### Smarter Support, Better Outcomes: The Case for Personalized Education in Pediatric Oncology

Pediatric oncology demands not only clinical precision but also emotional intelligence and systemic efficiency. Yet up to 80% of critical medical instructions are forgotten under stress, leading to missed treatments, canceled procedures, and preventable disruptions. Xploro, a clinically validated digital education platform, transforms complex care instructions into engaging, emotionally resonant experiences that improve comprehension, reduce anxiety, and strengthen adherence.

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#### Abstract

Pediatric oncology demands clinical precision, emotional sensitivity, and operational efficiency. Yet nearly one in three pediatric cancer patients struggle to stay on schedule, and up to 80% of critical medical instructions are forgotten under stress. These educational gaps result in missed infusions, imaging delays, canceled procedures, and preventable disruptions—threatening patient outcomes and organizational quality metrics.

Xploro is a clinically validated, interactive patient education platform designed specifically for pediatric oncology. Through personalized avatars, gamified learning, augmented reality, and interactive teach-back tools, Xploro ensures families don't just receive critical information—they truly understand and retain it. The platform emotionally prepares children, empowers caregivers, reduces anxiety, and equips clinicians to proactively identify and address knowledge gaps.

Healthcare organizations using tools like Xploro report fewer cancellations, reduced sedation needs, improved patient preparedness, higher family satisfaction, and substantial cost savings. Its multilingual and culturally inclusive approach also promotes equity, supporting every family across the childhood cancer continuum from diagnosis through survivorship.

Smarter patient education drives better care. Xploro delivers it.



"He had six surgeries that year, which was overwhelming, and he didn't really know what was going on—none of us did. I remember when Jad first showed me Xploro, he played a game that taught him about chemo. The next day, when he went into chemo, he knew how it was helping him fight cancer. When he went into his surgeries, he could talk about them and the machines. He could tell us how he was feeling when he was under anesthesia. It created conversations."

Young family member of a patient undergoing cancer treatment

#### An Overview: Why Pediatric Oncology Needs a Smarter Approach to Patient Education

#### A High-Stakes Challenge That Demands Precision

In child cancer treatment, the margin for error is razorthin. Missing even a single chemotherapy dose can quadruple a child's risk of relapse<sup>1</sup>, yet nearly a third of patients struggle to stay on schedule<sup>1</sup>. These statistics translate into daily disruptions for care teams, including delays, urgent sedation changes, and repeated education loops.

Families navigate a life-altering crisis, facing intricate treatment protocols and an immense information load. Without effective tools that support learning and retention under pressure, families fall behind, leaving the healthcare system struggling to catch up<sup>2</sup>.

### The Emotional Weight of Pediatric Cancer—for Families and Clinicians

The emotional toll of pediatric cancer begins immediately upon diagnosis, shattering routines, stretching emotional reserves, and destabilizing families. Caregivers must absorb complex instructions while managing fear and exhaustion.

These emotional pressures significantly impact how families interpret medical guidance, prepare for care, and maintain engagement throughout treatment<sup>2</sup>.

#### When Education Breaks Down, Outcomes Suffer

Traditional education tools—brochures, verbal instructions, and handouts—often fail under real-world clinical stress<sup>4</sup>, especially when delivered during moments of peak cognitive overload<sup>5</sup>. These breakdowns contribute to missed appointments, emotional distress, and preventable errors—costing patients and clinicians valuable time<sup>6</sup>.

### Reimagining Pediatric Education: The Case for Digital Tools

What if families could better absorb complex care instructions tailored specifically to their child's needs during high-stress moments?

Xploro makes this possible. More than just a digital library, Xploro is an emotionally aware, interactive patient education platform delivering personalized education based on age, diagnosis, and treatment stage. It helps children and caregivers retain critical information, reducing clinical burdens and significantly improving adherence.

#### Meet Xploro: A Digital Ally in Pediatric Cancer Care

Xploro is a clinically validated platform employing avatars, admification, immersive AR environments, and interactive storutelling to support families throughout their pediatric cancer journey. Designed to support compliance with Joint Commission, FACT, and other healthcare education and safety standards, Xploro includes emotional analytics and engagement dashboards that allow care teams to track understanding, flag distress, and intervene early. Built-in teach-back functionality reinforces comprehension and helps identify gaps before they lead to delays. By automating routine education in formats children respond to, Xploro improves adherence and allows clinicians and caregivers to reinvest their time in higher-value interactions that strengthen patient engagement, care guality, and overall experience.

