not collect medical data or personal health information, so it was exempt from review by the Cantonal Ethics Committee for Research on Human Beings. Authorization for the study was obtained from the head of the participating hospital department. All participants provided informed consent before taking part.

3.2 User-Centered Design Process

We structured the user-centered design process into two iterations (see Figure 1). Prototype 1 served as the baseline artifact for *Iteration 1*, while feedback collected during *Iteration 1* informed the refinement of Prototype 2, which was then evaluated in *Iteration 2*.

For *Iteration 1*, we designed an initial evidence-informed mockup (Prototype 1) based on family-centered care literature [15, 17, 52], mHealth design recommendations, and a review of NICU parent-support apps [12]. Low-fidelity paper sketches explored early ideas and were then translated into static app mockups in Figma, resulting in Prototype 1. Prototype 1 was presented in black and white to keep the focus on structure and content rather than visual styling. During *Iteration 1*, Prototype 1 was used as a paper-based walkthrough, with each app screen printed on an individual A4 sheet to support think-aloud activities. We conducted one-to-one sessions with parents ($n = 18$) and HPs ($n = 17$). Each session consisted of a semi-structured interview followed by think-aloud activities based on Prototype 1. Interview and think-aloud transcripts were analyzed to identify perceived motivators and barriers to adoption and engagement. These findings informed the design requirements guiding the redesign from Prototype 1 to Prototype 2.

For *Iteration 2*, Prototype 1 was refined in Figma by modifying, removing, and adding interface elements based on findings from *Iteration 1*, resulting in Prototype 2. Prototype 2 was also presented in black and white through a five-minute guided video walkthrough. During *Iteration 2*, we conducted follow-up interviews with a subset of parents who had participated in *Iteration 1* (10 of 18 parents from *Iteration 1*). These interviews took place 3 to 6 months after their child's discharge from the hospital to explore parents' support needs and expected app use after returning home. Prototype 2 was evaluated at a broader level, without reviewing each feature individually through the five-minute video.

4 Prototype Design and Features

The user-centered design process resulted in two non-functional prototypes in Figma. Both prototypes were used as design artifacts to explore how a NICU mHealth app could combine utilitarian support (e.g., information, coordination, and tracking) with emotionally supportive features (e.g., reassurance and memories). To support this analysis, we applied Wu and Lu's conceptualization of utilitarian, hedonic, and dual-purposed systems [56] to characterize the different features explored in both prototypes.

Prototype 1 included five features: (1) *Categorized Resources*, (2) *My First Album*, (3) *Baby Monitoring*, (4) *Badges*, and (5) *Peer Support*. *Categorized Resources* provided evidence-based content organized by themes to support parental education and discharge preparation. *My First Album* allowed parents to record milestones and memories (e.g., photos and notes) through a timeline. *Baby Monitoring* supported tracking of multiple indicators such as growth, feeding, sleep, and mood. *Badges* introduced gamification elements in three forms: App Expertise badges linked to onboarding milestones (e.g., profile creation and app discovery), Activities badges linked to functionality use (e.g., adding a memory or creating a post), and Competencies badges linked to successful completion of quizzes embedded within the *Categorized Resources* feature. Finally, *Peer Support* combined passive support via pre-made parental testimonials and active support through forum-like exchanges where NICU parents shared milestones and experiences.

Based on feedback collected during *Iteration 1*, Prototype 1 underwent a substantial revision leading to Prototype 2. Three core features from Prototype 1 were retained and further aligned with feedback from *Iteration 1*. *Categorized Resources* evolved into *Tailored Self-help*, with content reorganized according to stages of the NICU-to-home journey to help parents more easily identify content relevant to their current situation and needs (see Figure 2). *My First Album* evolved into *Memories*, with the addition of a prefilled example timeline illustrating another family's journey to help parents better understand how milestones could be progressively documented over time. Finally, *Baby Monitoring* evolved into broader *Baby Tracking* functionalities. Instead of many predefined tracking categories, *Baby Tracking* focused on two main follow-ups (growth and feeding), plus an observations section for personalized

