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An Enhancement in Patient Oriented Health Care System

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ABSTRACT: The Evolution of Health care have moved away from a "disease-centered model" and toward a "Patient-Centered approach." In the disease-centered model, based on clinical experience and data from various medical tests, physician makes almost all treatment decisions. In a Patient-Centered approach, in addition to advice and counsel from health professionals, patients become participants with their own care and receive services that focus on their individual needs and preferences. In this patient- centered approach, the patients and the providers chooses the treatment plan when non-life-threatening outcomes may result from different available condition for different health outcomes. Medical Professionals who monitor the health status of the patients after surgery and discharge from the hospital by conducting periodic telephone interviews include the symptom index. Other information resources available to various patients and different providers can help in choosing health plans and ensuring quality care and prevention services.

KEYWORDS: Patient-Centered approach, Personal Health Information, m-Healthcare, Pervasive Health Monitoring

I. INTRODUCTION

Replacement of Patient-centered care over current physician centered system that revolves on the patient. In consultation with patients rather than by physician dependent tools or standards, defines an Effective care.

On improving different aspects of the patient-physician interaction, patient-centered practitioners focus by employing measurable skills and behaviors. This type of care can be employed by physicians in any specialty, and it is effective across disease types. By improving the quality of the doctor-patient relationship, Physicians practicing patient-centered care improve their patient clinical outcomes and satisfaction rates, while at the same time decreasing the utilization of diagnostic testing, prescriptions, hospitalizations, and referrals.

In specific aspects of daily life the researchers found that patients level of satisfaction with their vision before surgery was more closely related to problems, especially feelings of depression and problems in social interaction than to visual activity as measured by the standard eye chart.

In patient – centered model, sensor nodes will be attached to the human body which keeps monitoring each patient's Personal Health Information (PHI) that delivers the gathered information through single-hop or multi-hop wireless communication to the base station for further processing and distributing.

Mobile Healthcare (m-Healthcare) system has been envisioned as an important application of pervasive computing to improve health care quality and save lives, where miniaturized wearable and implantable body sensor nodes and Smartphone are utilized to provide remote healthcare monitoring to people who chronic medical conditions such as



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diabetes and Heart disease. Specifically, in an m-Healthcare system, medical users are no longer needed to be monitored within home or hospital environments[1]. Instead after being equipped with the Smartphone and sensors network formed by body sensor nodes, medical user receives the high-quality healthcare from medical professionals anytime and anywhere. The study of opportunistic computing has gained the great interest from the research community recently. Opportunistic Computing is characterized by exploiting all available computing resources in an opportunistic environment to provide a platform for the distributed execution of computing-intensive task[2]. The flourish of m-Healthcare hinges upon how a medical user gains benefit by providing high quality pervasive health monitoring system, especially during medical emergency.

Pervasive health monitoring devices have become practically feasible, with recent advances in sensor networks (SN) and embedded computing technologies. In order to have an increased sensitivity and specificity, a continuous monitoring and analysis of physiological parameters has been obtained with the embedded sensor networks[3]. To facilitate research and development in SN and multi-sensor data fusion, a SN hardware development platform is presented. With its low power, flexible and compact design, the SN nodes provide a versatile environment for wireless sensing research and development.

Universal Mobile Telecommunications System [UMTS] and the availability of high (mobile) bandwidth (General Packet Radio Service [GPRS]) are combined with the ever-advancing sensor devices and computers, will give rise to new services and applications that will affect and change the daily life situations[4]. A major effect in Healthcare are employed with these advantages of new technology. In the future, patients can receive medical advice from a distance and be able to send full, detailed and accurate vital signs measurements irrespective of where they are. The concept of 'ubiquitous medical care' will be equivalent with the standard one obtained from the medical center.

The patient never felt any personal connection with doctor, from their point of view, the visit was an expensive waste of time, and, therefore, they did not return for further treatment. This lack of relationship significantly influenced their health decisions in the same way it impacts all patients[5]. The relationship determines both treatment outcomes and a patient's satisfaction with his/her care, between a patient and his/her doctor greatly. When measuring the effects of care, an attempt to ignore this relationship falls artificial and results in spurious results. For a good communication and empathy, patients want a personal relationship with their doctor.