"I 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 waiting for surgery to remove a brain tumor

#### Where Systems Struggle: The Gaps Undermining Pediatric Oncology

#### **Clinical & Operational Challenges**

- Fragmented Education and Workflow Burden Care often breaks down even before treatment begins due to inconsistent or conflicting instructions from siloed departments—chemotherapy, imaging, radiation, supportive care—each using different terms or assumptions<sup>7</sup>. Clinicians spend valuable time filling these gaps, contributing to burnout<sup>6,8</sup>.
- Adherence and Preparation Failures Adherence failures, from skipped medications to missed preparation steps, are frequent. Approximately 30% of pediatric patients fail to fully adhere to oral chemotherapy regimens, and only 49% consistently perform central line care<sup>9,10</sup>. Even a single missed dose dramatically increases relapse risk.

Preparation errors are similarly common, particularly with sedation requirements for younger patients undergoing imaging or therapy. Misunderstood instructions, such as fasting protocols, led one U.S. center to report over 100 annual sedation cancellations, resulting in significant emotional distress and lost resources<sup>11</sup>.

Delays That Jeopardize Outcomes

Treatment delays, even when unintentional, have serious consequences. A four-week delay in pediatric cancer care is linked to a 6–8% increase in mortality<sup>12</sup>. In the UK, over 73,000 patients waited more than six weeks for imaging in 2024, driven by a 30% radiologist shortfall—delays that routinely postpone cancer treatment<sup>13, 14</sup>. In the U.S., growing demand and workforce shortages have caused MRI backlogs to exceed seven weeks in some regions, jeopardizing timely diagnosis and intervention<sup>15</sup>.

- Attendance Failures and System Disruption No-shows are a significant issue, with some infusion centers reporting rates up to 16.4%, and radiation oncology programs seeing at least one missed appointment in 53% of patients<sup>16, 17</sup>. At an average cost of \$267 per visit, a 16.4% no-show rate in a clinic with 100 weekly appointments can result in losses exceeding \$225,000 annually <sup>18</sup>.
- Operational Waste and Financial Loss Operational inefficiencies quickly compound. Nearly 20% of MRI exams require repeat sequences due to patient motion—often linked to poor preparation—resulting in lost scanner time valued at \$592 per hour. Extrapolated across a year, this adds up to roughly \$115,000 in losses per scanner<sup>19</sup>.

#### Patient & Family Challenges

• Emotional Distress Undermines Engagement Within three months of diagnosis, many children show severe emotional distress, with 48% experiencing anxiety or depression in the first year of treatment<sup>20, 21</sup>. Caregivers also face significant emotional burdens, with 74% experiencing anxiety and 46% depression<sup>22</sup>. These strains directly disrupt treatment adherence and preparation.

• Behavioral and Emotional Spillover

Cancer affects entire households, particularly siblings, who often face school disruption, social withdrawal, and behavioral challenges. They are up to 10% more likely to need mental health services, with effects lasting up to 20 years after diagnosis <sup>23, 24</sup>. Age-appropriate support builds emotional resilience and strengthens household stability<sup>25</sup>.

- Information Loss in High-Stress Encounters
   Up to 80% of clinical information is forgotten
   immediately under stress, severely impairing patient
   education effectiveness<sup>26</sup>.
- **Financial Strain Compromises Adherence** High treatment costs average \$833,000, yet 95% of parents are forced to reduce work hours<sup>27</sup>. More than a third lose over 40% of their income. These financial pressures directly contribute to missed treatments<sup>28</sup>.
- Health Equity Gaps Widen

Social determinants significantly affect pediatric cancer outcomes, disproportionately disadvantaged low-income, rural, or minority populations—even within a universal health system<sup>29</sup>.



Storybooks like this one for Bone Marrow Transplant help patients understand complex treatments and procedures

#### A Solution Built for Pediatric Oncology

#### A Platform Designed for Oncology's Complexity

Xploro is purpose-built for pediatric oncology. Developed in collaboration with clinicians, child life specialists, families, and patients, it integrates clinical education, emotional support, and operational efficiency into a single child-centered platform. Its modular architecture adapts dynamically based on diagnosis, age, treatment stage, emotional state, and cultural context.

