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Laidlaw Undergraduate Research and Leadership Programme

Summer 1 – Additional Output

Public Engagement:
Outreach Programme with Paediatric Patients

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Overview

Alongside my Laidlaw summer project, the research team that I worked with was awarded a UCL Grand Challenge grant of £400 to carry out an outreach programme at the Great Ormond Street Hospital (GOSH) involving interactive, child-friendly activities to visually demonstrate differences between various antiemetic (anti-sickness) dosage forms to patients. Public engagement is an essential component of paediatric pharmaceutics since it allows researchers to understand patients' perspectives on current medications or administration methods, identify if there is a need for new kinds of formulations, and become better informed before tackling physical and psychological issues associated with taking certain medications.

Preparation

During the summer, I organised and led the outreach programme, working with postgraduate students in the research team and clinicians at GOSH to host a 2-day activity stall at the end of June. After having several meetings with the research team and collating ideas, I helped delegate different tasks across the team - these tasks involved creating promotional material for the stall (banners, posters, and videos) to explain the differences between various types of medicinal forms and placing orders for interactive tools and goodies for the children, ensuring that the £400 budget was utilised efficiently.

For the outreach stall, we set up various activities for the children at the hospital. The main activity was a medicine-making counter where we displayed various types of placebos such as capsules and orodispersible films. I taught the children how to create their own capsules using a manual capsule press and carried out dissolution experiments to demonstrate how quickly orodispersible films dissolve in water compared to capsules. To prepare for the activity and make it child-friendly, I created stock mixtures of glitter and sucrose to fill up the gelatine capsules and created approximately 150 multicoloured orodispersible films beforehand using an electrospinning machine. These orodispersible films were thin sheets of placebo fibres that I made using a polymer solution containing 10% Polyvinylpyrrolidone (PVP) in pure ethanol, along with food dyes like rhodamine and insoluble glitter. I learnt how to alter various parameters such as polymer concentration, molecular weight, and voltage to optimise a solution that would formulate fibres rather than particles. For example, through trial and error, I learnt that a voltage of approximately 24 kilovolts allowed the synthesis of these fibres. The resulting sheets of colourful fibres were then cut into square pieces to resemble the approximate medicinal size.

Images of the electrospinning equipment (left) used to create colourful orodispersible films (middle), and using a capsule press to make sucrose/glitter capsules (right)

Additionally, we set up creative activities for the children, asking them to draw their ideal "magic" medicine on foamboards. I also created an engaging comic book with activity pages for children at GOSH to explain how pharmaceutical scientists work in the laboratory to develop different medicines. The booklet does this by explaining the journey of a child through various parts of the laboratory, explaining different types of medicines currently available to patients such as tablets/suspensions/infusions, explaining their benefits and drawbacks, and also introducing novel types of medicines such as orodispersible films which are being developed at the UCL School of Pharmacy. Creating the comic book was a rewarding challenge since it taught me to communicate more effectively by using entertaining and expressive language to explain scientific concepts to children. For instance, I tried to use vivid imagery, analogies, and colourful digital graphics to simplify complicated concepts and make them more meaningful for children. All printing costs for the comic book were funded by the Laidlaw Foundation.

Images of the art foamboards (left) and the activity table where children could create their own sucrose/glitter capsules and carry out dissolution experiments with orodispersible films (right).

Key Insights

The outreach programme was an incredibly rewarding experience which taught me about the patients' struggles living with chronic conditions like cancer and the resulting impact on their families. For instance, I learnt that there were several patients who would vomit upon seeing the colour yellow, since they psychologically associated this with the colour of methotrexate, a chemotherapy drug. For some patients, Chemotherapy-Induced Nausea & Vomiting (CINV) was unfortunately a daily aspect of their life, with some patients having to carry a vomit bowl everywhere and dealing with general exhaustion throughout the course of chemotherapy treatment. Chronic illnesses can have a negative impact on a child's physical ability and free time, which can disrupt their education. For instance, the mother of a young patient diagnosed with soft tissue sarcoma informed me that her child had not attended school for an entire year due to the adverse side effects of ongoing chemotherapy. Several parents talked about the distress associated with their children's conditions, such as putting on a brave face in front of their children, uncertainty about their child's treatment outcomes, and anxiety when their child would not accept new or unpleasant medications. Having to pay frequent long visits to the hospital also had a profound impact on families' financial conditions. For instance, one clinician informed me about a patient whose parents both quit their jobs to provide full-time care for their child. Chronic conditions like cancer and their side effects such as CINV can therefore have a profound impact on a patient's physical and psychosocial wellbeing.

The outreach also provided insights into patients' treatment experiences and expectations. One child made a surprising comment that she would rather receive her medicines via an injection instead of taking 9 tablets a week. She stated that despite the pain, she would find a single injection more convenient, suggesting

that time-efficiency is an important consideration for improving drug administration. Another child informed me that she thought tablets tasted horrible. Tablets contain lots of inert fillers like calcium carbonate - their chalky, bitter taste is often unappetising and their large size makes swallowing difficult for both children and elderly patients. When I asked several patients what kinds of medicines they would prefer, they mentioned ones with pleasant flavours like fruit or chocolate. Parents often mentioned that their children preferred taking liquid formulations. Most parents and children were surprised by how quickly the orodispersible placebo films dissolved in water and thought that these would be very convenient and easy for children to consume. One clinician mentioned that it would be important for the films to dissolve immediately since paediatric patients usually did not like medicines sticking to their tongue or the sides of their mouth. A common theme therefore emerged from the children and their families' perspectives: modifying the taste, texture, and dosage form of medicines could have a significant impact on children's wellbeing and compliance with prescribed medications.

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