II. RELATED WORK

This section briefly explains about the review of the related work of various m-Healthcare system. In [1] Rongxing Lu et al., introduce a framework called SPOC Secure And Privacy-Preserving Opportunistic Computing Framework, for m-Healthcare emergency[6]. With SPOC, smart phone resources including computing power and energy can be opportunistically gathered to process the computing-intensive personal health information (PHI) during m-Healthcare emergency with minimal privacy disclosure. In specific, to leverage the PHI privacy disclosure and the high reliability of PHI process and transmission in m-Healthcare emergency, we introduce an efficient user-centric privacy access control in SPOC framework, which is based on an attribute-based access control and a new privacy-preserving scalar product computation (PPSPC) technique[7].

In [2] Rongxing LU et al., discuss about a scheme called SSH (same-symptom based handshake) scheme, each patient is granted with a pseudo-ID and its private key corresponding to his symptom. When two patients meet, only if they have the same symptom, they can use their private keys to make mutual authentication.

In [16] B Victor et al., Cellular type wireless systems such as 3rd generation partnership project (3GPP) long-term evolution (LTE) or LTE-advanced, and the Internet (i.e., cloud computing) serve as the M2M communication infrastructure for healthcare. The medical center can collect related information from the networked information from the networked cloud and instruct machines in the reverse direction, as a bi-directional communication network.

In [8], Passarella et al. evaluate the performance of service execution in opportunistic computing. Specifically, they first abstract resources in pervasive computing as services, that are opportunistically contributed by providers and

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invoked by seekers. Then, they present a complete analytical model to depict the service invocation process between seekers and providers, and derive the optimal number of replicas to be spawned on encountered nodes, in order to minimize the execution time and optimize the computational and bandwidth resources used.

In[9], Ming Li et al., describes in a hospital, patients may include their illness symptoms and medications in their personal profiles in order to find similar patients, for physical or mental support. In this scenario, an initiating user (initiator) may want to find out the patient having the maximum number of identical symptoms.

If users' private profiles are directly exchanged with each other, it will facilitate user profiling where those information can be easily collected by a nearby user, either in an active or passive way; and those user information may be exploited in unauthorized ways[10]. To cope with user profiling in MSNs, it is essential to disclose minimal and necessary personal information to as few users as possible.

In [17] Rui Zhang et al., describes proximity-based mobile social network, in which it refers to the social interaction among physically proximate mobile users directly through the Bluetooth/Wifi interfaces on their smartphones or other mobile devices[11]. As a valuable complement to web-based online social networking, this enables a tangible face-to-face social interactions in public places such as airports, trains and stadiums. In addition, a PMSN may be the only feasible social networking tool when mobile users cannot access the Internet for online social networking, e.g., due to the lack of Internet access minutes or very weak signals from cellular base stations or WiFi access points.

In [18] Ming Li, Personal health record (PHR) is an emerging patient-centric model of health information exchange, which is often outsourced to be stored at a third party, such as cloud providers. However, there have been wide privacy concerns as personal health information could be exposed to those third party servers and to unauthorized parties[12]. To assure the patients' control over access to their own PHRs, it is a promising method to encrypt the PHRs before outsourcing. We propose a novel patient-centric framework and a suite of mechanisms for data access control to PHRs stored in semi-trusted servers. To achieve fine-grained and scalable data access control for PHRs, we leverage attribute based encryption (ABE) techniques to encrypt each patient's PHR file. Different from previous works in secure data outsourcing, we focus on the multiple data owner scenario, and divide the users in the PHR system into multiple security domains that greatly reduces the key management complexity for owners and users[13]. A high degree of patient privacy is guaranteed simultaneously by exploiting multi-authority ABE.

III. PROPOSED WORK

In our proposed SPOC framework aims at the security and privacy issues, and develops a user-centric privacy access control of opportunistic computing in m-Healthcare emergency.

Each medical user in emergency can achieve the user-centric privacy access control to allow only those qualified helpers to participate in the opportunistic computing to balance the high-reliability of PHI process and minimizing PHI privacy disclosure in m-Healthcare emergency. Specifically, the main contributions of this paper are threefold[14].

