xploro®

Reducing anxiety, increasing compliance and improving operational efficiency in pediatric surgery: the power of effective patient education

Pediatric surgical preparation is often inconsistent, leading to anxiety, non-compliance, and operational inefficiencies. Digital, interactive education offers a structured approach to improving patient preparedness and reducing surgical cancellations. This white paper explores how gamified solutions, such as Xploro, support better surgical outcomes, optimize clinician workflows, and enhance the overall patient experience in pediatric care.

WHITE PAPER 15 mins

Contents

Abstract

Pediatric surgical preparation remains a significant challenge, impacting patient outcomes, hospital efficiency, and clinician workload. Anxiety, lack of accessible education, and procedural non-compliance contribute to preventable cancellations, increased reliance on sedation, and operational inefficiencies. Traditional perioperative education methods often lack standardization, fail to engage young patients effectively, and place additional demands on clinical staff.

This white paper examines the role of digital interactive education in addressing these challenges, highlighting how gamification, augmented reality, and personalized learning pathways can improve patient preparedness. Evidence from clinical research and real-world hospital implementation suggests that structured, engaging digital education can reduce preoperative anxiety, enhance compliance with surgical protocols, and improve perioperative workflows.

Xploro, an interactive patient education system, is one such solution that leverages gamification and immersive learning to empower pediatric patients and support healthcare teams. By integrating patient-centered technology into existing surgical pathways, healthcare systems may enhance both patient experience and operational efficiency. This paper explores key insights into the implementation of digital education solutions and their potential to transform pediatric surgical care.

The Challenge: Pediatric Surgical Preparation

Pediatric surgical preparation is a complex challenge that affects both patients and healthcare providers. Each year, millions of children undergo surgery, yet up to 75% experience significant anxiety at some stage of the process[1,2]. The unfamiliar hospital environment, complex medical terminology, and uncertainty surrounding procedures contribute to psychological distress, often leading to non-compliance, missed appointments, and last-minute cancellations[3].

Beyond the individual impact, inadequate preparation increases reliance on sedation, prolongs recovery times, and disrupts surgical workflows. Clinicians, already managing heavy workloads, must spend additional time addressing unprepared patients, diverting focus from critical responsibilities. However, many hospitals continue to rely on outdated, inconsistent educational methods, compounding inefficiencies and increasing the burden on clinical teams. Without structured, engaging education throughout the perioperative process, children remain unprepared, contributing to avoidable delays, increased costs, and clinician burnout.

Each year, millions of children undergo surgery, yet up to 75% experience significant anxiety at some stage of the process

Clinical and Operational Challenges

Inefficiencies Leading to Surgical Cancellations and Delays

Without proper education, children may not be adequately prepared for surgery, leading to missed appointments and cancellations. Pediatric surgery no-show rates range from 5% to 30% nationwide, significantly disrupting hospital operations and negatively impacting revenue[4].

Financial Burden and Hidden Costs

A single canceled pediatric surgery can cost a hospital around $4,500, with additional hidden costs from operating room inefficiencies and rescheduling expenses[5]. Missed appointments further burden hospitals, costing an average of $200 per hour[6].

High Patient Volume and Clinician Burnout

Pediatric surgical teams are often overwhelmed, leaving limited time for in-depth perioperative education. Repeating the same information about surgery, anesthesia, and recovery diverts clinicians from critical responsibilities, contributing to burnout and reduced patient preparedness[3].

Fragmented Multidisciplinary Coordination

Surgical preparation requires collaboration among pediatricians, surgeons, anesthesiologists, nurses, child life specialists, and administrative teams. However, siloed operations often lead to inconsistent communication, leaving patients confused and less confident about their procedures[3].

Underdeveloped and Inconsistent Patient Education

Most hospitals lack a standardized, scalable approach to pediatric surgical education. Instead, education efforts are often fragmented, relying on outdated materials, sporadic verbal explanations, or last-minute instructions that vary between providers and departments. Without a structured, hospital-wide program, many children receive limited or inconsistent preparation, increasing anxiety, procedural non-compliance, and preventable surgical delays.

