CLOUD COMPUTING FOR
ACHIEVING INTEROPERABILITY
IN HOME-BASED HEALTHCARE

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Abstract

The care of chronic disease has become the main challenge for healthcare institutions around the world. As the incidence and prevalence of chronic diseases continue to increase, it is a big challenge for traditional hospital-based healthcare to meet requirements of patients. To meet the growing needs of patients, moving the front desk of healthcare from hospital to home is essential. Home-based healthcare for chronic disease involves many different organizations and healthcare providers. Therefore, there are interoperability problems for cooperation among the various organizations and healthcare providers to provide efficient and seamless home-based healthcare.

This thesis aims to point out an appropriate technical solution to interoperability problems in home-based healthcare. There are different levels of interoperability, such as pragmatic, semantic and syntactic. We explored alternative solutions specifically for syntactic interoperability. We started to identify the interoperability problems among different healthcare centers by interviews and online surveys. Based on this empirical study, we mainly used two current techniques, namely peer-to-peer (P2P) networks and cloud computing, to design prototypes for sharing healthcare data. Comparing these two techniques, we found the cloud-based solution figured out most of the problems encountered in healthcare interoperability.

To identify state of the art, and pinpoint the challenges and possible future directions for applying a cloud-based solution, a systematic literature review was carried out on cloud-based healthcare solutions. Based on the literature reviewed, we suggest a hybrid cloud model, with access controls and techniques for securing data, could be an acceptable solution for home-based healthcare in the future. This cloud model would work as a community for both healthcare providers and recipients, as well as other stakeholders, such as family members and other patients with similar symptoms. Then we conducted a questionnaire study with healthcare recipients and interviewed healthcare providers to gather the requirements for the design of the community. Based on the concept of ‘community’ from the activity theory model, we designed a prototype to demonstrate our proposed solution.

Finally, we proposed the conceptual hybrid cloud model. In our hybrid cloud model, hospitals and primary healthcare centers could continue using their own databases as private clouds. For home-based healthcare data, we argued, the best approach is to store and process the data in public clouds. Healthcare recipients, as the owners of their health data in public clouds, should then decide who can access their data and the conditions for sharing. To evaluate this model, we conducted a two-step case study of diabetes healthcare in Blekinge, Sweden. We found that our improved hybrid cloud model will be feasible in the future for home-based healthcare, and it will benefit both healthcare providers and recipients.

To apply this model in practice, we suggest that a professional IT healthcare education team should be created to support both healthcare providers and recipients.