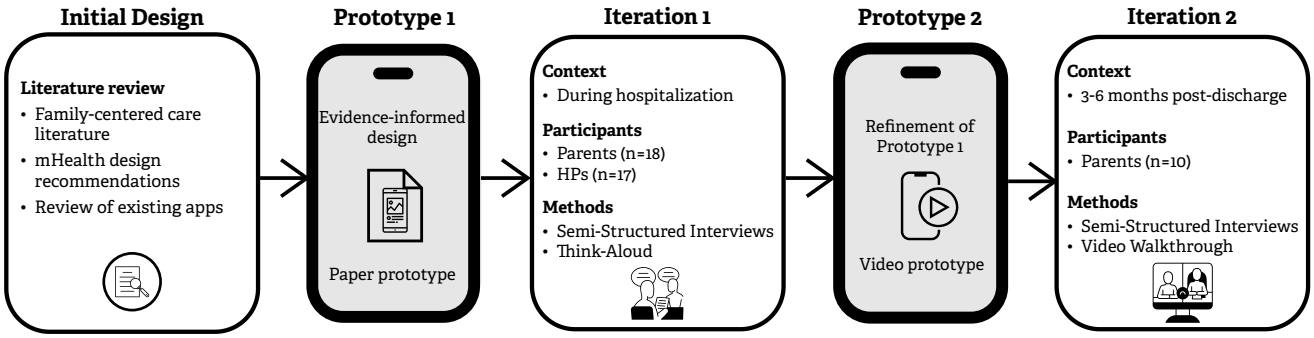

Figure 1: Overview of the two-iteration user-centered design process used to develop and evaluate the NICU parent-support app prototypes.

notes (e.g., sleep or behavior) and a caregiving information section showing the NICU care team and parents' presence schedules (see Figure 2). These changes aimed to reduce cognitive load and over-monitoring while preserving flexibility and coordination support throughout the NICU-to-home journey.

In contrast, the *Badges* and *Peer Support* features underwent more radical changes and were no longer retained as central standalone features. Gamification elements were reduced and more subtly integrated into the app after concerns about parental pressure and blame. Similarly, the social-network component of *Peer Support* was removed due to mixed perceived value and concerns regarding emotional burden, anxiety-inducing comparisons, misinformation, and lack of moderation. Parents and HPs also considered direct peer interaction poorly aligned with the hospitalization period, where parents tend to remain focused on their own situation. However, indirect forms of reassurance (e.g., parental testimonials and success stories) were retained and integrated into *Tailored Self-help*. Finally, two new coordination-oriented features were introduced: *Shared Agenda*, designed to support organization between parents, and *Asynchronous Messaging with HPs*, intended to facilitate non-urgent communication and reassurance.

Ultimately, Prototype 2 reflected these refinements and included five main features: (1) *Tailored Self-help*, (2) *Memories*, (3) *Baby Tracking*, (4) *Shared Agenda*, and (5) *Asynchronous Messaging with HPs*. Compared to Prototype 1, the redesign emphasized contextualized informational support and coordination while reducing potentially stress-inducing or cognitively demanding functionalities. Across features, the app was designed for co-parental support by default to reduce the mental load linked to information sharing between parents.

5 Parent Journey from NICU to Home

Based on our analysis of the data collected from parents and HPs in two iterations of the design, we mapped the parent journey from NICU admission to home, as illustrated in Figure 3. The journey typically consisted of four phases: (1) Admission and intensive care, (2) Intermediate care, (3) Preparation for discharge, and (4) At home. This trajectory was not always linear, as some infants experienced unexpected deterioration and returned to intensive care. Across phases, parents moved from high-uncertainty periods with emergency concerns toward increasingly routine moments as discharge approached and families returned home. Accordingly, support expectations evolved from predominantly utilitarian support toward a more blended combination of utilitarian and hedonic support. Wu and Lu's framing [56] was used as an analytical lens to interpret how support expectations and app functionalities evolved across phases of the NICU-to-home journey.