Unlike other aspects of perioperative care, patient education is rarely integrated into hospital workflows in a way that ensures every child and family receives comprehensive, age-appropriate guidance. Some hospitals may offer educational resources through child life specialists, while others depend on individual clinicians to provide explanations at their discretion. This variability results in missed opportunities to properly prepare patients, leading to higher cancellation rates, increased reliance on sedation, and greater operational inefficiencies.

Without a system to ensure all patients receive the right information at the right time, education remains an afterthought rather than a core component of perioperative care.

“ The explanations of the day surgery, hospital staff, and equipment were age-appropriate and clear, helping to prepare him for the day so he knew what to expect. A huge thank you to the team that makes this kind of thing possible—I am incredibly grateful!"

Parent of a child using Xploro to prepare for day surgery

Patient-Focused Challenges

Limited Accessibility to Surgical Education

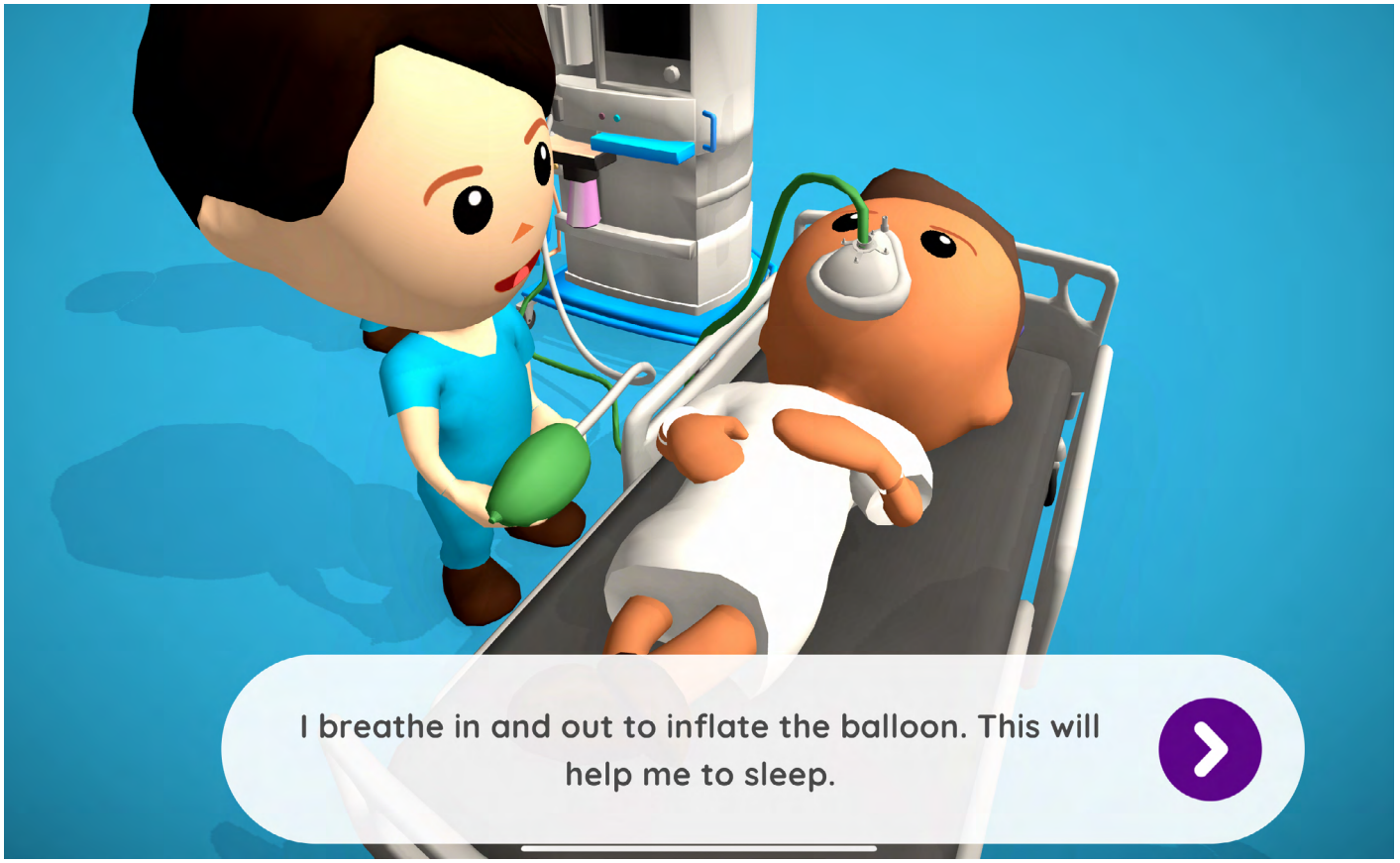
Traditional education across all perioperative stages is not always accessible, especially for patients with language barriers or lower literacy levels. Engaging, age-appropriate digital tools help bridge this gap through self-paced learning and visual reinforcement[7].

