Designing a Distributed Prosthetics Database for Use in Lower- and Middle Income Countries

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BACKGROUND

Even though electronic healthcare record (EHCR) systems are widely used in western countries, many lower- and middle income countries (LMICs) still use paper records. The problems with these range from legibility of handwriting, to data duplication and conflicts, and secure storage.

Modern systems require permanent connectivity. They store patient data in a secure cloud storage to tackle problems like lack of local storage space, multi-user access independent of geographical location and data protection.

Such systems are not suitable for production use in community-based care in rural places with sparse internet connectivity and lack of high-end hardware.

AIM

Our project aims to provide a system to overcome these challenges by synchronising data using a peer-to-peer (P2P) methodology in a network of specialised hardware (BluHubs). This solves the problems with paper records and mitigates the connectivity challenges. The goal is to support clinical staff by reducing the number of admin tasks they need to do and increase the time to spend on patients. Our system will support GDPR and let patients manage consent for the use of their personal data.

METHOD

Current database management systems (DBMS) are based on different use-cases. They support big data and require high availability to power global webshops or run complex data analysis. Our system is different from in two ways:

1. More important than availability is that the system works autonomously and stays responsive while offline. Eventual consistency is sufficient.
2. We use a P2P approach, for which there is no master copy. Nodes (i.e. BluHubs) are independent of each other, each node can read and write and there is no central register.

We are currently gathering user requirements. We will run benchmarks to find suitable technologies and implement a proof-of-concept prototype, which we then evaluate in Cambodia with our clinical partners.

RESULTS

The expected outcome will be a distributed DBMS, capable of supporting our use case.

CONCLUSION

This cross-domain research addresses specific needs of prosthetics in LMICs. Lack of funding and this being a niche application domain for DBMS have led to a gap in EHCR systems. We hope to bring state of the art computer science together with the requirements of prosthetics services to build a usable system.

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KEYWORDS

Prosthetics; Distributed Databases; Electronic Healthcare Record Systems, Lower- to Middle Income Countries; Community-based Care