

Savecare - EHR HIV/AIDS System

Development of a Prototype for Data Analysis and Collection

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Abstract: Human immunodeficiency virus treatment demands constant monitorization and evaluation and tracing tools are important weapons against this epidemic. SaveCare stands for System for HIV/AIDS Virtual Evaluation. It is our goal to develop web-based tools which can motivate the HIV/AIDS patients' data collection adjusted to both Portugal and Angola. As a result is presented a prototype with a module for HIV/AIDS patients personal and clinical data collection; a module for the performance and quality of healthcare evaluation, that uses a set of indicators and has as output printable reports; and an additional module for configuration purposes. Clinicians find the many features of the prototype very useful, but additional modules are in need.

1 INTRODUCTION

Amongst the infectious diseases, human immunodeficiency virus infection and the acquired immunodeficiency syndrome (HIV/AIDS) epidemic are severe worldwide health problem (Sorensen et al., 2008), nowadays accounted as the main death cause for the adult population and were accountable for more than 20 million deaths in the past two decades (Jazayeri et al., 2003).

HIV/AIDS treatment demands constant motorization and evaluation (Sorensen et al., 2008).

In order to now thy enemy, evolution monitoring tools for the infected patients, as well as epidemic trace tools, are important weapons in the war against this strong adversary that is the HIV virus epidemic.

In 2009 there were 42000 people living with HIV/AIDS in Portugal and in 2010 the highest rates of AIDS diagnosis in Europe, were also in Portugal (ADVERTing, 2012).

A low prevalence of HIV cases in Angola, is due to the armed conflict which limited the movement of populations of the respective areas of residence.

The storage media expenses, such as paper and film, per unit of information differ dramatically from that of electronic storage media whereas all related processes regarding data analysis can be simplified with the use of electronic health records (EHR) in addition to residual paper-based records.

Regarding the development of EHRs for HIV/AIDS patient records, were cited three priorities (Nucita et al., 2009, Kanter et al., 1997):

- The research tools;
- The health infrastructure and communication;
- The clinical care of patients.

In Portugal, as from December 2012 the hospitals should be submitted in the system SI.VIDA in terms of notification, registration information and documentation of outpatient medication dispensing, including situations of post-exposure prophylaxis, relating HIV/AIDS patients.

A tool that allows the registration of the HIV/AIDS patient clinical data storage episode by episode and to carry out along these episodes evolution evaluation represents an optimization of patient follow-up service.

2 AIM AND MOTIVATION

This paper was based on a previous systematic review on informatic systems for HIV/AIDS motorization and a literature review on HIV/AIDS indicators, and reflects the work behind the development of a tool, called SaveCare – System for HIV/AIDS Virtual Evaluation.

The objective is to develop a set of web-based

tools, which can help and motivate the error proof, practical, accurate, validated, automatic HIV/AIDS patients' data collection adjusted to both Portugal and Angola, in order to better know the disease behavior.

3 METHODS

In this prototype implementation, it is intended to use Open Source technologies in both the database and the prototype development, such as PHP, HTML, CSS and JavaScript, as well as open source packages like JQuery User Interface and others. Since in Portugal, the framework is already working with Oracle, the system should be prepared to work with it as well.

This study is structured in three distinct phases: requirements analysis, prototype development and quality assessment by final users.

3.1 System Requirements Analysis

The requirements for the prototype were defined according to the review made on other used IT systems used in data analysis for HIV/AIDS patient records. In addition to the typical basic functionalities of any EHR registration and query users, appointments registration and scheduling must be included specific characteristics for the treatment of patients with HIV/AIDS. Accordingly, this prototype must be user friendly, safe and secure and allow interoperability, modular development and offline mode.

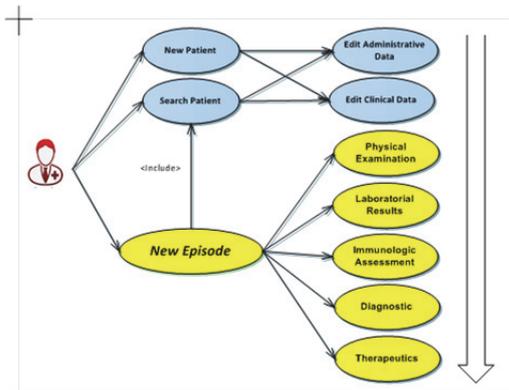


Figure 1: SaveCare simplified UseCase diagram.

The system is intended to be used upon patient consultation and for posterior patient evaluation consultation. Figure 1 represents the physician usecase of the system.

3.2 Indicators Definition

Initially, the authors just considered the indicators proposed by the European AIDS Clinical Society and the HHS Panel of the Office of AIDS Research Advisory Council (OARAC). With the advance of implementation this tool also collects data for performance indicators.

- Patient quality indicators – Indicators that measure the disease spread in a set of patients. E.g. Number of HIV-positive pregnant women who received antiretroviral to reduce risk of mother-to-child-transmission.
- Performance Quality Indicators – Indicators that measure the healthcare quality provided. E.g. Proportion of patients who had CD4 count measured at least once during the last 6 months.

3.3 Forms Definition

In order to collect the required information for the indicators calculation, improved forms were in need.

For this prototype, patient data was separated of the episode data, so that some of the information was kept static, whilst the non-static one is recorded episode after episode. Thus, two types of forms were created. The Patient Data forms (PD), record such information as, date of birth, gender, race, the last performed AntiHIV 1 and 2 test dates, first consultation date, last negative analysis date, first positive analysis date and WHO's and CDC infection stage classification.