Xploro acts as a pediatric learning management system, structured and personalized to support the entire care team:

 Clinician Admin Portal: Enables care teams to assign educational Missions that match each child's cancer journey—from blood tests and port placements to bone marrow transplants or proton therapy. Oncology-specific materials, interactive storybooks, educational videos from a variety of sources and precision learning games guide



"Proton Power" educates patients about Proton Beam Therapy

patients step-by-step. Precision content includes games like Proton Power (targeted radiation), Plasma Patrol (blood cancers), and Statue Quest (staying still for scans). Dashboards track engagement, mood trends, and comprehension via teach-back tools, enabling proactive, efficient care.

- Parent Portal: Gives families access to their child's progress, mood insights, and educational content. Synced calendars, mirrored prep materials, reminders, and sibling resources ensure household alignment and emotional preparedness—especially important during high-stakes moments like diagnosis or sedation planning.
- **Child-Facing App:** Blends storytelling, gamified learning, and self-expression. Children personalize avatars with medical features (e.g., PICC lines, hair loss), mobility aids, and cultural or religious dress. They meet their care team through avatars including oncologists, hematologists, and palliative care clinicians. Storybooks like Proton Therapy,



"Statue Quest" reinforces the importance of staying still for procedures like Proton Therapy and MRIs

Linear Accelerator (LINAC), Mask Making, Bone Marrow Transplant, and Chemotherapy demystify procedures, while educational games like Proton Power, Surf the Sedation, and Plasma Patrol reinforce emotional readiness.

"Xploro deeply engaged him from the moment he entered the experience... the very next day, in his fourth round of chemo, he shared with his nurse that he finally gets what this medicine is doing to his body (thanks to a game he played on the app the night before). It was amazing. He was encouraged, and for the first time in months there was a lightness about him."

Caregiver of 12 year old child, receiving treatment for Osteosarcoma

#### Built With Kids, for Kids: A Human-Centered Teaching Model

Xploro isn't designed merely to distract—it prepares children emotionally and cognitively well before they enter the healthcare setting. The educational approach is built around the natural questions children ask: What's going to happen? What will it feel like? What can I do to cope?

Through self-paced engagement, children use interactive storybooks, mood diaries, and teach-back tools to build understanding over time. These low-pressure knowledge check-ins identify confusion early, fostering emotional resilience and procedural comprehension.

Xploro's human-centered design integrates continuous input from patients, families, and clinicians. Our Expert Advisory Boards (EABs) in the US and UK include diverse children aged 6–16 whose experiences directly inform and validate content—from game mechanics to emoji sets.

Feedback from neurodiverse EAB members guided the inclusion of sensory-rich descriptions (smells, sounds, textures), enhancing accessibility. Empathy permeates every interaction; for instance, one developer underwent a radiation mask fitting to better understand a child's emotional and physical experience.

Inclusivity is foundational. From their first interaction, children create avatars without preset gender or racial alignment, with options for mobility aids, head coverings, and soon, prosthetic limbs. The message is clear: you belong here—just as you are.

This ethos of co-creation and emotional safety sets the stage for what follows: building trust, reducing fear, and preparing each child for their cancer journey.

#### Diagnosis: Building Trust from the Start

The moment of diagnosis often triggers fear, confusion, and emotional shutdown—for both child and caregiver. Xploro steps in early to bring structure and calm.

- **Patients:** Children meet their care team through avatars and explore their diagnosis via Missions covering topics like What Is Cancer? and Your First Blood Test. Games like Heart Race and Bendy Bones help introduce body systems, while environments like Jigsaw Junction familiarize them with clinical spaces.
- **Clinicians:** Assign onboarding Missions tailored to the diagnosis and treatment plan. Real-time dashboards flag children who may be struggling emotionally or cognitively, allowing for early intervention.
- **Families:** Receive mirrored diagnostic content to reduce misalignment, strengthen communication, and support sibling engagement.

Outcome: Trust is established early, emotional risk is reduced, and families begin their journey on stable, shared ground.

