

CREATING ETIOLOGY/PROGNOSTIC CRITICAL APPRAISED TOPICS CATROM ORIGINAL SOFTWARE FOR ROMANIAN PHYSICIANS

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Abstract - *Etiology and prognosis are important factors in diagnostic and treatment decisions-making being activities that must to be faced by physicians every day. Evaluation of the specificity of an association between risk or prognostic factors and disease is usual described in a case-control or a cohort study and are made on categorical variables. There are publications of assessment the validity, relevance and results of etiology/prognosis but Romanian physicians could not have access to this information's because of poverty of English language knowledge. Because assessing an etiology/prognosis paper is time consuming it will be a waste of time not to summarize the information in order to be available and to be read by other physicians. Based on a comprehensive review of medical literature we developed an etiology/prognosis CATRom interface, software that to assist Romanian physicians in creating, storing, retrieving, and filtering etiology/prognosis critical appraised topics.*

Keywords - *evidence-based medicine, critical appraise topics, risk factors assessment, case-control study, cohort studies*

Introduction

Etiology and prognosis are important factors in diagnostic and treatment decisions and can affect whether a test is ordered, the choice of treatment, and when a patient will return for follow-up, being activities that must to be faced by physicians every day. Evidence-based medicine defines as 'medical practice that integrates the individual clinical experiences with the best available evidence from systematic research, as well as patient's values and expectations' [1] is a reality today.

The best evidence is the one that is valid and relevant and is not a static concept being change when new better evidence becomes available. Because of rapid expansion of medical knowledge, physicians must to acquire specific skills as translating a specific clinical problem into an answerable question, searching the best evidence, appraising relevance (usefulness in clinical practice), and validity (closeness to the truth) of evidence, and applying the evidence in the practice [1, 2]. It is necessary to apply the evidence to the right patient, at the right time, in the right place, at the right dose, and using the right resources [3].

Evaluation of the specificity of an association between risk or prognostic factors and

disease is usual described in a case-control or a cohort study [4, 5]. A case-control study start with identification of the people with the disease of interest (cases) and a suitable control group (without the disease). The difference between the cases and controls is the presence or absence of the disease of interest. The relationship between the risk factor and the disease of interest is examines by comparing the frequency of the risk factor in the cases and controls. Reported to the time of the study, the case-control studies are retrospective. A cohort study is an observational study in which a defined group of people (the cohort) is follow over the time. The outcomes (disease for example) in subsets of this cohort are comparing, to examine for example the people who were exposed or not expose to a particular risk factor. Usually, a cohort study is prospective.

The critical appraised topic (called CAT), define as a standardized summary of the evidence is a useful concept applies in practicing evidence-based medicine. In medical literature there are reported some software which assist creation of a critical appraise topic and also allows storing CATs into a database [6, 7].

Finding a CAT is an easy task if they are stored into a database. Even if there are some databases that contain critical appraised topics,

because most of them are in English, it is suppose to have high-level knowledge of English in order to use the information. How the majority of Romanian physicians did not know English as well as is necessary, we cannot speak by implementing the evidence-based medicine in Romania without implementing specific programs, programs which to have the menu and the contents in Romanian. The aim of this paper is to present the CATRom interface program used to create critical appraised topics of association between risk or prognostic factors to disease.

Materials and Methods

Creating an application for assisting and storing an etiology/prognostic critical appraise topic can be divides into two parts: one for assisting the creation of the CAT and another for managing the information, components that can be see in our CATRom application. The database implementation of the application was presented in a previously paper as well as the first form of the application (formulating the clinical question, terms used for searching the evidence and the reference of evidence) [8].

Behind the CARTRom etiology/prognostic study interface are some **.php* and **.html* programs. In the application there are some parts that are commune to all three study domains (treatment/therapy, diagnosis/screening, etiology/prognosis) represented by the first page, login page, and the page where the title, the clinical questions, the search terms and the reference are submitted. The core programs that are common to all three medical domains are: *p_i.php*, *p_d.php*, *aa.php*, *ab.php*, *ac.php*, *index.php*, *browse.php*, *insert.php*, *delete.php*, *select.php*, *password.php*, *s.php*, *sr.php*, *insert_do.php*, *insert_do1.php*, *insert_do2.php*, *BetaDistribution.php*, *ProbabilityDistribution.php*, *SpecialMath.php*, *ci_functions.php*, and *confidence.php*.

