EpiBasket: a prototype information system to support the epidemiological investigation of an emerging infectious disease outbreak

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Abstract and Objective

The epidemiological investigation of an emerging infectious disease outbreak requires a series of different designs, protocols and questionnaires. The de novo development of these protocols and questionnaires deployed upon outbreak alert results in a substantial detrimental delay for the understanding and control of the epidemic. We propose a new web application for facilitating the outbreak investigation. In this prototype of information system, the user is guided to select variables of interest in a proposed dataset based on the analysis of the available literature on previous similar outbreaks, and afterwards, the system provides ready-to-use forms to be used for the data collection of the desired epidemiological investigation. This new tool can save time, standardize the data collected during an outbreak, and facilitate collaboration at a national and international level.

Keywords:

Information systems, Emerging communicable diseases, Disease outbreaks, Epidemiologic studies.

Introduction

Information sciences were widely applied in the development of syndromic surveillance systems, including the practical implementation of sophisticated algorithms for detecting outbreaks. However, in the event of outbreak of emerging disease, a heavy load of critical work begins immediately at the time of this discovery to address efficiently the medical and public health priorities, and information systems may also be considered for providing helpful tools increasing the value of the public response at this step of the outbreak. This context is the framework of the proposed prototype.

Methods

The proposed web application, "EpiBasket", was developed with XHTML and PHP. It has an architecture based on the internet shopping basket which is popular on consumer internet sites. In EpiBasket, the epidemiologist "shops" the variables he needs for a study. After completion of this shopping, the resulting basket is "packaged" under the form of a questionnaire: the software automatically generates online a ready-to-use form with the selected variables for the data collection of the desired epidemiological investigation.

The system prototype is based on the analysis of the literature on the severe acute respiratory syndrome (SARS)–taken as a model of emerging respiratory disease–epidemic in Hong Kong and Toronto. We analyzed all studies dealing with this SARS epidemic published in peer-reviewed journals (n = 311). The present implementation focuses on the special case of the investigation of the psychobehavioral changes during an outbreak. This is a major topic during outbreak investigation, as we have identified that 19% (59/311) of all published studies were in this domain. Any epidemiologist "shopper" can find all variables that we identified in these 59 psychobehavioral studies. A clustering algorithm was used for grouping similar variables. User interface provides a detailed description of each variable including a link to the papers that have already used this variable, together with the information on their citation indexes which may be useful for avoiding the user to forget those variables that were successfully used in high profile papers. The prototype will include coding recommendations that are critical, as they maximize the chance that two users selecting the same variable will apply the same coding and achieve the same quality.

Conclusion

This work is a first step towards the development of information tools supporting the epidemiological investigation during outbreaks. Such tools must meet three priorities: speeding the construction of the questionnaires, avoiding "reinventing the wheel", maximizing the interoperability of the different data acquired separately on the same topic.

The current EpiBasket already constitutes the solid backbone of a useful practical tool able to substantially increase the rapidity of the data collection in the case of an outbreak, together with the value and the standardization of the data collected.

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