QL4POMR: A Graph-Based Problem Oriented Medical Record

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BACKGROUND/OBJECTIVES: The objective of this five years MITACS research project is to realize Dr. Lawerence Weed (MD) vision on care design using the SOAP upper schema (Subjective as encountered by the patient, Objectives from the physician observations and notes, Assessments from the physical and lab tests performed and the Plan of treatment and follow ups) and all the other care data that is connected to this upper schema should be schema free (i.e. semi-structured) with variety of existing and new attributes. Dr. Weed's dream remains highly popular in medical circles although there is no existing electronic medical record that has implemented it. The challenge of adopting Dr. Weed vision was on the complexity of processing and interrogating semi-structured data using the current electronic healthcare record systems that employ kind of SQL Relational Databases which requires data to have exact clear structure. Dr. Weed tried to solve this challenge by introducing what are known as knowledge couplers to solve this obstacle but with limited success.

METHOD: The method that we are using is to design an architecture that can deal with semi-structured data. For this purpose we are building a complete problem oriented medical record (POMR) using the emerging GraphQL API to deal with semi structured care design and model the lower ends of SOAP as a graph. The early results of our research have demonstrated an amazing success of building an infrastructure called QL4POMR that can be interfaced with the standard HL7 FHIR record server which is widely used in the clinical world over the globe. The new QL4POMR system uses a CRUD (Create, Read, Update, Delete) interface to fetch and save semi-structured care data on the actual FHIR system. The MITACS research group is currently embarking on adding two other interfaces to the QL4POMR to enable higher connectivity. The first is to connect via ScalaJS to Dr. Arnold KIM Aurora Initiative where physicians can describe patient cases and care design based on special semi-structured ways suitable for physician practice. The second interface is to develop a graph database as a backend to link all the patient cases. Our overall architecture have the following components:



RESULTS: We have achieved all the goals of Phase 1 of this MITACS where our QL4POMR ecosystem is capable of representing any medical case and use the front-end CRUD interface to process it. We have managed to connect QL4POMR with the WHO HL7 FHIR medical record based on GraphQL gateway.

CONCLUSION/IMPLICATION: We are anticipating huge impact on care design when all the phases of this MITACS research project to be completed. Connecting all care practice in one big graph along with all the other datasets will enhance care design and decision making.