#### "We see Xploro as a way to add power to the concepts we cover with oncology patients in person, and to reinforce information and keep the patient and family engaged in between visits."

Lisa Wolff, MS, CCLS, Oncology Department, UChicago Medicine's Comer Children's Hospital

#### Preparing for Treatment: Boosting Readiness, Reducing Sedation

Treatment preparation is a high-risk moment for missed instructions, anxiety spikes, and clinical delays. Xploro addresses this with immersive, child-led education.

- Patients: Storybooks such as IVs, CT Scan with and without Contrast, MRI, Port Access, Intravenous Chemotherapy, and LINAC explain what to expect step-by-step. Games like Snack Attack (fasting rules), Pack & Dash (inpatient prep), and Surf the Sedation or Sleepy Space Sheep (anesthesia) prepare children for common procedures. 3D environments, which can be customized—like proton therapy rooms—allow for exploration of actual treatment spaces.
- Clinicians: Assign precision content based on treatment milestones. For proton therapy, a child might follow their avatar through a step-by-step storybook, experience mask making, explore a 3D treatment room in AR (customized to Varian, Leo Cancer Care, or Hitachi), play Statue Quest to practice staying still, and complete Proton Power to learn how targeted beams treat cancer. A teachback quiz reinforces procedural understanding and confidence, while mood and comprehension data feed directly into the EHR. Clinicians can also deploy short questionnaires—separate from quizzes—to capture patient-reported concerns or readiness; responses sync to the EHR or remain available for review in the Xploro Admin Portal.
- **Families:** Access the same prep content as the child, supporting reinforcement at home and reducing day-of-procedure surprises.

Outcome: Better-prepared patients reduce sedation use, decrease appointment cancellations, and improve workflow reliability.



### During Treatment: Sustaining Engagement and Emotional Resilience

Ongoing cancer treatment brings emotional highs and lows, physical discomfort, and shifting care protocols. Xploro helps families navigate this with continuity and care.

- Patients: Use mindfulness games like Seaside Search, Cloud Pop, and Pond Pause-designed to promote calming focus, emotional regulation, and gentle sensory engagement—to manage stress during long infusions. Smile Squad, a structured oral care game, reinforces antiseptic hygiene routines to support mucositis prevention and selfcare during chemotherapy. Storybooks such as Patient Monitor, Blood Test, and Port Access continue to explain ongoing procedures. Teachback tools help patients understand changing regimens, while the chatbot-enhanced with oncology-specific responses—answers common patient questions on treatment and side effects, escalating sensitive topics to clinicians and caregivers when needed.
- **Clinicians:** Monitor mood trends and engagement through dashboards. Use PROM/PREM data to trigger new content proactively or reactively in response to challenging days.
- **Families:** View emotional and educational progress to stay informed and support their child without being overwhelmed.

Outcome: Ongoing engagement improves adherence, lightens staff load, and ensures emotional red flags don't go unseen.

## Recovery and Survivorship: Extending Support Beyond Discharge

Cancer care doesn't end when treatment stops. Families must manage late effects, monitor recurrence risks, and help children reintegrate into school and daily life. Xploro provides long-tail support designed for these next steps.

- **Patients:** Engage with content like Stitch & Slide (wound care), Recovery Rush (post-treatment simulation), and mood logs that reflect the transition back to daily life. Avatars can evolve alongside patients to show post-treatment changes.
- **Clinicians:** Assign follow-up Missions that reinforce medication adherence, promote psychosocial recovery, and track comprehension through teachback data.
- Families: Access medication trackers using calendars, and psychosocial resources for managing school return, sibling adjustment, and future appointments.

Outcome: Survivorship becomes not a cliff, but a bridge—digitally supported and clinically informed.

"Xploro has played a significant role in the life of our cancer patients. It's equipped them with knowledge about their illnesses and educated them on treatment-appropriate attire. Xploro has been key in introducing them to those who are involved in their care and reducing their levels of stress and depression during their medical journey."

