Integrated healthcare in the C3-Cloud project pilots – a technical perspective

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Introduction
Integrated care for patients with long-term conditions is a key challenge in many healthcare systems, where there is little interaction among primary, secondary and social care sectors. Shared decision making and care of patients involving a multi-disciplinary team of health care professionals, patients and informal caregivers has the potential to improve health outcomes and the engagement of patients in their care management. The EU H2020 C3-Cloud project aims to develop an integrated care platform that would enable the management of shared care plans and provide a broader view of the patient status using the information from various health IT systems.

Methods
Three sites will pilot the C3-Cloud system during a 15-month study. Region Jämtland Härjedalen (RJH), Sweden uses Cambio Cosmic, a primary and secondary integrated electronic health record (EHR) system. The Basque Country (BC), Spain uses the Osabide Global unified EHR system. South Warwickshire (SWFT), UK uses EMIS for primary care, Lorenzo for patient administration in secondary and community care, and GAP for scheduling in community care. RJH uses Swedish version of ICD-10, LOINC and ATC. BC uses a mix of ICD-9 and ICD-10, LOINC, and a local coding system for medication. SWFT uses Read Codes 2 and BNF in EMIS, and local codes in Lorenzo and GAP. C3-Cloud extends each of the sites with a coordinated care planning platform that enables patient engagement by using of international interoperability standards.

Results
C3-Cloud integrates with local health systems through the FHIR standard and uses ICD-10, LOINC and ATC as the coding systems for interoperability. A centralised FHIR repository provides an integrated view of patient data. The C3-Cloud extensible extract-transform-load framework enables data exchange with the diverse API exposed by local systems, which implements the technical layer of interoperability. The semantic interoperability component transforms EHR data into FHIR resources and maps local terminology codes to standard terminologies.

Discussion and Conclusion
The diverse data exchange API and data coding systems present interoperability challenges. C3-Cloud uses international standards to ensure a consistent view of patient data from various sources in order to deliver integrated health care.

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