High Anxiety and Fear of the Unknown

Medical environments and procedures can be overwhelming for children, leading to significant anxiety. Preoperative anxiety is a well-documented factor affecting pediatric surgery, with studies indicating that up to 60% of children experience significant distress before their procedure[1]. This anxiety is associated with:

- Reduced cooperation in preoperative holding areas.
- Heightened physiological stress responses, complicating anesthesia induction.
- Increased risk of procedural non-compliance and last-minute cancellations.

Studies confirm that interactive, child-friendly education significantly lowers stress compared to standard verbal explanations[1]. Addressing anxiety through engaging digital interventions can help children feel more in control, improving their overall surgical experience.



Xploro's interactive storybooks help patients understand i) what's going to happen, ii) what it will feel like and iii) what coping strategies they can use to help them through the process

Non-Compliance with Pre and Post-Surgical Instructions

Many day-of-surgery (DoSC) cancellations stem from non-compliance with nil per os (NPO) guidelines — one of the most common preventable causes of surgical delays. Research shows younger children (ages 6–12) and non-English speaking or non-White families have higher rates of NPO non-compliance[13].

At hospitals like Nationwide Children's, NPO instructions are given three times — during the preoperative visit, a nurse-led phone screening, and a call the day before surgery. Yet, miscommunication persists due to parental misunderstanding, anxiety, and lack of awareness of fasting safety risks[13].

Interactive digital education can address these gaps, improving adherence, reducing preventable cancellations, and enhancing surgical outcomes[8].

Parental Anxiety and Misinformation

Parental anxiety can directly impact a child's ability to cope with surgery[9]. When parents receive clear, interactive education at all perioperative stages — including preoperative, intraoperative, recovery, and post-discharge—their stress levels decrease, creating a smoother surgical experience for their child[3].

Xploro's Solution: A Personalized and Gamified Perioperative Education Experience

Addressing the challenges of pediatric surgical preparation requires a solution that not only engages young patients but also supports clinicians in delivering consistent, effective education. Xploro reimagines perioperative education by using gamification, immersive storytelling, and interactive learning to make complex medical information accessible and reassuring for children. By guiding patients through their surgical journey—from preoperative preparation to intraoperative expectations and postoperative recovery—Xploro helps reduce anxiety, improve compliance, and enhance surgical outcomes. Research confirms that interactive digital tools are more effective than traditional methods, leading to fewer cancellations, better adherence to perioperative protocols, and reduced stress for both patients and healthcare teams[3,10].

> **"I just wanted to say a sincere thank you for the Xploro App. It was a fantastic tool for us to engage our little boy in his upcoming surgery. He loved the interactive character and felt prepared for what to expect. I am incredibly grateful!"**
>
> **Parent of a 7-year-old patient**

Preoperative: Building Confidence and Ensuring Compliance

The surgical journey begins well before a child steps into the hospital. Proper preparation is key to reducing anxiety, ensuring adherence to medical instructions, and improving overall patient outcomes. Xploro provides structured, compassionate education tailored to each child's unique needs, empowering them to approach surgery with confidence rather than fear.

