# Electronic Health Records for Smoking Cessation With a Web Based Software

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***Abstract*- Cigarette smoking is the leading preventable cause of mortality. Smokers who quit smoking reduce their risk of developing and dying from tobacco-related diseases. Smoking cessation outpatient clinics play an important role for cessation of smoking. Health information systems such as Electronic Health Records (EHRs), computerized decision support systems, and electronic prescribing are increasingly identified as potentially valuable components to improve the quality and efficiency of patient care. The paper-based methods which are used in Smoking Cessation Outpatient Clinics (SCOCs) are time and resource expensive and unlikely to be performed consistently. EHRs provide a systematic mechanism to improve patient care. In this study, a Web based software is developed for use of primary health care physicians and other health workers to implement smoking cessation for addicts. The system which was developed will be used for recording therapy, following up with the patient and evaluating the quitting process of smokers. Electronic health records computerized decision support systems are potentially valuable components to improve the quality and efficiency of clinical interventions for tobacco use. This software is developed with Microsoft Visual Studio 2015 C# programming language as a Web application.**

***Keywords- smoking cessation, electronic health records, decision support systems,***

## I. INTRODUCTION

It is a known fact that both active and passive smoking are damaging to human health and have associated economic costs. Cigarette smoking is the cause of many preventable diseases, leads to premature deaths, and accounts for a significant proportion of many health inequalities. The World Health Organization currently estimates that each year smoking accounts for about ~6 million deaths worldwide and causes about half a trillion dollars in economic damage annually [2]. This number of smoking-attributable deaths is expected to rise to 7 million by 2020 and to more than 8 million a year by 2030 if the current rate of smoking continues unabated [3].

Health information systems such as Electronic Health Records [1], computerized decision support systems, and electronic prescribing are increasingly identified as potentially valuable components to improve the quality and efficiency of patient care. EHRs are also very likely to disseminate rapidly, at least in developed countries, as healthcare systems modernize away from paper records [4].

In this study, a Web based software is developed for use of primary health care physicians and other health workers to implement smoking cessation for addicts. The idea is to combine the power of the Web based environment with primary health care specialists. With these approaches, dependent patients will not only use a computer program, they will also communicate with their physicians for several problems in a easy to use environment. Currently, there is no computer application used by physicians for managing patients in Smoking Cessation Outpatient Clinics. For that reason, it is impossible to retrieve patient's records online since the information is currently stored in paper environment. On the other hand, to analyze patient records is very difficult and having reports about several patients is almost impossible.

Our software is developed with intensive aids of primary care physicians. During the development phase, first of all, the Smoking Cessation process is observed for several

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patients. After that, each case is discussed with related physicians, then the application program screens are developed for modelling processes. Finally, the beta version of the software is completed for test usage.

## II. BACKGROUND

In 2012, an estimated 31.1% of men and 6.2% of women worldwide were daily smokers [5]. Although daily smoking has been reduced among men and women, population growth has led to a significant increase in the number of smokers around the world [5]. Tobacco use currently kills more than five million people each year and this number is expected to increase substantially [6]. Even if prevalence rates remain unchanged, an estimated 500 million people will die as a direct result of tobacco usage over the next fifty years [7]. The healthcare setting remains an underused venue to provide cessation assistance to tobacco users, particularly in developing countries.

Evidence-based clinical practice guidelines for tobacco cessation support recommend systematic identification and intervention for tobacco use. Changes in health systems operations that institutionalize the identification and clinical treatment of patients using tobacco are a particularly promising way to take advantage of the primary care visit to help patients quit tobacco use [8]. A system level change that might increase the frequency of effective cessation delivery is to take advantage of the electronic medical record for clinician reminders, linking patients to cessation services, monitoring performance, and providing feedback.

Treatment for tobacco use in a healthcare setting first requires an assessment of tobacco use and patient willingness to stop using tobacco [9]. Healthcare clinician advice has a small effect on cessation - leading to approximately three to six per cent of patients stopping using tobacco [10]. However, higher rates of cessation are achieved when a coordinated system within the healthcare setting facilitates evidence-based actions such as cessation counselling and use of cessation medications [8]. In the absence of electronic records, a stamp or similar visual aid in a paper chart can serve as a clinician reminder to discuss tobacco use, to provide treatment, and to facilitate referrals. Chart audits by hand can also provide performance measure information needed for quality improvement. However, these paper-based methods are time and resource expensive and unlikely to be performed consistently. EHRs provide a systematic mechanism to improve the fidelity of following clinical practice guidelines consistently [11].

