number. Further search functions are proposed, such as searching and displaying by name or hospital number.
**Conclusion** A proof of principle system for an AR patient data clipboard was developed to connect with the FHIR database and fetch patient information for use by clinicians in a hospital environment. Further work on this system could enable the application to connect with IoT medical devices to pull patient observations in real time.

## 43 CONSULTING VIRTUALLY WITH EASE: FHIR-ENABLED COMMUNICATIONS CHANNELS

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**Introduction** The COVID-19 pandemic has accelerated the uptake and adoption of virtual consultations by healthcare professionals, seeking to provide care at a distance. Standards are needed to promote a common understanding of systems, tailor-made and integrated to clinical workflows. To solve this, Health Level Seven International (HL7) have created Fast Healthcare Interoperability Resources (FHIR), a standard data exchange framework that is structured, standardised and human-readable aiming towards universal interoperability. Here, we present FHIR-enabled communication channels between patients and healthcare professionals. This Proof of Principle prototype was developed as part of a Hackathon between UCL Computer Science and Great Ormond Street DRIVE centre.
**Methods** Building in Python and using a synthetically generated database of patient details, we created an Application Programming Interface (API) that uses patient identifiable details in FHIR to generate unique links to Skype, then connected to the client side using Django; a Python web framework. This was developed with the capability for group calls, anticipating its application for multidisciplinary meetings and group therapy sessions for patients.
**Results** The resulting web application was successfully demonstrated in a testing environment with up to 500 mock patients through the FHIR API. It intends to streamline the process for initiating virtual consultations, enabling healthcare professionals to filter and select patient lists, and commence a group call over a virtual platform like Skype or Teams with a click of a button.
**Conclusion** The lack of interoperability between virtual platforms and the existing electronic health records (EHRs) is one challenge presented by new ways of working. Similar studies have shown that time spent logging into systems can be reduced by 75% introducing a single-system login. Likewise, we believe that FHIR-based web applications can facilitate group therapy sessions and team-based meetings in a remote and safe environment, whilst retaining a centralised health record.

## 44 INTERNET OF HEALTHCARE THINGS (IOHT) HANDHELD DEVICE FOR SECURE PATIENT DATA RETRIEVAL

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**Introduction** Fast Healthcare Interoperability Resources (FHIR), is a common tool to make it easier to read, write, and transfer medical data. Internet of healthcare things, IoHT, is a system of interrelated computing devices which are commonly used to record data about a patient, such as an ingestible sensor, which is then transmitted using FHIR over the internet. Traditionally such data is viewed as a patient care record on a computer. Here a device was developed to allow this data to be viewed in real time with a small handheld device as a faster and more convenient alternative.
**Method** To be faster than a digital clinical system the device uses radio-frequency identification (RFID) where each patient is provided with a small tag containing their patient number, such as a bracelet. This allows the device to only need to be near a patient to identify them. FHIR-Parser is a library to simplify the development of Python applications using FHIR, it was developed in parallel with the device to allow anyone to start building on FHIR data using familiar object-oriented programming techniques. The device was built using standard off the-shelf components and the Arduino computing platform.
**Results** A prototype of the device was built using an Arduino Mega, RFID-RC522, LCD Keypad Shield (2 × 16 character display with 5 inputs), and a 50 mm by 100 mm 3D printed box. It connected over serial to a python application connected to a FHIR endpoint, successfully retrieving patient information from an id encoded RFID tag.
**Conclusion** Devices, such as the one demonstrated, can be miniaturised and used to display timely key care record information paperless, without the delays of a clinical information system, from an array of IoHT devices. Showing information at opportune times ensures information remains private and relevant allowing patients to receive better and more personalised care.

## 45 PREDICTING LONG LENGTH OF STAY IN A PAEDIATRIC INTENSIVE CARE UNIT USING MACHINE LEARNING

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**Introduction** Length of stay (LOS) prediction modelling in intensive care units is a valuable capacity planning tool as hospitals attempt to clear the backlog of surgical patients resulting from the COVID-19 pandemic. Recent work in adults has demonstrated the benefits of using machine learning over statistical methods for LOS prediction, however machine learning approaches have not been applied to paediatric populations.
**Objectives** The study set out to develop machine learning models to predict long LOS in the paediatric intensive care unit at Great Ormond Street Hospital using electronic patient records.
**Methods** Paediatric intensive care patients between 1st May 2019 and 30th April 2020 were extracted from electronic patient records. Random forest, XGBoost, and multilayer perceptron models were built to predict LOS greater than three or seven days. The dataset contained demographics, ventilation data, and summary statistics of physiological time-series data, taken from the first twelve hours of admission. The

performance of the machine learning classifiers was compared to a baseline logistic regression model.