The *index.php* program contains the welcome page information. This page presents the main objectives of the application and allows to login to the database if the user has already an account. Otherwise, an interface conducts to define a new account. In addition, a button (called 'Ajutor') opens the help of the program. The connection to the MySQL database is made by *p_i.php* program while the disconnection by the *p_d.php* program. The *aa.php* and *ab.php* programs allow physicians to connect to the database.

The menu has designed with feature of Multilanguage support and was implementing in *ac.php* program. The *browse.php*, *select.php*, *delete.php*, and *password.php* programs are responsible for browsing the database, selecting the information from database, deleting a previous creates critical appraise topics and changing the personal password.

The common interface in creating a new critical appraise topics are represented by translating the need of knowledge in an answerable question (first form, *insert.php* program) [8].

Now the application interface is different and depends on the type of the subject domain. The cores structure follows the description of the design of the study, the characteristics of the patients, the results, and comments and are creates based on a comprehensive study of medical informatics literature. All above-describe characteristics will help physicians to critically appraise the article.

The etiology/prognosis study design interface is an individual one and was implemented using the *p_m_r_3.html* program. The storing of the data from this program is possible through *p_d_3.php* program. There are four sections on this form: study characteristics, patient characteristics, results, and comment.

The study design section has statements that allow physicians in validity of evidence assessment. The modality of collecting data (representative sample, exposed-nonexposed, case-control) must be filed chousing one option. Also in this section of the program was implemented five statements (it can be answer with 'Yes', 'No', or 'not known'): 'Was the sample homogenous (were the patients in a similar point in the course of their disease)?', 'Were patients followed long enough for outcomes to occur?', 'The outcomes were objective appraised?', 'There were adjusted other possible risk factors?' , and 'If there exist subgroup of risk factor was identify' which allows users to assess the relevance and validity of the evidence.

The characteristics of the patients in a etiology/prognosis study contains the total number included in the study, the criterions of inclusion and exclusion in the study, the patients which dropout the study, and specification of the outcome(s).

The structure of results is designs on 2x2 contingency table like FRP(risk/prognostic

factor)\B(disease) can be creates where four group of cases can be defined: real positive (FRP+B+), noted with a , false positive (FRP+B-), noted here with b , false negative cases (FRP-B-), noted here with c ; true negative cases (FRP-B-), noted here with d .

Six etiology/prognosis-key parameters can be compute based on the 2x2 contingency table in the assessment of the association between risk or prognosis factors and disease as well as

theirs associated confidence interval limits. The implementation of the point estimations and associated confidence intervals limits are in *BetaDistribution.php*, *ProbabilityDistribution.php*, *SpecialMath.php*, *ci_functions.php*, *confidence.php*, and *sr.php* programs. The name of the etiology/prognosis-key parameters, the nickname and the associated confidence intervals functions used by our CATRom software are presents in table 1.

No	Medical key parameter	Nickname in the program	Confidence interval function	Ref.
1	Excess risk	ExcesRisc	DAC	[9]
2	Individual risk on exposure group	RiscIndividualExpusi	Binomial	[10]
3	Individual risk on nonexposure group	RiscIndividualNeexpusi	Binomial	[10]
4	Odds ratio	RataSansei	R2AC	[11]
5	Relative risk	RiscRelativ	RPAC2	[12]
6	The risk etiological fraction of exposure	FractiaEtiologicaRiscExpusi	RPAC	[12]

Table 1. Risk factor key parameters and theirs confidence intervals functions

Results

The presented application is an original one, based on a comprehensive review of diagnostic assessment studies. After the literature reviewing, the proper information for diagnostic studies was selects and included in the designed application.

The CATRom software is hosted on academicdiret.ro domain and is available at

http://vl.academicdirect.ro/medical_informatics/mesh/cat/. The design interface of the etiology/prognostic CATRom is present in figure 1. As we can see, the name of the user, the data and time of creation, the title and the clinical question for which the CAT is create are insert from the first form (the clinical question forms, that is common for diagnosis/screening, treatment/therapy, and risk/prognosis factors).