- **Missions and Learning Pathways**
  Clinicians can co-create interactive learning pathways that guide children and families through each step of the surgical journey. These structured pathways ensure that patients receive the right information at the right time, reinforcing pre-admission testing procedures, arrival procedures, and anesthesia expectations. For healthcare teams looking for ready-to-use solutions, Xploro offers pre-built, clinically-informed learning journeys that can be implemented immediately, with the option to tailor content as needed. By making education engaging and interactive, Missions improve adherence, increase patient confidence, and reduce the risk of surgical delays.
- **3D Avatars and Personalized Guidance**
  Xploro's customizable Avatar "buddy" serves as a trusted companion, guiding children through every step of their journey. Children can personalize their avatar's appearance—from skin tone and clothing to assistive devices—helping them see themselves represented in the medical environment.
- **Gamified Storybooks and Interactive Walkthroughs**
  Engaging, story-driven modules explain the surgical process step by step, covering everything from fasting (NPO) requirements and anesthesia preparation to pre-op hospital check-ins in a child-friendly, reassuring format.
- **3D-AR Hospital and Equipment Exploration** –
  Interactive 3D models allow children to explore operating rooms, anesthesia induction areas, and surgical equipment, helping them understand their environment before arriving at the hospital. By reducing fear of the unknown and improving patient cooperation, this technology plays a crucial role in preoperative education. To further enhance familiarity, Xploro can develop custom 3D environments that accurately reflect a hospital's surgical suites, recovery areas, and specific equipment—such as anesthesia machines, laparoscopic tools, and monitoring devices. This level of customization ensures that children recognize the spaces and instruments they will encounter, making the experience more predictable, engaging, and ultimately less intimidating.
- **Pre-Surgery Compliance Games**
  Gamification reinforces key preoperative behaviors in a way that children understand, enjoy, and remember.
  - » **Pack and Dash**
    Helps children understand what to bring to the hospital, reducing uncertainty.
  - » **Jigsaw Junction**
    Familiarizes children with the hospital setting, making it feel more welcoming.
  - » **Snack Attack**
    Reinforces fasting (NPO) compliance, significantly reducing last-minute surgical cancellations due to non-compliance.

"Snack Attack" encourages NPO compliance

"Jigsaw Junction" aids familiarization with hospital environments

Intraoperative: Reducing Fear and Encouraging Cooperation in the OR

The transition from pre-op to the operating room can be one of the most stressful moments for a child. Xploro helps ease this transition by fostering familiarity with the surgical team and demystifying the OR environment through engaging digital experiences.

- **Familiarizing Patients with Their Surgical Team**
  Seeing custom avatars of their actual surgeons, anesthesiologists, and nurses before surgery helps children feel safe and reassured as they transition into the OR. By recognizing their care team ahead of time, children experience less uncertainty when meeting medical professionals in real life. To further build rapport, patients can also co-create staff avatars alongside their medical team, personalizing details like scrubs, accessories, or friendly identifiers. This collaborative approach fosters familiarity and trust, transforming the surgical team from a group of strangers into a reassuring presence before the procedure even begins.
- **Step-by-Step Surgery Walkthroughs**
  Interactive digital guides explain what happens in the operating room, covering mask induction for anesthesia, monitoring devices, and the role of different surgical team members. Knowing what to expect reduces fear and promotes better patient cooperation.
- **Gamified Induction and Sedation Preparation**
  Many children experience anxiety about anesthesia, but Xploro introduces sedation concepts in a way that is engaging and easy to understand.
  - » **Sleepy Space Sheep**
    Guides children through a fun, dreamlike adventure, helping them understand how anesthesia works in a comforting way.
  - » **Surf's Up**
    Uses a playful surfing-themed experience where the avatar rides the waves to capture sedation molecules, normalizing and demystifying the process as they make their way to Dreamland.
  - » **Dreamland**
    Helps children understand that sedation is temporary and normal by immersing them in a dream-like, brightly colored island. Their avatar collects pieces of a magical alarm clock, and once all are gathered, the clock rings, gently waking them—demonstrating that sedation is safe and only temporary.
- **Relaxation and Distraction Tools**
  Gamified relaxation techniques and interactive pre-op distraction activities help lower stress and improve patient cooperation. Studies show that digital distraction can significantly lower preoperative anxiety and, in some cases, reduce the need for sedatives[1].