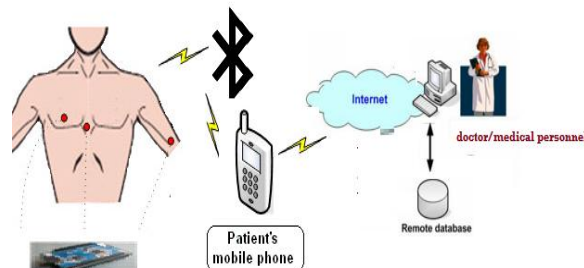


Figure 1: Architectural Diagram

- First, we propose SPOC, a secure and privacy-preserving opportunistic computing framework for m-Healthcare emergency. With SPOC, the resources available on other opportunistically contacted medical users' smart phones can be gathered together to deal with the computing intensive PHI process in emergency situation[15]. Since the PHI will

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be disclosed during the process in opportunistic computing, to minimize the PHI privacy disclosure, SPOC introduces a user-centric two-phase privacy access control to only allow those medical users who have similar symptoms to participate in opportunistic computing.

- Second, to achieve user-centric privacy access control in opportunistic computing, we present an efficient attribute based access control and a novel non-homomorphism encryption based privacy-preserving scalar product computation (PPSPC) protocol, where the attributed-based access control can help a medical user in emergency to identify other medical users, and PPSPC protocol can further control only those medical users who have similar symptoms to participate in the opportunistic computing while without directly revealing users' symptoms[16]. Note that, although PPSPC protocols have been well studied in privacy-preserving data mining, yet most of them are relying on time-consuming homomorphic encryption technique.

- Third, to validate the effectiveness of the proposed SPOC framework in m-Healthcare emergency, we also develop a custom simulator built in Java. Extensive simulation results show that the proposed SPOC framework can help medical users to balance the high-reliability of PHI process and minimizing the PHI privacy disclosure in m-Healthcare emergency.

In mobile-Healthcare emergency, Opportunistic Computing enhances the reliability for high intensive Personal Health Information (PHI) process and transmission . since these information , even in emergency, a medical user won't expect to PHI disclosure to all passing-by medical users. Instead , their PHI can be disclosure to their medical users who have similar symptoms with them. In such emergency situation ,a minimal privacy disclosure can be handled by opportunistic computing[18]. This system imposes., two-phase privacy control , that are required for achieving high-reliable PHI process and transmission.

Phase-I access control: Phase-I access control indicate that even when a passing-by person has a smart phone as a non-medical user, that person is not welcomed to participate in Opportunistic computing[19]. Since smart phone need this same medical software to be installed to process the PHI , if a passing-by person is a non-medical user , then they won't be as an ideal helper. Hence this phase becomes a prerequisite.

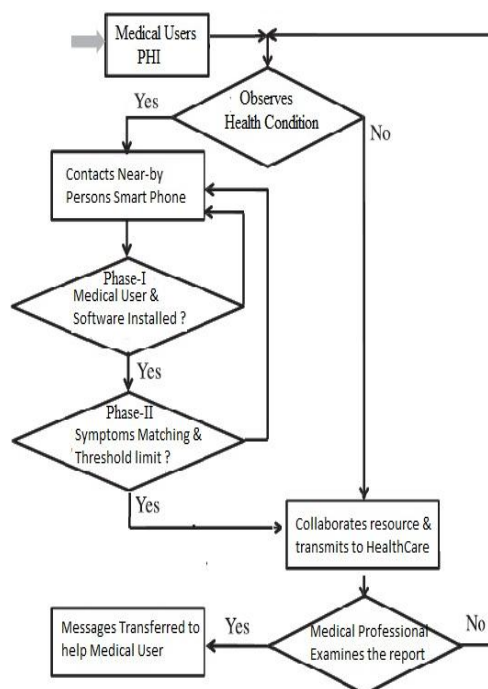


Figure 2: Flow Chart of Patient-Centered System Approach

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Phase-II access control: Phase-II access control allows only the medical user those who have similar symptoms to participate in this Opportunistic Computing. Due to the similar symptoms, the process is skilled only for same type of Personal Health Information (PHI).