Gracious Mbhuh, Play Specialist, Oncology Department, Mbingo Baptist Hospital, Cameroon

#### From Promise to Proof: The Measurable Impact of Personalized Education

Improving patient education in pediatric oncology goes beyond information delivery—it supports system-wide improvements. Hospitals face pressures to reduce delays, enhance patient experiences, control costs, and ensure equitable care. Evidence-based digital tools like Xploro address these demands effectively, aligning closely with clinical outcomes, operational efficiency, financial sustainability, and equity—backed by real-world data<sup>30, 31</sup>.

#### Clinical Outcomes: Building Readiness, Understanding, and Adherence

The most immediate impact of improved patient education is clinical. For children facing complex procedures and high-stress treatments, emotional readiness and understanding directly shape safety, cooperation, and adherence to care<sup>32</sup>.

- Reduced Anxiety and Emotional Distress: Interactive tools significantly reduce pediatric anxiety, lowering sedation needs and cancellations <sup>33, 34</sup>. Features like avatars and AR walkthroughs further minimize distress <sup>35, 36</sup>. Xploro significantly reduces procedural anxiety, enhances knowledge, and boosts satisfaction compared to standard preparation <sup>30</sup>.
- Improved Understanding: Gamified education improves children's understanding of complex medical procedures. Xploro, for example, has been shown to increase comprehension of blood draws <sup>37</sup>. This approach is increasingly applied to chemotherapy, anesthesia, and imaging—where reducing fear and improving procedural understanding are equally critical.
- Better Adherence and Self-Management: Digital platforms such as Xploro help reinforce high-risk

self-care behaviors like central line care and medication adherence. By supporting long-term self-efficacy, they reduce preventable complications and improve overall treatment continuity<sup>38</sup>.

### Operational Impact: Enhancing Workflow and Reducing Rework

Beyond clinical outcomes, structured digital education also improves operational efficiency. By enhancing patient preparedness and reducing last-minute complications, these tools help streamline care delivery and ease pressure on clinical teams<sup>38</sup>.

- Reduced Sedation and Cancellations: Improved preparation has been linked to fewer same-day cancellations and reduced sedation needs in pediatric imaging and treatment<sup>39, 33</sup>. These gains are especially important in high-stress clinical settings where missed prep disrupts workflow. Children using Xploro have shown significantly reduced pre-procedure anxiety, minimizing delays and supporting smoother care delivery.
- Decreased Teaching Burden: Structured digital education reduces the time clinicians spend on repetitive verbal instruction, saving time per patient and freeing up bandwidth for higher-value tasks<sup>40</sup>. These efficiencies also support broader quality goals by standardizing patient messaging across teams and encounters. In one pediatric program, more than 1,800 caregivers were contacted with information about Xploro; over 900 registered for the platform, and more than 600 pediatric patients actively used it. This level of engagement demonstrates the platform's potential to scale caregiver outreach efficiently while reinforcing readiness and comprehension at home.
- Improved Workflow Coordination: Integrated dashboards that track emotional signals and

teach-back metrics help care teams identify risks early and coordinate more effectively across departments. When connected to the EHR, Xploro enables seamless content delivery and documentation within existing clinical workflows<sup>41</sup>. To further support a connected and engaging patient experience, Xploro also offers a customizable "Digital Front Door" capability that brings together hospital-branded education, personalized information, and immersive 3D content—all in one intuitive platform.

• **Clinician Satisfaction and Retention:** Reduced rework and better patient preparedness ease the emotional and cognitive load on care teams. These efficiencies have been linked to higher clinician satisfaction and lower burnout risk in pediatric settings<sup>42</sup>.

"In the years that I have been visiting radiation oncology departments, the hardest thing I have ever witnessed is a young child walking alone to the treatment room for proton therapy. All too often, people underestimate the importance of reducing anxiety around the treatment process, but that is where Xploro really comes in. Xploro creates an immersive environment to really prepare pediatric patients for their treatment process—reducing anxiety for the patient and for their parents."

Stephen Towe, CEO, Leo Cancer Care

### Financial Impact: Reducing Waste and Supporting Strategic Goals

In addition to clinical and operational gains, Xploro also reduces financial waste. By addressing inefficiencies like missed appointments, repeat imaging, and sedation delays, patient education tools help lower costs and support long-term sustainability goals<sup>43</sup>.