"Teach-back" quizzes test retained knowledge

"Stitch and Slide" educates patients about wound care

"Recovery Rush" helps patients understand what goes on in the Recovery Room

Postoperative: Supporting Recovery and Ensuring Discharge Success

A child's surgical experience doesn't end in the OR—successful recovery requires adherence to post-op care instructions. Xploro ensures that children and caregivers retain critical discharge information, helping to reduce post-operative complications and hospital readmissions.

- **Interactive Quizzes And Comprehension Checks**
  Gamified quizzes assess a child's understanding of pain management, mobility restrictions, wound care, and medication schedules. These quizzes leverage the "teach-back" method, a widely recognized best practice in pediatric patient education. By encouraging children to explain key concepts back in their own words, clinicians can confirm comprehension and reinforce critical information. This process reduces miscommunication and ensures patients and caregivers fully understand discharge instructions before leaving the hospital.
- **Age-appropriate questionnaires**
  Clinicians can construct structured questionnaires (such as PROMs and PREMs) in Xploro's admin portal and distribute them to patients, allowing for seamless post-operative progress monitoring. Every time a patient responds, they receive a dance animation for their avatar, encouraging engagement while reinforcing participation. Beyond individual patient care, these questionnaires generate valuable data that hospitals can analyze to identify patterns in recovery, patient-reported outcomes, and adherence to post-operative instructions. By leveraging these insights, healthcare providers can refine perioperative protocols, enhance patient support strategies, and drive continuous improvements in surgical care and recovery pathways.
- **Self-Paced Learning for Families**
  Children and caregivers can revisit post-op instructions anytime, reinforcing key recovery topics such as early mobilization, dietary restrictions, and physical therapy exercises.
- **Multilingual and Accessibility Support**
  Xploro's multilingual functionality and Read-Aloud feature ensure that all patients, regardless of language proficiency or literacy level, fully understand their discharge plan—reducing miscommunication-related complications and preventable readmissions.
- **Gamified Recovery Education**
  Xploro uses interactive games to reinforce post-op recovery behaviors:
  - » **Stitch and Slide**
    Teaches children about stitches, scars, and wound healing, improving adherence to wound care instructions.
  - » **Recovery Rush**
    Simulates postoperative care, allowing children to "play charge nurse" and manage recovery steps, reinforcing adherence to key post-op behaviors and helping the patient understand why they may have to wait a while before all their needs are tended to.

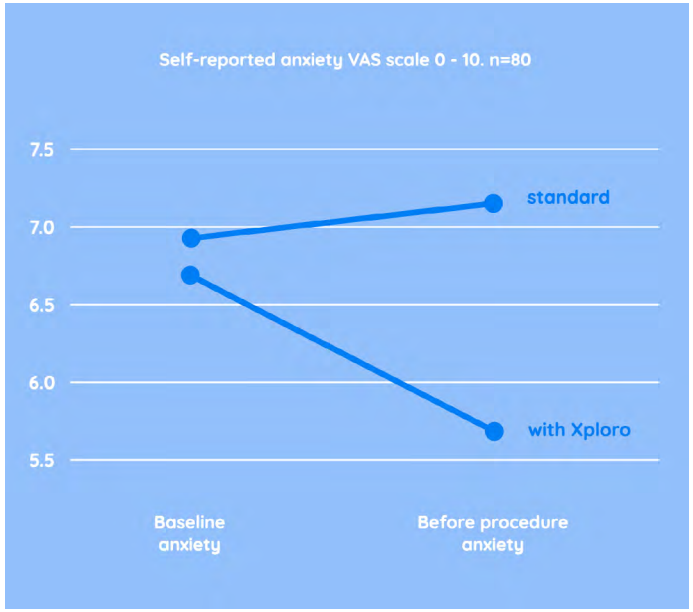
From Innovation to Impact: Validating Xploro's Effectiveness and Impact

