Development of a self-completed Electronic Health Record for assessing University students health

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***Abstract*—Mental and physical health care issues of students are increasingly recognized as both prevalent and complex. However, recording and treating these problems can be a hard task. At the same time the importance of prevention for improving health status is widely recognized both for the general population and the therapists themselves. This work presents an internet based health prevention program developed for medical students, which could also be used by other biomedical students, developed by the Department of Hygiene and Epidemiology, Medical School, University of Athens. Specifically, the self-completed Electronic Health Record aims to assess the health attitudes, concerns and needs of medical students as well as train them in preventive strategies and health promotion. Medical students answer the questions through internet connection using a username and password that ascertain anonymity and confidentiality.**

The program is developed using the security protocol SSL. In the program, considerable emphasis is given on the assessment of various mental health problems, drug and alcohol abuse, lifestyle and family history of mental health disorders. The program objectives include apart from the medical students mental health assessment, their sensitization about mental health issues and how to implement them both to themselves and to their patients. Moreover, it aims to the development of a University Health Network to provide students with free medical care and services. Constructive implications for academic medicine are discussed regarding initiatives in the area of policy.

I. INTRODUCTION

THE issue of the health care of medical students was up-to-date neglected in the content of the education and its importance and complexity was recognized just recently [1]. Specifically for the Greek Universities medical students, with the only exception of few and fragmentary studies for specific health issues (smoking, sexual life, obesity) [2]-[6], no systematic attempt of observation and recording the needs, perceptions and attitudes concerning their health issues has been performed.

International literature suggests that a substantial portion of medical students suffers from mental (anxiety, depression) [7]-[12] or physical disorders (infections, headaches) [11], as well as problems of drug and alcohol abuse [12]-[21]. Notable are the results of a recent research revealing that 47% of the participating students expressed their concerns related to their mental health and the use of substances, whereas the majority (90%) has seeked medical advice during their studies [13].

Contemporary studies register difficulties in the treatment of health problems of medical students and this is mainly attributed to the limited access to the appropriate medical services, the underestimation of their symptoms and the lack of confidence to the medical care providers, basically due to the fear of a disease that may follow them to their professional-academic career (HIV, alcohol and drug abuse, psychiatric disorders) [13], [22]-[26].

The problem of health care of medical students is complicated due to their dual role both as a doctor and as a patient who could potentially need medical care [22]. This fact could undermine their effort to seek for medical help [13], [22]-[26].

Prevention is a fundamental factor of the modern medicine efforts to improve and assure life quality and it is greatly dependent upon the adoption of the corresponding rules by general population as much as on the sensitization of the young doctors on the public health promotion. However, deficient knowledge of medical students on epidemiological data have been reported by recent studies, such as the prevalence of the HIV virus on the general population, and the risk of infection they undergo as physicians during the medical practice [27]. Moreover, difficulties to fill in the medical record by the practitioners are observed when sensitive personal data that are fundamental for the integrated health care (such as the sexual behavior) are involved [28].

Recent research trying to investigate the frequency of potentially harmful behavior for the health of medical students (sexual life without protection, smoking), reveals deviation between their theoretical knowledge and the actual application in their everyday life [28]. It is notable that the frequency of smoking is the same both among medical students and the general population [29]. Furthermore, physicians' personal perceptions on harmful habits have been found to influence their medical practice and especially the application of basic preventive interventions [30]. Thus, the investigation and recording of medical students' attitudes and behaviors and the adoption of basic principles of

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preventive medicine throughout their studies, are highly important both for their own and the general population's health improvement and assurance [14], [31]-[36].

Additionally, the constantly increasing incorporation of new technologies in the medical field induces the need for familiarization of doctors with the use of modern methodologies of medical information recording and administration and communication among the health professionals, such as medical records, local networks and the internet. The program "Student Health Card" being implemented by the Medical School of the University of Athens focuses on the sensitization and education of medical students in prevention and health care problems as well as the provision of appropriate medical care through the development of a broader network of medicaid. The program "Student Health Card" has been approved by the Committee of Bioethics and Deontology of the University of Athens.

II. OBJECTIVES

The objectives of the program "Student Health Card" are multiple:

- Familiarization of the students with the use of modern technologies (electronic recording and surveillance of medical data through the internet).
- Education on filling out of the medical history emphasizing on preventive interventions, including corresponding sensitive data that are important in a complete preventive intervention [28].
- Investigating and recording medical students' personal health needs and direct identification of symptoms, with the potentiality to recommend further diagnostic evaluation and possible therapeutic interventions.
- Recording of medical students' habits and way of living, aiming to reveal harmful habits and behaviours (e.g. smoking, alcohol, not using seat belt) and to the adoption and promotion of safe behaviour and healthy life models.
- Investigating and recording medical students' believes and behaviors on medical problems they disregard or underestimate (e.g. reference for psychiatric valuation), aiming to enhance their therapeutic practicing [36].
- Sensitization of the medical students into current expressed population medical needs regarding important aspects like reproductive health (contraception, safe sexual relationships, sexually transmitted diseases, pregnancy), substances abuse (smoking, alcohol, psychotropic drugs), diet issues (healthy nutrition models, obesity, diabetes), mental health (anxiety depression, sleep disorders), sport activities, but also other topics of general interest (acne, allergies, migraine, blood donation)
- Endmost objective of the program is the improvement of the Medical School students' syllabus and the education quality enhancement, in order to develop therapists with holistic knowledge and view.