- **Fewer Missed Appointments:** Improved readiness reduces no-shows and repeat imaging—inefficiencies that account for over 67,000 missed visits annually and an estimated \$7 million in lost productivity and resource waste in oncology settings<sup>44</sup>.
- Savings from Better Preparation and Discharge: Structured discharge education improves caregiver understanding of at-home care for common issues like nausea, infection, and pain—reducing 72-hour return rates by over 8% and preventing approximately 600 unnecessary visits annually<sup>45</sup>.
- **Efficiency Gains:** Structured digital education platforms like Xploro reduce repetitive teaching through standardized videos and interactive tools, reclaiming clinician time. These gains support high-quality care delivery without added staffing or extended hours<sup>46, 47</sup>.
- Value-Based Alignment: Xploro contributes to value-based financial performance by reducing preventable costs and supporting quality benchmarks linked to reimbursement. By improving comprehension, emotional preparedness, and adherence, the platform helps decrease unplanned utilization such as emergency department visits and readmissions—key cost drivers in pediatric oncology. These financial benefits are reinforced by strong patient-reported experience outcomes. In one evaluation, children reported feeling more

informed and better prepared for medical procedures<sup>37</sup>. Earlier findings from Xploro's Impact Report further support its role in driving both cost efficiency and care quality through improved patient understanding, emotional regulation, and clinician-reported preparedness.

#### Advancing Equity: Reducing Barriers to Participation

Equity is a critical dimension of impact for digital education in pediatric oncology. By supporting families who face barriers to preparation, participation, and continuity of care, these tools help reduce disparities that directly affect outcomes, care delivery, and longterm costs.

- Addressing Literacy and Language Barriers: Multilingual narration, visual aids, and culturally responsive content ensure consistent, accessible preparation for families with limited English proficiency or low literacy. Xploro supports multiple languages—including right-to-left options like Arabic—and offers customizable, culturally inclusive avatars to meet the needs of diverse patient populations<sup>48</sup>.
- **Mitigating Financial Strain:** Asynchronous, ondemand digital education provided by Xploro reduces reliance on real-time instruction, offering flexibility for families under economic pressure. Tools like these support better retention, adherence, and sustained engagement<sup>49, 50, 51</sup>.
- **Consistency for Underserved Populations:** Children from low-income or linguistically diverse households face higher risks of missed preparation and care delays. Digital platforms with multilingual content and culturally tailored resources help bridge these gaps, promoting more consistent care and equitable outcomes<sup>29</sup>.

**Global Reach:** Xploro extends high-quality education to oncology programs worldwide without increasing staff burden. This commitment to global support is reflected in its work with programs in Ghana, Malawi, Cameroon, Indonesia, and Nepal, where it delivers locally adapted, accessible content to meet diverse patient needs.

"Xploro stands out as a great exemplar of how resources can address the key elements of health literacy. Xploro provides information and education which is accessible to help children understand key elements of their health care journey. Not only does Xploro educate children, but also has a positive impact on their parent's knowledge and their ability to support their child during a hospital visit. The elements and impacts of Xploro are fundamental to children with cancer having positive healthcare experiences and mitigating any upset or medical trauma they may encounter."

Lucy Bray, Professor of Child Health Literacy at Edge Hill University

#### **Conclusion: Smarter Support Starts Here**

Pediatric cancer care is more than just a clinical challenge. It tests the emotional resilience of families, the operational capacity of healthcare teams, and the systemic strength of hospitals and clinics. In this complex landscape, traditional educational methods no longer suffice. Families who feel overwhelmed, anxious, or underprepared directly impact clinical outcomes through missed appointments, unnecessary sedation, and avoidable treatment delays.

Xploro directly addresses these challenges with ageappropriate, emotionally attuned, and clinically validated digital education. It transforms how children and their families experience cancer care—replacing confusion with clarity, and fear with empowerment. As children arrive prepared and parents become confident caregivers, clinicians regain crucial time to focus on delivering expert treatment.

From diagnosis through survivorship, Xploro supports clinical effectiveness, operational efficiency, and care equity. It's more than a digital tool—it's a strategic investment in the future of pediatric oncology, ensuring that every family receives the preparation and personalized support they deserve.

The future of pediatric oncology is interactive, inclusive, and human-centered. Together, let's build smarter, more supportive care.



### Let's explore how Xploro could support your oncology program. Click one of the buttons below...

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