While Figure 3 illustrates a conceptual progression of support needs across the NICU-to-home journey, parents and HPs emphasized that this trajectory was rarely linear in practice. Families frequently oscillated between routine and emergency situations, including sudden clinical deterioration, returns to intensive care, unpredictable discharge trajectories, and unexpected hospital readmissions after discharge. Rather than following clearly separated stages, parents continuously navigated shifting emotional and informational needs shaped by changing care situations and the infant's condition.

(1) Admission and intensive care. Often feared and rarely positively anticipated, preterm birth leading to NICU admission marked a major turning point characterized by uncertainty, stress, and alternating emergency and routine moments. Healthcare professionals then take over intensive monitoring and care, often leaving parents feeling powerless and uncertain about their role [14, 53]. Seeking to regain a sense of control and clarity, parents anticipated frequent app engagement during those early weeks, particularly through trusted evidence-based information and visibility into their infant's progress. Even during this utilitarian-focused phase, parents also emphasized the need for reassurance and emotionally supportive forms of engagement, although direct peer exchanges were often perceived as too emotionally demanding during early hospitalization. Many parents also reported documenting the hospitalization through photos and short notes, reflecting their desire to document and revisit meaningful moments throughout hospitalization.

(2) Intermediate care. Once the infant's condition stabilized, families typically entered an intermediate care phase characterized by greater clinical stability. During this period, parents progressively gained autonomy in caregiving activities such as feeding and changing diapers [42]. Parents described celebrating "small victories" and valued documenting these moments to make progress