In many countries, a large investment is being made in technology to computerize patient medical records. One potential of electronic health records is that they could be used to remind doctors and other clinic staff to record tobacco use, to give brief advice to quit, to prescribe medications and to refer to stop smoking counselling. They could also help refer people to these services and be used to measure how well a clinic was doing. EHRs could also help make the delivery of tobacco use treatments standard practice by providing electronic referrals for additional treatment services (e.g., referral to a telephone tobacco quit line). Specifically, documentation of tobacco uses and referral to cessation counselling appear to increase following EHR changes [3].

Edward G. Feil et al. developed a cessation Web site and examined recruitment approaches on a short time evolution. They proposed a therapy from Internet and observed the results were encouraging however, outcomes were assessed only by self-report for that reason. They cannot conclude that quitting smoking was a function of their Web site [12].

Victor J. Strecher et al. proposed smoking-cessation interventions should be generalized to other cessation interventions. They demonstrated the importance of tailoring for smoking cessation program. They also used a novel fractional factorial design for examining the aims of their study. The aims of the study identifying active psychosocial and communications elements of a web-based smoking-cessation intervention and testing the impact of tailoring depth on smoking cessation [13].

The World Health Organization proposed specific obligations concerning smoking dependence and cessation. The obligations are listed below, as follows:

*a)* Designing effective smoking cessation program in locations such as educational institutions, health care centers, workplaces and sporting environments.

*b)* Including diagnosis and treatment of smoking cessation programs in national health and education programs.

*c)* Establishing programs for diagnosing and treating smoking cessation in health care facibilities and rehabilitation centres.

*d)* Collabrating with other parties such as pharmaceutical products (14).

Freedom from Smoking Online software is a Web based software for adult smokers. This software is for users who have regular access to a computer and are comfortable with others through online environment [15].

Stop Smoking Center is a Web based software developed in 2000. The software is still enhancing through methodologies from their clinical advisers, technology experts and other program members [16].

## III. MATERIAL AND METHODS

### B. Software Environment

This software is developed with Microsoft Visual Studio 2015 C# programming language as a Web application. A master page template is used for designing the pages. Microsoft SQL server application is used as a database server. We used a XEON processor server with 32 GB for publishing our software.

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### C. *Methods of Our Software*

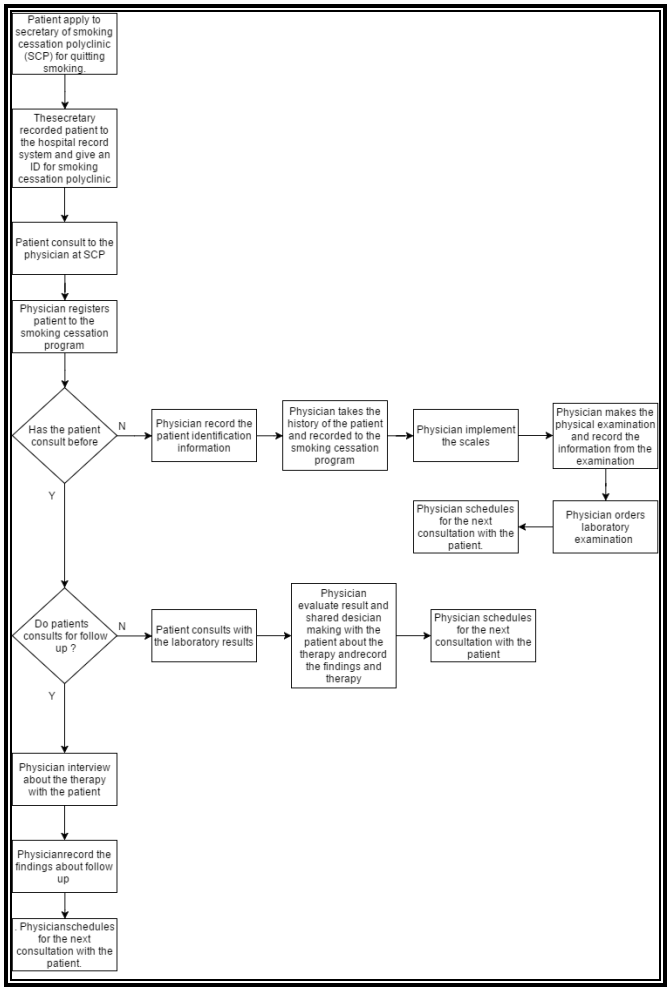


Figure 1. All Steps of our software

Figure 1. shows all steps of Smoking Cessation Process in SCOC. In the first case, the patient visits the outpatient clinic for first time. Patients records are stored the system for future use. In the second case, the patient comes with laboratory and other results. The physician gives related materials and/or therapy. In the last case, after a period of time, the physician checks the patient's current status and physician should request a new laboratory examination if necessary.