III. PRESENTATION OF THE PROGRAM

The electonic application which is accessible through the internet (http://karta.epi.net.gr) was developed with the programming language PHP the database PostgreSQL, and it is hosted on a Linux operated system server held at a University building. The use of open source, free license software, minimized the development cost and is a common technique used by Universities, governmental institutions and by companies.

Along with the main application, designated for the students, an administrator application has been developed, which enables the modification of many parameters (e.g. editing, addition and deletion of question or the change in priority), without the aid of a technician.

Students' accessibility is feasible using a username and a password chosen by the user (student) when registering to the application and known only by him/her. During the registration phase of the user, there is a choice to allow the use of their data for statistical process and epidemiological research provided their personal identification are eliminated so that they retain their anonymity.

Access to the application is feasible on a 24 hour basis using any personal computer that has Internet connection through a simple web browser.

To retain confidentiality of the transferred information during the use of the application, the security protocol SSL is used, which is widely used to assure critical internet based applications such as e-banking and e-shopping.

The health card data are stored on the server hosting the application and their accessibility is protected by rigorous personal data assurance procedures. The stored data can be extracted for further processing by specialised scientific personnel to files compatible with statistical software (e.g. SAS, SPSS).

IV. CONTENTS OF THE PROGRAM

Every new user-student of the electronic application is informed about the national legislation concerning the protection of personal data. The current law in Greece states the prerequisites regarding the personal data processing aiming to protect the fundamental rights and freedom of physical persons.

Apart from the user's choice to consent to the statistical processing of his/her health data, he/her also has a choice to be informed by specialized members of the program team through e-mail for possible predisposition towards certain diseases and the need for specialized medical treatment.

Following, the user chooses a highly confidential username and password, assuring his/her access to the application. This enables the user to complete the medical

record, which includes open– and closed- type categorized questions.

Initially, student's personal data involving sex, age, birthplace, residence place and marital status are being stated. These are followed by the family's history data, such as age, employment, education level, residence place of parents and brothers and sisters and health problems, emphasizing on the presence of heredity diseases.

Following, the data of the pediatric history of the student are entered emphasizing in the vaccination coverage, according to the information recorded on the personal health booklet. Possible occurrence of various diseases is investigated and recorded with great detail (cardiological, pneumological, gastroenterological, orthopedic, metabolically, urinogenital, neurological, ophalmological, contagious and others), together with the need for hospitalization and/or surgical intervention and the subscription of drug treatment in the recent or deep space past. For women-users, the gynecological history (disorder of menstrual cycle, pregnancy history, abortion and miscarriage) is also examined, emphasizing on preventive strategies (Pap test, breast self examination). Oral hygiene and dental problems are also recorded.

Of high preventive significance is the unit investigating the behaviors and the way of living, such as the physical training, smoking, alcohol and coffee consumption, sexual life, risky behaviors, road-traffic attitudes, living and work conditions and the financial status.

On the next unit the somatometric characteristics and possible symptoms as well as results from possible clinical examinations are recorded.

Finally psychiatric history data are recorded when the student completes the screening test SCL-90-R. This test consists of 90 ascertainments that represent 9 symptom dimensions: somatization, depression, anxiety, obsessive-compulsive behaviours, interpersonal sensitiveness, aggressiveness, phobic anxiety, paranoid ideation, psychotism. Apart form these separate aspects, the total symptomatology is evaluated and the subjective discomfort of each patient by the symptoms is estimated.

The application is improving and constantly enriched with new features. The automatic calculation of the Body Mass Index (BMI) and the calculation of the psychometric screening test SCL-90-R have already been implemented, together with a series of parameter tests for personal history, vaccination coverage, gynecological history and the way of living. The entered data are being evaluated, risk factors are being detected and the user is informed for matters that need urgent attention and surveillance. In the immediate future the performed test is to be expanded to complex conditions (e.g. consumption of alcohol and great amounts of coffee combined with smoking and increased weight) and will alert the student referring him/her to the appropriate bibliography.

V. DISCUSSION

The therapist being constantly in contact with diseases and death endangers directly or indirectly his/her physical as long as mental health. It is essential for "new" physicians to promptly reconcile with their new role as therapists, and especially to adopt basic preventive medicine principles. Recent research findings revealing the necessity of medical students training on preventive strategies, do also underline their impotence to perform basic preventive strategies and consultation to the patient [5],[28],[33],[38]. Many physicians have not yet accepted their preventive aspect of their clinical practice [39], although many patients expect to receive advices for healthier life models from health professionals [40].

The use of the program "Student Health Card" through the Internet comprises an important step to a complete and systematic approach of the physical and psychological health care of the medical student and a practical and direct way of sensitization and educating through prevention. This sensitization could have great impact, firstly because it is accomplished during schooling and secondly because it uses as a motivation the preservation of the medical student's health. Recent scientific studies report the positive attitude of medical students towards the enrichment of their studies curriculum with preventive issues [34],[41] taking into account the beliefs both of the population as well as the therapists [41].

The program's innovation lies in the utilization of modern technology. It provides students with the potential to create their own personal health record, which they can recall and use at any time, assuring confidentiality of their personal data. Especially for the medical students it consists an interesting way to be introduced and educated in new organization ways and managing medical information.

The use of the internet as the mean of recording and investigating medical history facts, perceptions and behaviors, is disputable due to the lack of trust on behalf of the participants in ascertaining their anonymity, although modern technology can ensure confidentiality greater than other conventional methods of keeping medical records. About 42% of the Medical School of Athens students are supporting the use of new technologies, according to the evaluation of the program. The long-term aim is the improvement of student's and the general's population health and developing therapists with holistic knowledge and view who have recognized and solved personal health issues.

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