The screenshot shows a web browser window with the address http://vl.academicdirect.ro/medical_informatics/mesh/cat/insert_do.php. Below the address bar are navigation buttons: Afiseaza, Creaza, Sterge, Filtreaza, Parola, and a language dropdown set to Romana. The main content area is titled 'Pacienți, metode, rezultate și comentarii' and contains several form sections:

- Caracteristicile studiului:** Includes radio buttons for 'Eșantion reprezentativ', 'Expus-nonexpus', and 'Caz-martor'; checkboxes for 'Eșantionul de studiu a fost omogen?', 'Urmărirea pacienților a fost completă?', 'Aprecierea rezultatelor a fost realizată după un criteriu obiectiv?', 'Au fost ajustați alți factori de risc/prognostici posibili?', and 'Dacă au existat subgrupe de factori de risc/prognostici acestea au fost identificate și studiate independent?'.
- Caracteristicile pacienților:** Includes a text input for 'Număr pacienți incluși în studiu', dropdowns for 'Criterii de includere în studiu' and 'Criterii de excludere din studiu', and a dropdown for 'Rezultatul urmărit'.
- Alte informații:** Includes a date field (05.01.08.01.0), an author field (Sorana Bolboaca), a dropdown for 'Tip: etiologie_prognostic', a dropdown for 'Titlul', and a large text area for 'Intrebarea clinica'.
- Rezultate:** A table with columns for FRP/B, B+, and B-.
- Comentarii:** A large text area for user comments.

A 'Finalizează' button is located at the bottom center of the form.

Figure 1. New etiology/prognostic CATRom design interface

The most important criteria for assessment the relevance, validity and results of the categorical data included into the study are present in this form. After a comprehensive literature study of assessment of etiology/prognosis papers, some fields from the above-form were define as essential (modality of

data collecting, the sample homogeneity, the follow up of the patients, the contingency table, and so on). The software was creating in the way that essential fields must be complete in order to finalize the critical appraised topic, redirecting back if find an empty essential filed (see figure 2).

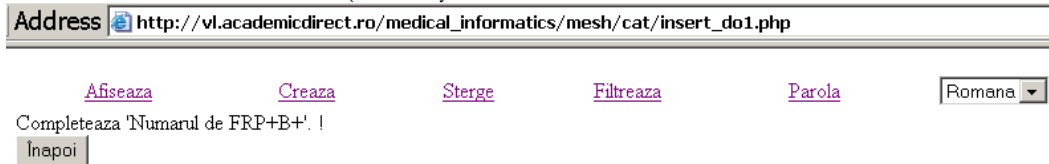


Figure 2. Warning interface for empty essential field

The most important results are the selection and summarizing the etiology/prognosis key parameters used in order to association between risk factor and disease. Based on the data introduced by the user in the 2x2 contingency table, the software computes a total number of six

etiology/prognosis-key parameters: RiscIndividualExpusi, RiscIndividualNeexpusi, ExcesRisc, FractiaEtiologicaRiscExpusi, RiscRelativ, RataSansei. All medical key parameters are accompanied by confidence intervals limits (see figure 3).