- Users of our Software
  There are two types of users: Physicians and Clinic Secretary. To start, the patients first records are entered into the system by the secretary. If the patient comes again, it will not be necessary to enter the same information into the system. The secretary will only find the related records of the patient before treatment. Finally, the physicians will continue the treatment using related Web pages. Figure 2. shows the data entry page of the software.

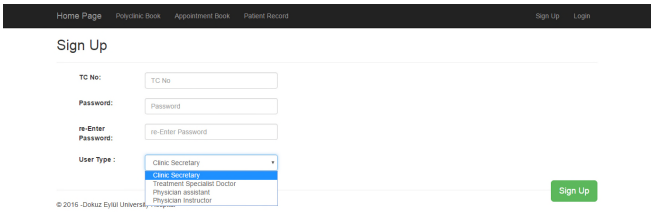


Figure 2. Enterance Web Page

- Functions of our Software
  There are three types of physicians: Treatment Specialist Doctor, Physician Assistant and Physician Instructor. In our software, three different parts exist for each of them. In addition, three types of patient's visits exist: for first time patients our software has a section for having personal information and background data collected, as shown in Figure 3. For patients with laboratory examination results, there is another section. Finally, for follow up patients, there is another page to record current situations.

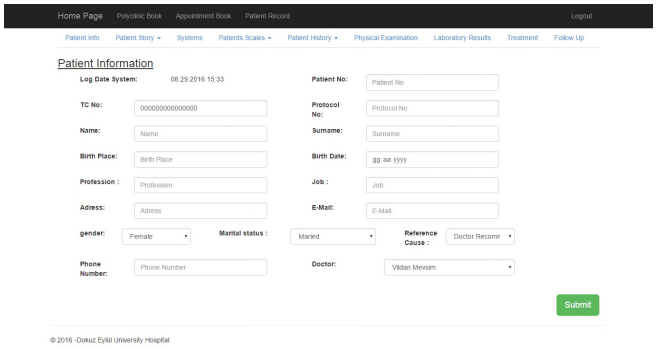


Figure 3. First time patient record page.

- Query and Reports of our Software
  There are two ways for accessing stored information. In the first case, using patient's ID, it is possible to have all the information of the related patient. In the second case, it is possible to have patient's information summary by selecting the date, as shown in Figure 4. In the second case, it is also possible to select one patient for accessing detailed information.

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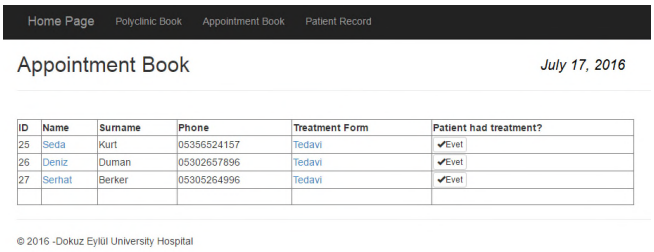


Figure 4. List of patients in a specific day.

## IV. CONCLUSION AND FUTURE WORK

Because smoking is one of the most important health issues in the world, smoking cessation treatments are intensively studied areas in medicine. Electronic health records are considered for every aspect of health, such as patient registration, patient follow up, etc. A smoking health record system that can be used in SCOC will influence the treatments success. Firstly, the application is programmed as a recording system and allows easy usage for the physicians. Secondly, clinical decisions can be used in accordance with clinical guidelines for the treatment of patients is the first step in the creation of support systems. Additionally, collected patient data will consist of data banks and will allow the emergence of new therapies and new approaches to smoking cessation.

As a future work, collected patient records will be analyzed by machine learning techniques for implementing a Decision Support System. With this system, common characteristics of smokers will be discovered and also treatment methods should be customized for related patient clusters.

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