A parameter which is of self-controlled by medical user is set as a threshold th . If any emergency takes place at a location with high traffic., then the threshold th will be set high to midsize the privacy disclosure. Rather, if the traffic is low, then the threshold th should be low so that transmission will be guaranteed first[20]. To the best of our knowledge, our novel non-homomorphic encryption based PPSPC protocol is the most efficient one in terms of computational and communication overheads.

IV. IMPLEMENTATION

In this proposed system, the sensor nodes are first deployed in the medical user body in which the PHI values can be monitored continuously[21]. These sensors are embedded with a Bluetooth device which is used to transmit the sensed PHI parameters (such as body temperature and blood pressure value) to an android oriented Smart phone. Then the same parameterized value is further transmitted to the healthcare with a 3G network periodically.

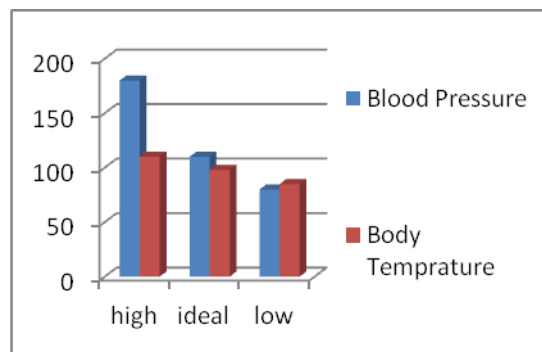


Figure 3: Bar chart for various PHI values

In case of an emergency the parameters will cross certain threshold value by which the medical professional who is examining on the other side will come to know about the emergency situation[22]. Once they detect the emergency situation, the time duration between the transmission of PHI values from the embedded device to the smart phone and from the smart phone to the Health care server will be reduced.

Also a GSM modem will be attached to server through which the emergency message will be transferred to the neighbor phone, who was authorized by the medical user.

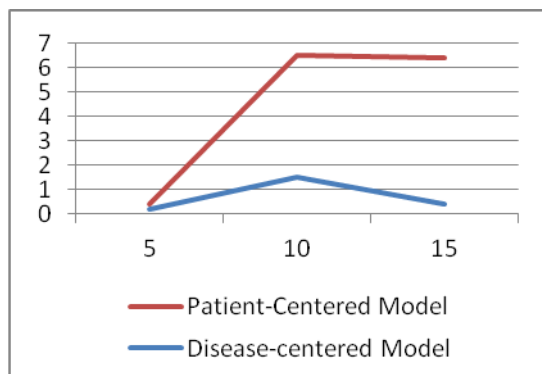


Figure 4: Proposed system variation

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The above graph includes how a Patient-Centered approach gets varied from the Disease -Centered model , in which the x-axis shows the time variation and y-axis shows the improvement of one system over the other[23]. During medical emergency, the m-Healthcare system can benefit the medical users by providing high quality pervasive healthcare monitoring.

All pervasive and available communication opportunities are exploited to provide computing services to meet application needs by leveraging available computing resources that are available in the reachable environment.

The below figures illustrate how the system actually works in Patient-Centered approach.



Figure 5: User Registration

The new user first registers them self as a medical user in particular healthcare center.




Figure 6: PHI values

The embedded kit senses the PHI values from the medical user and transfers that to the HealthCare system.

In the HealthCare system, a medical professional examines the users report for an emergency occurrence.

The resources available on other opportunistically contacted medical users' smart-phones can be gathered together to deal with the computing-intensive PHI process in emergency situation. Since the PHI will be disclosed during the process in opportunistic computing, to minimize the PHI privacy disclosure, SPOC introduces a user-centric two-phase

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privacy access control to only allow those medical users who have similar symptoms to participate in opportunistic computing.



Figure 7: Admin Login page

In case of an emergency, a message is transferred to them for an immediate aid.



Figure 8: Report Generation

Thus the patients health is tracked by healthcare center to provide immediate aid to patient with the hospitals to the location of the medical user.

V. CONCLUSION

Due to the limited capabilities of sensor nodes, providing security and privacy to a sensor network is a challenging task. In this project, couple-based detection scheme is used for early detection of patients emergency with the help of Smart phone.. Concretely, by simply building couples among neighboring Smart phones in a local area, physicians and provides can be detected easily to help the medical user. In addition, we also exploit the security issues of PPSPC with static address using which a non-medical user cannot access the PHI that are furnished.

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