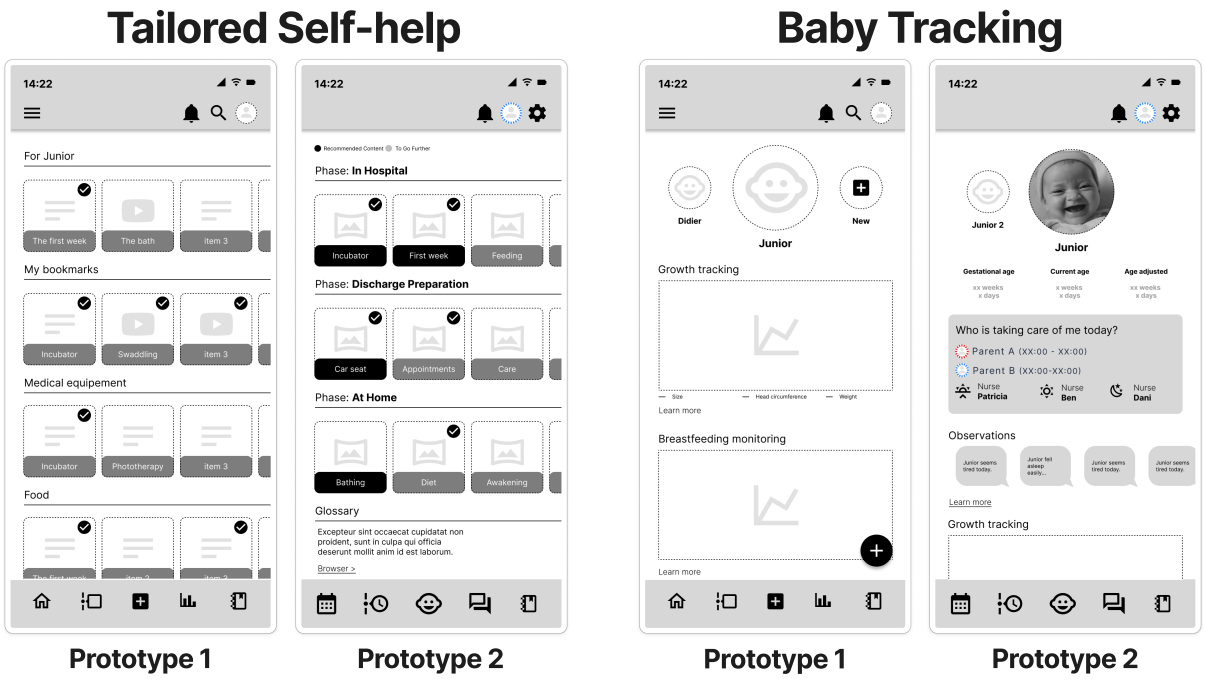

Figure 2: Evolution of the *Tailored Self-help* (left) and *Baby Tracking* (right) features from Prototype 1 to Prototype 2.

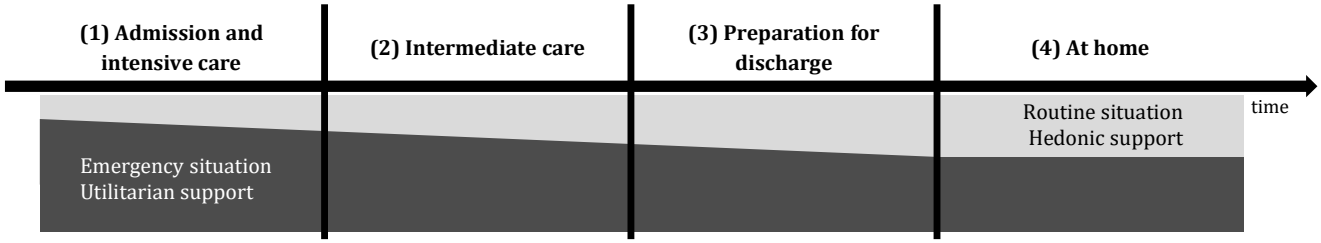

Figure 3: Conceptual evolution of app support needs across the NICU-to-home trajectory, derived from our empirical findings.

tangible and sustain hope. As emergency situations progressively shifted to more routine moments, parents also increasingly engaged with more hedonic features such as recording memories and meaningful milestones alongside practical caregiving needs. Parents and HPs emphasized that shared access to questions, answers, and updates could reduce the load of information-sharing placed on the parent who is physically present and help both parents stay aligned and involved.

(3) Preparation for discharge. As discharge approached, parents described mixed emotions ranging from relief to anxiety. Discharge timing was difficult to predict, making it challenging for parents to plan and prepare emotionally. Stress was further amplified by the perceived loss of constant monitoring and the large amount of information that needed to be transmitted and remembered before returning home. Parents therefore emphasized the importance of lightweight and rapidly accessible support that reduced cognitive burden during this transition.

(4) At home. After discharge, parents described feeling relieved to be reunited as a family. However, they also felt destabilized by the shift from constant professional availability to a home context where reassurance was harder to obtain. Nevertheless, parents expected app use to become less frequent and more needs-driven, often describing a weekly rhythm after discharge depending on emerging questions. Rather than shifting exclusively toward emotional support, parents expected a blended combination of utilitarian and hedonic support for non-urgent concerns. Parents also indicated that sustained post-discharge app engagement depended on whether the content evolved with home needs (e.g., feeding, developmental milestones).

6 Discussion

Based on prior work distinguishing utilitarian, hedonic, and dual-purposed systems [56], we conceptualize our prototypes as a dual-purposed NICU app, combining primarily utilitarian features (e.g.,

Shared Agenda and *Baby Tracking*) with more hedonic features (e.g., *Memories*). Our findings further suggest that the boundary between utilitarian and hedonic support is not always fixed, as some features can serve both dimensions depending on parents' intentions and context of use. For example, *Tailored Self-help* primarily supports informational needs while also incorporating success stories as emotionally supportive elements. Similarly, consistent with Wu and Lu's characterization of communication technologies as potentially dual-purposed [56], *Asynchronous Messaging with HPs* was intentionally designed not as a telemedicine tool, but rather as a communication and reassurance mechanism supporting both coordination and emotional support.