Effective perioperative education extends beyond simply delivering information—it must drive measurable improvements in patient outcomes, clinical workflows, and financial performance. Hospitals that integrate interactive, patient-centered tools like Xploro into their surgical pathways are experiencing enhanced patient preparedness, optimized perioperative processes, and reduced preventable inefficiencies. As hospitals are increasingly evaluated on patient experience and staff engagement, solutions that improve both patient preparedness and operational efficiency can also support clinical teams by reducing repetitive educational tasks and allowing staff to focus on higher-value patient interactions. The true measure of success lies in how these improvements manifest in clinical outcomes, hospital efficiency, and financial sustainability.

Clinical Validation: Reducing Anxiety, Improving Compliance, and Enhancing Surgical Outcomes

To evaluate Xploro's real-world impact, clinical studies have examined its effectiveness in reducing pediatric preoperative anxiety, improving patient compliance, and enhancing the overall surgical experience. Research from leading children's hospitals demonstrates that digital, interactive education tools can positively influence both patient and hospital outcomes.

A six-month clinical study conducted at the UK's largest children's hospital assessed 80 pediatric patients, comparing those who received Xploro's digital education to those who received standard hospital information. Findings published in the Journal of Medical Internet Research revealed that Xploro significantly improved perioperative preparedness[11]:



Xploro has been shown to reduce pre-procedural anxiety

- Lower procedural anxiety (P = 0.008, statistically significant).
- Higher levels of procedural knowledge (P = 0.001, statistically significant).
- Greater overall satisfaction with their surgical experience (P = 0.03, statistically significant).

Further research at a leading U.S. pediatric hospital is reinforcing these findings. A randomized controlled trial (RCT) is currently investigating Xploro's effect on perioperative anxiety in children. Early results indicate a promising trend toward lower anxiety levels, particularly in acute care settings, underscoring the potential of interactive digital education in surgical preparation.

In a separate study published in the Health Education Journal, Xploro was evaluated in preparing children for planned blood tests, a key step in reducing procedural anxiety and fostering familiarity with medical settings before surgery[12]. The study included 24 children aged 6–14, their parents, and six healthcare professionals, and findings showed that:

- 96% of children found Xploro "fun" and "easy to use."
- 94% of children reported that Xploro helped them understand what to expect during the procedure.
- Parents observed that the app facilitated conversations about the procedure and helped calm their children.
- Healthcare professionals noted that Xploro allowed children to engage with educational content at home, ensuring better retention and preparedness.

With compelling clinical validation, the next consideration is how these patient-centered improvements translate into hospital-wide operational efficiencies and cost savings.

" Just wanted to quickly say that my daughter is loving the app. She said she feels that it's making the process less scary for her and she's loved showing it off to family members. We have noticed that in the few days since using it she has been openly talking about going into hospital, which before this she wouldn't do"

Mother of a 9 year old, booked for surgery to remove a brain tumor

Operational Impact: Enhancing Perioperative Efficiency and Resource Utilization

Beyond improving patient outcomes, structured perioperative education plays a critical role in hospital-wide efficiencies by enhancing patient compliance, reducing workflow inefficiencies, and optimizing resource allocation.

By incorporating structured, gamified education and real-time progress tracking, hospitals can:

- Improve adherence to preoperative instructions, helping to minimize procedural disruptions.
- Streamline OR scheduling and turnover, ensuring procedures start on time.
- Reduce administrative workload, allowing clinical staff to dedicate more time to direct patient care and practice at the top of their licenses.
- Support staff retention, as a reduced educational burden may help alleviate burnout and improve job satisfaction.

A structured approach to perioperative education also supports operational efficiency by allowing hospitals to:

- Verify patient readiness through progress tracking, ensuring adherence to key preoperative requirements such as fasting (NPO) and medication adjustments.
- Identify and address compliance issues before surgery, reducing the risk of last-minute delays and cancellations.

