Rainbow Rabbit's Radiotherapy Journey

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Radiotherapy can be a frightening experience, especially for paediatric patients. The unfamiliar environment and fear of the unknown make this procedure particularly challenging for children. At the University of Malta, students from the digital health course have created a new mobile application prototype designed to support young oncology patients undergoing radiotherapy.

Digital health is a growing global industry, and M.Sc. students Gavin Schranz and Mark Agius know how impactful technology can be to streamline medical interventions and solve problems within the healthcare sector. As part of the Master of Science in Digital Health programme's first cohort, Gavin and Mark, in collaboration with their supervisors, Dr Susan Mercieca from the Faculty of Health Sciences and Dr Conrad Attard from the Faculty of ICT, have developed a novel mobile application prototype designed to meet the needs of paediatric oncology patients undergoing radiotherapy.

Gavin and Mark bring a unique blend of personal experience and professional expertise to this project. Gavin, a haemodialysis patient with a background in tech, has experienced the corridors of numerous hospitals from a young age. His journey through healthcare systems in Malta and abroad has been marked by a deep understanding of the uncertainties and fears that come with being a young patient in various treatment settings. This personal history allows Gavin to intimately connect with the emotional world of paediatric patients, infusing the project with genuine empathy and insight.

On the other side, Mark's professional experience as a radiographer at Sir Anthony Mamo Oncology Centre (SAMOC) complements this perspective. Witnessing the distress and anxiety of paediatric patients in the Rainbow Ward during radiotherapy treatments, Mark has seen the clinical side of these challenges. Together, Gavin's firsthand patient experience and Mark's clinical insights converge, inspiring them to focus on paediatric oncology patients – a group in dire need of compassionate support.

Rainbow Rabbit's Radiotherapy Journey is an immersive, child-friendly experience that helps paediatric patients become accustomed to the hospital setting while learning about their diagnosis and radiotherapy in an age-appropriate way, which can reduce the potentially daunting and distressing nature of the treatment process.

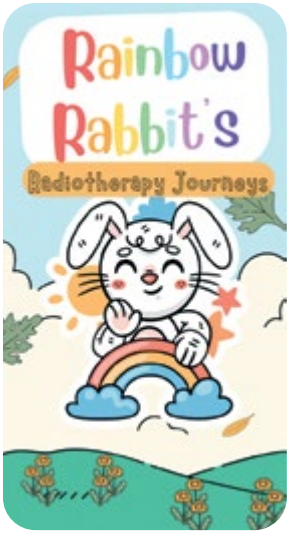
FROM COMPASSION TO CONCEPT

When brainstorming for this project, Gavin and Mark wanted to cater to a specific age and tackle a pressing real-life scenario by blending their collective expertise to solve a unique medical problem on a local level. While a variety of potential challenges came to mind, the idea of meeting the needs of paediatric oncology patients struck a chord for Gavin and Mark. As a radiographer, Mark sees first hand how paediatric patients experience distress and anxiety when receiving radiotherapy, a common treatment for cancer. Some even require anaesthesia to complete their treatment. Although radiotherapy is a painless procedure, it requires the patient to lie completely still for 10 to 15 minutes at a time, and the range of treatment can last from 5 to 30 sessions over a period of weeks.

In research involving healthcare stakeholders such as nurses, paediatric oncologists, and child psychologists, the literature showed that children between the ages of 6 and 8 tend to struggle the most with understanding the process of radiotherapy. They are less likely to comply with instructions and are more likely to be developmentally impacted by the stress of the procedure. By targeting this age group, Gavin and Mark set out to find a way for children to get used to the hospital setting and radiotherapy itself in a safe and non-threatening atmosphere. This would limit their distress when receiving treatment and decrease the need for anaesthesia.

HOW DOES IT WORK?