6.1 Preliminary Design Principles for a Dual-Purposed NICU mHealth App

Building on this perspective, we propose five design principles (DP1 to DP5) to guide the design of such an app, combining insights from the user journey with prior literature. While grounded in the NICU context, these DPs connect to broader mHealth design work on sustaining engagement under fluctuating user needs and across care transitions [24, 55]. As these DPs are based on participants' responses to non-functional mockups, they should be treated as preliminary hypotheses and further examined through real-world implementation.

6.1.1 DP 1 – Support Sense-Making Through Meaningful Progress Traces. The app should support parents in making sense of their experiences throughout the NICU-to-home journey by integrating easy-to-understand clinical updates with emotionally meaningful personal memories (such as photos and brief notes). This extends the idea of dual-purposed systems [56] to perinatal mHealth support. In sensitive contexts such as the NICU, sustaining engagement may require combining utilitarian support (e.g., medical information and progress tracking) with emotionally supportive and meaningful experiences [10]. It also aligns with Zhang's motivational affordances by supporting self-identity, providing positive feedback through progress visibility, and supporting affect through emotionally meaningful interaction [59].

6.1.2 DP 2 – Reduce Coordination Burden Through Shared Awareness. The app should reduce the burden of relaying information between parents and caregivers by supporting shared situational awareness through a shared space for key information, especially when one parent is less present at the bedside. This includes shared visibility of the same baby-related information and shared access to the same communication (e.g., questions and answers exchanged via *Asynchronous Messaging with HPs*), so both parents can stay aligned. Shared coordination tools (e.g., *Shared Agenda*, *Asynchronous Messaging with HPs*) should reduce the burden of relaying information and help both parents remain involved under stress and time constraints. This can help distribute the mental load of coordination between both parents and fit their practical constraints rather than concentrating it on the parent at the bedside [46, 51, 52].

6.1.3 DP 3 – Calibrate Support to Emotional and Situational Contexts. The app should adapt not only information, but also interaction forms and emotional support mechanisms according to parents' situational and emotional context across the NICU-to-home journey. Our findings extend Liu et al.'s distinction between emergency and routine mHealth use [28] by showing that parents continuously shift between emergency moments (e.g., urgent concerns and clinical uncertainty) and routine moments (e.g., waiting periods and caregiving routines) throughout the NICU trajectory. In emergency moments, support should remain task-oriented and reassurance-focused to maximize perceived usefulness (utilitarian aspects). In routine moments, the app can support gradual learning and reassurance by combining usefulness with more enjoyable or emotionally supportive interactions that can sustain engagement (hedonic aspects). This also suggests that emotionally supportive features should remain context-sensitive. While peer exchange is often conceptualized as beneficial in NICU support systems [16, 26, 29], our findings refine this perspective by showing that some parents perceived direct peer interaction as emotionally overwhelming during hospitalization, particularly during emergency moments. This indicates that peer-support features may not be suitable for every phase of care in the same way, and thus should stay optional and be thoughtfully timed throughout the NICU-to-home journey. To support these evolving situational and emotional needs, content and interactions should remain clear, evidence-based, jargon-free, easy to navigate, and lightweight rather than demanding across all phases of care [12, 45, 51].

6.1.4 DP 4 – Foster Parental Self-Efficacy Without Surveillance. The app should foster parental self-efficacy without turning caregiving into surveillance or performance monitoring. Rather, the app should support parents' self-confidence and skill-building as they progressively become more involved in caregiving practices and decision-making throughout the NICU stay and until discharge. To reduce frustration from inconsistent or hard-to-remember information, it should provide non-blaming traceability (e.g., capturing questions, answers, and key takeaways). It should also support parents' proactivity without turning the experience into surveillance or performance. In motivational terms, this design should support competence and autonomy by keeping feedback informational and parent-controlled rather than evaluative or controlling [59]. This direction is consistent with prior NICU apps that target preparedness and parental confidence, while cautioning against designs that can increase pressure or diminish perceived competence [10, 18, 19, 32].