The Episode Data forms(ED), collect different data, and group the episode by date. ED form collect clinical data, such as weight, height, age at the time, physical examination, laboratorial results, diagnoses code according to the ICD 9-MC, and therapeutics prescription.

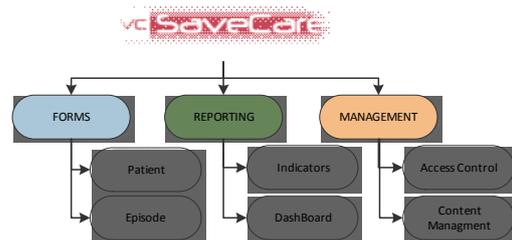


Figure 2: SaveCare module's flow.

4 RESULTS

For each module in this structure, VCSaveCare

prototype, there is controlling layer (PHP), responsible for communication functions; a modeling layer (PHP inc files), responsible for data modeling, and a viewing layer (HTML .tpl files), responsible for data presentation.

4.1 Savecare Prototype Forms

The prototype consists of different forms for the data collection, divided in 2 categories, patient data forms and episode data forms.



Figure 3: Prototype printscreen – Patient Data.

For example in Figure 4, it is presented the patient data form for administrative data collection.

Specific information relevant for HIV/AIDS must be collected in this form.

4.2 Episode Schedule

It was needed a module where the physician, could evaluate the patient evolution on previous episodes in order to improve profitability and productivity of doctors themselves. To facilitate visualization of the patient’s evolution by the physician, it shows up on the screen of forms, a list (Figure 5) with a summary of several patient episodes, chronologically sorted.



Figure 4: Table with last patient’s episodes.

This table presents information graphically through the means of symbols. For example the pill

symbol, intended to illustrate the therapeutics under taken by the patient.

4.3 Patient Condition Summary

It is also required a patient condition evaluation on a glance, thus it was developed a summary table of the patient condition in the present day (Figure 6).

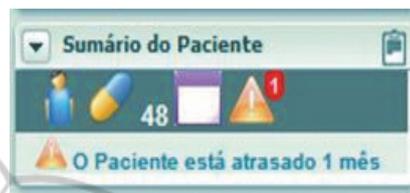


Figure 5: Patient condition summary.

This summary presents such information, as patient, age, therapeutics, next appointment date, and a set of warnings relating various issues.

4.4 Savecare Prototype Indicators

As a Reporting Module, it was defined a module where users can make and view preconfigured and other type of reports, adjusted to their needs, based on the proposed predefined indicators.

Indicador 10 - Percentagem de pacientes VIH/SIDA com neutrófilos totais

Período	Neutrófilos Totais							
	<4250		4250 - 5999		>5999		Sem Dados	
	N	%	N	%	N	%	N	%
2008 - 2009	53	21,1	71	28,2	65	25,8	62	24,7
2008 - 2009	53	21,1	71	28,2	65	25,8	62	24,7
2008 - 2009	48	18,3	70	26,7	82	31,2	55	23,6
2008 - 2009	80	31,7	70	27,7	47	18,6	60	21,8

Figure 6: Indicator Table - Total of HIV/AIDS patients with chest X-Ray exam preformed.

Indicador 16 - Pacientes VIH/SIDA com raio X do Torax PA

Período	Pacientes VIH/SIDA com raio X do Torax PA							
	Normal ⁽¹⁾		Anormal ⁽²⁾		Duvidoso		Não Realizado	
	N ⁽³⁾	% ⁽⁴⁾	N ⁽³⁾	% ⁽⁴⁾	N ⁽³⁾	% ⁽⁴⁾	N ⁽³⁾	% ⁽⁴⁾
2008 - 2009	300	23,1	250	19,2	600	46,2	150	11,5
2007 - 2008	473	22,5	582	27,6	251	11,9	800	37,9
2006 - 2007	446	21,1	670	31,8	230	10,9	759	36,1
2006 - 2007	473	22,5	582	27,6	251	11,9	800	37,9

Figure 7: Benchmarking table – Total neutrophil count.

In addition, the lists allow the user to check the occurrences of different values in a field, and sort these values by name or total of occurrences.

5 CONCLUSIONS

The feedback obtained from final users so far, reveals that this tool offers great advantages over the others in use. As key attributes stand out, the fact that it prevents errors that were common in other applications such as different types of introduction by each physician. A great feature on the reporting module is how it presents the results with different colorations, allowing simple and direct reading of values more relevant.

This solution is prepared to two distinct countries' realities and it's capable of being easily used in due to its data model based largely minimal data sets, common in large part of health care systems worldwide, it is only necessary adjustment for use in languages other than Portuguese. Being a tool of indicators that can be easily fed by new data, also allows an analysis in near real time the evolution of the indicators, as the data is loaded into the application.

5.1 Future Work

Temporarily it is intended to network install this prototype in Portugal and Angola, to start as soon as possible the data collection and detection of possible bugs, as well as adjust the forms to its users.

As future work, to be carried further in the next year, will be implemented the other indicators and define other correlation sets. By implementing these indicators is intended to compare the results from the two countries where the system will be deployed. Addition to these, is under study to implement other indicators, namely in data quality, which will aim,

Additional modules are already under team's consideration. It is intended to develop the following modules:

Laboratorial Module in which will be recorded and documented all patient examinations;

Medication / therapy module, which may be accompanied by the prescription of treatments to patients including the prescription of antiretroviral therapy.

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