Patient and Care Network can Improve Interoperability of Telemedicine

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Abstract. The Shared Medicine Card (SMC) is a national service in Denmark that allows citizens/patients and caregivers to access citizens’ medicine information. SMC web service implements a national standard “The Good Web Service” (TGWS), intended for Danish healthcare. SMC is exposed as SOAP based web service, which allows client applications to securely exchange confidential medicine information with SMC. The project Net4Care supports an idea of a plug-and-play market for telemedicine by integrating existing stand-alone telemedical systems to national healthcare services. Telemedicine should be easy to install on citizens’, patients’ and caregivers’ devices to support collaboration and better health quality and support business opportunities of telemedicine. However, it turns out that integration of telemedical systems that support patients/citizens needs, to national web services is not possible, because firstly, TGWS has not specified citizens interactions with their private health information. Secondly, if citizens will be able to access their own health information through telemedicine then the TGWS specification should consider a possibility of sharing confidential health information not only between care givers but also among a care network: spouse, next of kin, or a volunteer. An aim of this project is to design security policy for Danish telemedicine.

The vision of Net4Care and PhD thesis

Net4Care (NC, 2010) aims at lowering the implementation burden of telemedicine by stepwise integrating telemedical applications to existing health and welfare systems and extracting common integration components into open source libraries for reusability purposes.

My interests lie in identifying software engineering challenges, which can be faced by developers of telemedicine during integration to existing health and
welfare systems. My aim is then to ease the burden of developers, by creating new models, components, and libraries for reusability, which I call *materials* (as inspired from materials used by carpenters). If time permits I would like to create *tools* that would fasten the coding process of telemedical applications, leaving more budget for designing user-friendly interfaces that support collaborative care.

As a first step towards lowering the implementation burden of telemedicine we have conducted an experiment of integrating a telemedical application, called Remote Rehabilitation Support (RRS, 2009) to a national service Shared Medicine Card (SMC, v1.2.4). The experiment of integrating RRS to SMC is described in the next section.

### Experiment of integrating RRS to SMC

Remote Rehabilitation Support is an application for a hip operated patient and his care network (Grönvall, 2010), which informs the patient before and after the operation on his medicine, X ray pictures of the hip, allows video conferencing and contains other educational material. It is an end-to-end system, where a patient via a client application can exchange information with a client application at the hospital, while shared information is placed on the server, located at university.

RRS server contains among other things the medicine information of the patient and when needed a nurse at the hospital uses RRS to change the medicine schema of the patient. The nurse would also change medicine schema in the patients Electronic Health Record (EHR). Instead of using a server to share medicine card, we wanted to integrate the RRS medicine schema directly in SMC, because it saves nurses time and SMC guarantee high availability.

The integration should be easy using XML based SOAP technology. The SMC web service requires a security header, which contains a signed identification card of the user. It turns out that the level of security SMC web service understands, which is 4, is described in a standard for web services of Danish health care systems, known as “Den Gode Web Service”, or The Good Web Service (TGWS, v1.0). Level 4 security (see section below), is a decision which developers behind SMC have made built on top of TGWS. This standard might be a source of telemedicine interoperability problems and the analysis of it, together with conflicting political IT- strategies for Danish health care follow below.

### Citizen Dilemma of Web Service Standard

Historically the national IT strategy for Danish Health Care evolved from a strategy that supports clinicians and care givers with electronic patient records (EPR), to a strategy that supports citizens and patients, with digitalized treatment and health services. (Rasmussen et al, 2008) Latest national IT strategies emphasized the need of enabling citizens’ participation in their own personal
care\(^1\). However, TGWS standard, by MedCom (medcom.dk), does not even mention citizens’ interactions, with web services of Danish health care. The standard, excludes the citizens with its security policy\(^2\) or precisely, its five security levels described below:

1. No personal identification
2. Username and password authentication
3. ID-card signed with system sig. (SS)
4. ID-card signed with employee signature
5. Envelope is signed with employee signature (ES)

Security policy has a non-repudiation requirement, which means that at any given time it should be possible to prove that a user or a system has accessed the data.

Recall, SMC web service asks for a level 4 security from a service consumer, which stands for an employee signature. Meaning only employees can access SMC web service, while citizens cannot use their OCES signature or NemID card.

In the media and brochures about SMC it is stated that citizens can also access the medicine card and indeed they can do it via a specially developed web client at fmk-online.dk or sundhed.dk (a national web portal for healthcare). Developers behind SMC explain, that the way sundhed.dk allows citizens to view their medicine information is by redirecting to fmk-online.dk in a web-frame. This means that when accessing medicine information being a citizen, the data cannot be further processed and hence there is no way of integrating telemedicine to the national service.

**Lowering Implementation Burden of Telemedicine**

Current situation of the national web service is not satisfactory, as it does not cover citizens’ needs for accessing their own private data. A web client solution of SMC that allows citizens view data cannot satisfy needs of telemedical

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1 Citation from National Strategy for Digitalization of the Danish Healthcare Service 2008-2012: “The individual citizen and patient should have better opportunities to take care of his or her own health. The strategy comprises the entire healthcare service and all efforts to promote public health, as well as prevention and treatment – including tasks performed by the individual citizen/patient.”

2 Security policy consist of authentication, authorization, confidentiality, integrity and non-repudiation properties (later proof that users accessed data). Confidentiality and integrity guaranteed by VPN/SSL
applications that should support and improve healthcare service, because it should be possible to pass the data to e.g., patients calendar application, which would remind him to drink the medicine in time. The idea of a national web service is good, but standards should explicitly state that citizens must be able to authenticate as well.

We have conducted a quality attribute workshop with the developers (ethnographer, clinician and developer) of RRS and the main input that we got was a requirement of RRS that allows supporting group of the hip operated patient to work with the system on behalf of the patient. This means that it is not enough to simply allow a patient/citizen to login to the system, because in RRS and in other care systems, it is usually the spouse, next of kin or other person from a care network that should perform care and thus interact with telemedical applications. Thus access of health information on behalf of a person from care network should also be supported by a security policy for telemedicine.

I believe that in order to ease implementation burden of telemedicine there should be designed a security policy or standard for telemedical applications that support citizens’ needs.

References

NC 2010: Net4Care project description: ttp://caretechinnovation.dk/projekter/net4care/index.htm
SMC v1.2.4: https://projekter.sdsd.dk/projekter/projektportal/FMK/teamsite/default.aspx
TGWS v1.0: http://digitaliser.dk/resource/248311/artefact/DenGodeWebservice_1.0.pdf
NORDICHI 2010 17. October 2010, Reykjavik, Iceland

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