**INTRODUCTION**

The aging of population and prevalence of chronic illnesses have exacerbated many social problems. Remote diagnosis and treatment systems, which make use of information technology to provide accessible, cost-effective, and highquality clinical healthcare services remotely, can be deployed to alleviate some of the problems. Such a system makes it possible for continued treatment in a home environment and increases patient adherence to medical recommendations [1]. The medical Internet of Things (mIoT) plays a critical role in distant medical diagnosis and treatment by deploying wireless wearable (or implantable) sensors on a patient to collect the vital signs and physiological data [2], [3]. The monitored physiological parameters are sent to hospital for medical diagnosis, which supplies rich longitudinal health records than the brief illness description. Using the detailed monitoring data, physicians can make a much better prognosis for the patient and recommend treatment, early intervention and drug adjustment that are effective for disease recovery The key factor for the accuracy of remote medical diagnosis and treatment is the physician’s expertise and professional experience. A medical model is designed in accordance with objective and measurable observation to provide clinically useful information about the course of the illness over time and direct specific treatments for the condition, which plays a significant role in regulating the treatment process and providing premium rate healthcare services.

Finite automata (FA) [4] is one of the mainstream technologies that can be used to represent medical models. Compared with the flow diagram or block diagram based model, a FA-based medical model has the advantage of regularized representation, flexibility in illness state evaluation and good expansibility [5], [6]. FA can be categorized into two types: deterministic finite automata (DFA) and nondeterministic finite automata (NFA). The term “deterministic” in DFA means that it can only transit to one state at a time (i.e. for some given input); “nondeterministic” in NFA means it can transit to multiple states at once. Hence, DFA can be regarded as a special case of NFA; NFA is powerful to represent the nondeterministic state transitions and allows empty string input (-move), which is more practical. NFA is a competent modeling tool and applicable to various fields in practice, such as regular language processing, program lexer, and medical modeling. NFA-based medical models have been used in healthcare monitoring [5], [6], diagnosis and treatment of diseases [7], virus genome detection [8], etc.

Due to the high availability, accessibility and powerful computation capability of cloud, NFA-based medical models can be outsourced to a cloud platform to make diagnosis decisions and recommend the treatment methods on-the-fly according to patient’s physiological data that are monitored by mIoT. Such as an approach could tremendously improve patients’ healthcare, reduce cost, and enhance the accuracy of diagnosis due to its nature of quantitative analysis. Despite the trememdous benefits that can be brought by the remote diagnosis and treatment technology, healthcare providers and patients are hesitant to adopt it without adequate security and privacy protections [9]. Since a high quality NFA-based medical model is often regarded as the intellectual property and core competitiveness of a medical institution, one of the main challenges is to protect the privacy of the model and strictly prohibit it from disclosure during online medical services. On the other hand, it is required in many jurisdictions to protect the confidentiality of patients’ health states and prevent them from unauthorized access. Moreover, treatment methods for patients are highly sensitive and must be kept confidential by the cloud platform or any other third party.