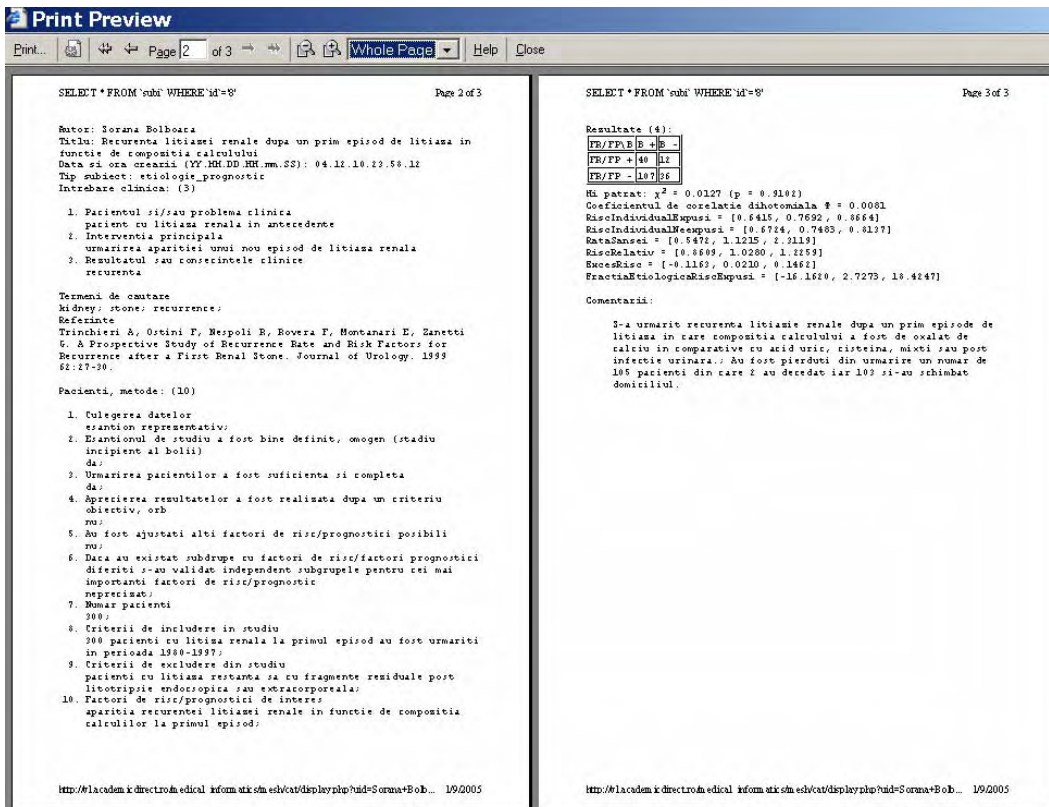


Figure 3. The etiology/prognosis CATRom printing interface

Discussions

The etiology/prognosis CATRom interface was create for two types of users. First, is

dedicate to the physicians that possessing high level English language knowledge wand and are able to create critical appraise topics based on

association between risk factor and disease articles. In other words, for these users the etiology/prognosis CATRom interface assist Romanian physicians in creating an etiology/prognostic critical appraise topic. Second, is dedicating to those Romanian physicians which do not have enough English language knowledge but they want to apply the best evidence into their practical activities. The second users are in fact the Romanian physicians which will browse, filter and select CATs from database, critical appraised topic created by the first category of users.

Computing all literature referred risk factor key parameters and their confidence intervals limits represents the main advantage of the etiology/prognosis CATROM interface. Because that physicians are influence of the modality of presenting the results of a etiology/prognosis study because depending on which measures of effect choused, the impact of an intervention may appear large or small, even though the underlying data are the same. Our application gives possibility to observe and interpret all risk factor key parameters compute on categorical data providing useful knowledge for clinicians to balance the benefits and harms of therapy for their patients. Note that, in order to interpret correctly these point estimators and associated confidence limits the users must to have basic knowledge of biostatistics as well as research methodology. Even if the program computes for example Individual Risk on Exposure Group (RiskIndividualExpusi) if for example data was collected as case-control, this parameter could not have clinical significance.

When is necessary to interpret a point estimator of etiology/prognosis an estimation of the trustworthiness or robustness of the finding [13] is necessary, estimation which is give by the confidence intervals. Note that just few papers report the risk factor key parameter accompanied by a confidence intervals and when is reported is

referred the one that can easily be compute. Our application use in computing confidence intervals laborious methods, most of them new ones, tested in providing better or equal estimations of confidence limits than reported ones [9, 10, 11, 12].

When we read a critical appraise topic of etiology/prognosis must take into consideration that the material contain a single element from the relevant medical literature and we cannot be sure that the evidence is the best one. Because today evidence it is not necessary that it will be and evidence tomorrow etiology/prognosis CATs have a short life and is very useful to look at the data when the CAT was created in order to use it in day-by-day activity. The CATRom present these features.

Conclusions

The etiology/prognosis CATRom interface, dedicated for Romanian physicians, has a friendly interface that allows interaction with the users and can run on any computer that has Internet connection, being a useful instrument in assisting etiology/prognosis critical appraised topics.

Computing all literature referred risk factor-key parameters and their confidence intervals limits represents the main advantage of the application. Providing etiology/prognosis parameters that are compute on categorical data accompanied by their confidence intervals, the application is a useful tool for etiology/prognosis decision-making, giving to physician useful information for balancing the association between risk factor and disease.

The quality of the etiology/prognostic critical appraise topic depend just on the skills of user who create the CAT. But, with basic research methodology and biostatistics knowledge, the etiology/prognostic CATRom can become a useful tool in day-by-day activity.

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