6.1.5 DP 5 – Design for Episodic Use and Gradual Disengagement. The app should be designed as a tool that matches parents' evolving trajectory: high-frequency use early in NICU when uncertainty is at its peak, then progressively lighter use as the situation stabilizes and confidence grows. After discharge, parents are expected to experience more routine than emergency moments. Therefore, the app should remain helpful in everyday routines (e.g., step-by-step guidance and reassurance) while still supporting needs-driven returns during occasional emergency moments (e.g., symptom interpretation). To support ephemerality, the app should progressively reduce interaction demands and enable gradual disengagement as parental competency and confidence develop. As in prior work on baby tracking [40], reduced or intermittent use should not necessarily be interpreted as disengagement or system failure. Instead, it may reflect stabilized routines, increased parental confidence, and changing support needs over time. Given existing engagement challenges

in mHealth apps, the design should prioritize usefulness and "right-time" support rather than continuous daily engagement [4, 34, 44].

7 Limitations

This work has several limitations. First, participants were recruited from a single Swiss tertiary hospital, and recruitment during hospitalization may have underrepresent parents who declined or were too overwhelmed to participate. Second, as this study is based on interviews and think-aloud sessions, our findings reflect articulated needs, which may differ from actual behaviors. The use of prototypes may also have framed participants' responses, potentially constraining the range of needs and solutions expressed. Third, as the app was non-functional and no longitudinal usage study was conducted, we could not assess real-world use or how engagement evolves over time. Consequently, the proposed design principles should be understood as preliminary hypotheses rather than validated design guidance. Their applicability and their effects on actual user engagement remain to be evaluated.

8 Conclusion

In this work-in-progress, we conducted an iterative user-centered design study with parents and HPs in a Swiss tertiary NICU. We combined semi-structured interviews and think-aloud sessions to explore the needs and design implications of an mHealth app spanning the NICU-to-home journey.

From these data, we identify key parental needs shaping engagement with NICU support apps. Our findings show that engagement depends not only on utilitarian support, but also on how mHealth apps address evolving emotional and situational needs across phases of care. Building on this insight, we conceptualize NICU support apps as dual-purposed systems combining utilitarian and emotionally supportive dimensions across the NICU-to-home journey, and propose five preliminary design principles: (1) support sense-making through meaningful progress traces, (2) reduce coordination burden through shared awareness, (3) calibrate support to emotional and situational contexts, (4) foster parental self-efficacy without surveillance, and (5) design for episodic use and gradual disengagement. These principles remain hypotheses for future evaluation.

These contributions extend existing mHealth literature by highlighting the importance of adapting support to fluctuating contexts (e.g., emergency vs. routine situations) and by emphasizing the need to balance utilitarian support with emotionally meaningful interactions [28]. They also illustrate how Wu and Lu's framework of utilitarian, hedonic, and dual-purposed systems helps explain how support expectations and app features evolve across phases of care [56]. These contributions additionally respond to limitations of current NICU apps, particularly in the Swiss context, where accessibility, multilingualism, and continuity of care remain insufficiently addressed [12, 47].

In future work, we will build on these insights and design principles to further design a functional prototype and investigate how engagement evolves across phases of the NICU-to-home journey. The prototype will act as a tangible boundary object in subsequent co-design and acceptability studies, supporting validation and refinement of the proposed design principles in a real-world care setting. This next phase will clarify how parents value different features over time, how engagement changes across caregiving contexts, and how to foster meaningful engagement rather than assuming that higher levels of use necessarily indicate higher-quality engagement. These evaluations align with mHealth research calling for a better understanding of how engagement evolves across changing care contexts, routine and high-stress situations, and longitudinal caregiving trajectories [28, 40]. To conclude, this work highlights the need to move beyond purely functional perspectives in mHealth design and to account for the dynamic nature of parental needs, which are shaped by both contextual and emotional factors across the NICU-to-home journey.

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