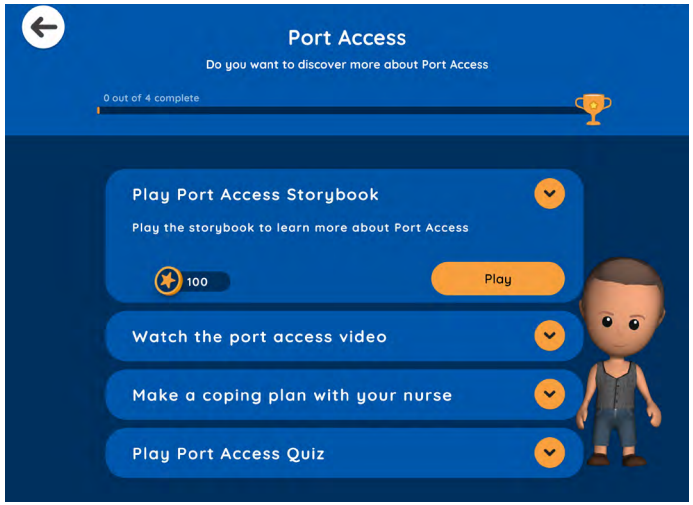
For hospitals managing high patient volumes, workflow enhancements such as these may contribute to improved patient flow, reduced inefficiencies, and a more effective allocation of clinical resources.

Financial Impact: Reducing Costs and Maximizing ROI

Xploro's ability to improve patient preparedness and reduce inefficiencies directly contributes to financial sustainability by optimizing resource utilization and reducing unnecessary costs.

Key Financial Considerations:

- **Optimizing OR scheduling and resource allocation**
  Hospitals that enhance patient preparedness see fewer last-minute procedural disruptions, leading to improved OR utilization and scheduling efficiency. Preventing avoidable cancellations helps maintain procedural volume and reduces the costs associated with rescheduling and underutilized OR time. By improving compliance, structured perioperative education may help prevent unnecessary cancellations, leading to estimated annual savings of $54,600 in rescheduling costs and OR inefficiencies[5].
- **Maximizing clinical efficiency**
  By reducing the need for repetitive preoperative explanations, structured digital education allows clinicians to dedicate more time to direct patient care. Saving 20 minutes per patient across 100 pediatric surgeries per month translates to more than 33 clinician hours that can be reallocated to higher-value tasks.
- **Reducing preventable costs associated with procedural delays**
  Ensuring that patients arrive fully prepared may contribute to a reduction in costs associated with last-minute adjustments, overtime pay, and prolonged OR turnover. Improved adherence to preoperative instructions also supports greater efficiency in perioperative workflows.



"Missions" allows you to set personalized learning journeys for patients and track completion.

- **Strengthening compliance and risk mitigation**
  Hospitals must ensure that patients and caregivers fully understand pre- and post-surgical instructions. Structured digital education provides verifiable documentation of patient comprehension, reducing liability risks associated with miscommunication and procedural non-compliance.
- **Lowering readmissions and supporting long-term financial sustainability**
  Strengthening discharge education has been shown to help reduce preventable ER visits and hospital readmissions, easing strain on healthcare resources while improving long-term cost-effectiveness. Additionally, hospitals that integrate patient-centered digital solutions position themselves as leaders in pediatric care—enhancing their reputation, increasing referral rates, and expanding access to research funding and strategic partnerships.

Conclusion

Xploro is more than a digital tool—it is transforming pediatric surgical preparation by engaging young patients, reassuring families, and optimizing healthcare workflows. Through interactive, gamified education, Xploro empowers children to approach surgery with confidence while enabling healthcare teams to streamline perioperative processes. By improving patient preparedness, reducing procedural anxiety, and enhancing clinical efficiency, Xploro directly supports healthcare organizations in achieving better surgical outcomes, improving patient experience scores, and optimizing resource utilization.

Healthcare providers looking to advance pediatric surgical care can integrate Xploro into their perioperative strategies to enhance patient engagement, support staff efficiency, and improve compliance with pre- and post-operative protocols.

Join leading organizations that are already transforming surgical education—contact us today to explore how Xploro can support your team and improve the way young patients experience surgery.

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