**Results** There were 564 patients in the study population, of whom 307 had a LOS greater than three days and 105 had a LOS greater than seven days. Using the seven-day threshold, the optimal model was the random forest, which achieved an AUC of 0.785 and correctly classified 42.9% of long LOS patients. Using the three-day threshold, the optimal model was the multilayer perceptron, which achieved an AUC of 0.737 and correctly classified 85.7% of long LOS patients. The performance of the machine learning models was variable, and they did not unanimously outperform the baseline models.

**Conclusions** The machine learning models performed poorly in predicting long LOS. Further work is required to assess the clinical utility and value of deep learning methods in an operational setting.

## 46 CAPTURING THE INSIGHTS OF ADOLESCENTS WITH LIVED EXPERIENCE OF HEALTH AND SOCIAL CARE TO INFORM THE DESIGN & DELIVERY OF A TRAINING FOR HSCP THAT SUPPORTS EFFECTIVE CONVERSATIONS WITH CHILDREN & YOUNG PEOPLE & THEIR FAMILIES ABOUT TRANSITION

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Transferring from children's to adult health and social care services can provide both risk and opportunity (Northumbria, 2017). Effective programmes that offer a period of preparation and integration (transition) should be centred on children and young people (CYP) and placed in the context of CYP's lives and should include 'the training of healthcare professionals to utilise effective interpersonal and communication skills' that meet the needs of each CYP (Kime et al 2013, NICE 2016). In 2018 the CQC identified shared decision-making within the top 4 areas requiring improvement in CYP care.

We captured insights from adolescents and their parents with lived experience of transition services both within and external to GOSH. Twenty-nine adolescents participated in an all-day focus group delivered remotely. The group considered 3 key questions. All contributions were transcribed. A separate parent group, focused on the same questions. Themes of Time, Information, Personalisation, Communication and Integration were common to both YP and parents. In addition, YP referenced the impact of mental health on decision making and the impact of health on their education and were aware of diversity and language barriers and the importance of including siblings in communications. Parents had additional concerns around the impact of learning disabilities on their child's transition and of moves to adult learning institutes.

Results provide preliminary information about what 'good should look like' in the design and delivery of our transition services with particular reference to communication. Focus group data, systematic review of the literature and engagement with additional stakeholders including health and social care professionals themselves will be triangulated to develop a co-produced training.

## 47 FHIRWORKS 2020: AN INTEROPERABILITY HACKATHON FOR A HEALTHCARE INFORMATION EXCHANGE

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**Introduction** Interoperability in healthcare is a fundamental principle for scalable deployment of novel tools. Fast Healthcare Interoperability Resources (FHIR) comprise data specifications and an application processing interface (API) for the secure exchange of electronic health records (EHR). GOSH DRIVE together with UCL Computer Science and the National Framework of IXNs (Industry Exchange Network) has supported the integration and mainstreaming of standards that make healthcare systems interoperate. Here we present an interoperability hackathon and resulting catalogue of prototypes built using the latest R4 FHIR for healthcare.

**Method** During February 2020, a two-day hackathon with UCL CS and GOSH DRIVE tasked computer science students with 15 broad challenges to explore FHIR for healthcare. Solutions were built using a synthetic patient record testbed. This testbed offered a FHIR API access allowing connection to any developer environment and technology stack. Mentorship was provided to students by Microsoft, Aridhia, IBM, Intel, EMIS and NTT Data.

**Results** The GOSH FHIRworks 2020 Hackathon saw 129 FHIR open source demonstrators being built for GOSH DRIVE and the NHS. Exploratory prototypes included smart letter generaters (28), graphical data visualisations (37), and also a breadth of smart watches, scanners, chatbots and AR/VR demonstrators. This included automated video conferencing over Skype and MS Teams, filtered FHIR data aggregated on Google Maps to visualise patient demographics and immersive solutions that conceptualised patient FHIR records as holograms.

**Conclusion** As part of the GOSH DRIVE vision to accelerate the deployment of cutting-edge technologies, we have demonstrated effective use of synthetic patient datasets through FHIR APIs to conduct interoperability hackathons. As a next step, these FHIR solutions will be hosted in a demonstrator suite on site to introduce FHIR principles and capabilities to staff at GOSH. We believe that such NHS partnerships with academia facilitate the advancement of safe and secure future healthcare information exchanges.

## 48 CHILDREN'S EXPERIENCES OF PERSONAL PROTECTIVE EQUIPMENT (PPE) DURING THE COVID-19 PANDEMIC

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**Background** The Coronavirus pandemic has affected each one of us from every part of society. From the neonate to centenarians no one is exempt. Our paediatric population has had to adapt rapidly to the huge changes arising from the pandemic, none more so than those coming into hospital and interacting with healthcare professionals. Great Ormond Street Hospital caters for many children with multiple disabilities and/or health problems and rare and congenital conditions. They may present for multiple surgeries and procedures requiring anaesthesia over many years but these interactions