During their market research, Gavin and Mark were inspired by Alderplay, a tool used by Alder Hey Hospital in Liverpool to acclimatise children to the medical setting by taking them on a virtual tour of the hospital. They wanted to apply this concept to the local context here in Malta at SAMOC. By combining Gavin's IT knowledge and Mark's experience as a radiographer, the duo created an interactive prototype that introduces children to the hospital while teaching them about the treatments they will undergo. As the user enters the game, they are greeted by Rainbow Rabbit (a nod to SAMOC's Rainbow Ward) who guides them through their personalised journey around the hospital. The prototype is split into two main features, 'My Hospital' and 'My Journey', which tackle the logistical and emotional



App screenshots from *Rainbow Rabbit's Radiotherapy Journeys*

Images courtesy of Gavin Schranz and Mark Agius

Designed using icons from flaticon.com

Gavin Schranz (left) and Mark Agius (right)
Photo by Kristov Scicluna

elements of undergoing radiotherapy while using colourful imagery and cartoon animation that directly target the age group. With creative and interactive content, the game highlights what children will see when they go in for treatment and provides them with a space to process what they have experienced.

The 'My Hospital' feature functions as an interactive simulation of SAMOC, allowing children to tour 25 different rooms and familiarise themselves with the experiences, processes, and items they will see during their actual visit to the hospital. This feature is split into a three-part journey that helps children acclimatise to the application. Users can choose their own special animal to accompany them as they embark on a playful scavenger hunt and add items related to the medical field (like stethoscopes, syringes, and wheelchairs) to their inventory. This helps to desensitise potentially scary medical instruments by portraying them in a cartoon setting. Players then meet with virtual nurses and doctors at the Rainbow Ward, where their diagnosis and treatment options are explained in a metaphorical and child-conscious way, which helps younger patients gain a deeper and less distressing understanding of their illness and how it can be treated. The child also learns about radiotherapy, how the treatment is delivered, the importance of lying still, and even the sounds the machine will make. By the end of the tour, players receive a certificate that they can bring to their first radiotherapy appointment, helping them enter their first session with awareness of what the process will be like and mitigating the stress of receiving treatment.

The 'My Journey' feature serves as a roadmap of the child's own radiotherapy experience and helps them keep track of their emotions as treatment progresses. This feature acts as a visual schedule of the child's particular treatment plan so that the child can mark their progress day by day and receive a reward after completing each stage of their treatment. Additionally, after completing a radiotherapy session, the child can enter the application and choose from different feelings and emotions to express how the session was for them in a non-invasive and non-confrontational way, allowing them to chart their feelings throughout their radiotherapy journey. In this way, children can process their treatment experience while trusting the interactive and empathetic content within the application to validate their particular feelings. Together, the 'My Hospital' and 'My Journey' features work hand in hand to complement what is currently happening locally to support paediatric patients before, during, and after their diagnosis and treatment.

BEYOND THE PROTOTYPE

Gavin and Mark's prototype may have started as an academic project, but its potential to support paediatric patients and those who work in their care has far-reaching effects. To gauge the application's usability, they asked key members of the healthcare community who work closely with paediatric patients to try out the game. The application garnered excellent responses from these professionals and scored high on the system usability scale, indicating that the prototype is ready to be deployed to its target audience. Now that they have received input from professionals, Gavin and Mark look towards the future and hope to present their prototype to actual paediatric oncology patients preparing for radiotherapy garnering their feedback to incorporate into the application. In this way, Gavin and Mark can truly test how impactful their application is for young patients and adjust their design to match the needs of children undergoing radiotherapy.

The concept Gavin and Mark have put forward is versatile and can be easily replicated in other clinical areas within the medical field. An application like this can be specifically tailored to help young people of different developmental ages understand sensitive and complex topics and provide an empathetic space where patients can learn about potentially distressing treatments. Gavin and Mark have shown how digital health innovations can improve the experiences of patients, even at a young age.

The project has been selected for a presentation at the European Society for Radiotherapy and Oncology (ESTRO) conference in Glasgow in May 2024.