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Decision Support for the Prescription of Hepatitis B Virus Tests in Cardiovascular Surgery

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Abstract

We aimed at developing an alert-system to decrease the inappropriate repetition of hepatitis B virus tests. We evaluated the impact of the alert by an interrupted time series of the proportion of repeated results and the physician's response to the alert by system execution traces archiving. The alert was successfully implemented. We validated our method for measuring expected outcomes. But the preliminary evaluation of the alert could not prove any effect on the HBV tests repetition.

Keywords:

Decision Support System, Laboratory Test Redundancy

Introduction

Several studies and systematic reviews have demonstrated the efficacy of computerized decision support systems, especially alerts and active reminders, for improving the quality of care and/or hospital practices [1, 2]. However, other studies have identified problems with the implementation of such systems in routine practice and with the accessibility of such systems to doctors [3].

The Georges Pompidou European Hospital is a university hospital with 880 beds [4]. It has a complete information system centered on the electronic health record, DxCare®, facilitating the computerized prescription of drugs, imaging and laboratory tests. During 2005, 216 (13%) of the hepatitis B virus (HBV) tests prescribed by the Cardiovascular Surgery Department were ordered less than 30 days after the previous order for the same patient. An active reminder system concerning the repeated prescription of HBV tests in this department was implemented as a mean of decreasing this redundancy. This paper presents the implementation of this intervention, and its evaluation.

Materials and methods

DxCare® permits both the prescription of laboratory tests and the viewing of their results. By default, the results shown are those for the current stay in hospital, but it is possible to search for all previous results for the patient. The alert system created in this environment triggers a new page concomitant with the prescription window, the moment of a HBV test is selected to be prescribed. This alert contains the date and complete result for the most recent last HBV test carried out for the patient (obtained less than 30 days previously and whether linked or not to the current hospitalisation). For the purpose of the evaluation, the system was developed so that traces of its execution be archived. They reflect the selection of HBV test for ordering, the display of any alert, and the time elapsed between any previous result and these events.

The impact of the intervention is measured by interrupted time series analysis of repeated HBV tests over a four-year period, with assessments at two-month intervals. As the system became functional at the end of June 2006, the "before intervention" period runs from January 2004 to June 2006 and the "after intervention" period from July 2006 to December 2007. The consequences of alerts on the repetition of serological tests are estimated from HBV results extracted from the DxCare® database. The corresponding indicator is the proportion of all HBV results that were repeated within an interval of less than 30 days (RT_{30}).

A trace is stored each time that the prescriber selects a HBV test, *i.e.* each time that he or she intends to prescribe that test. This makes it possible to estimate the proportion of all intentions to prescribe a repeated test within 30 days of the last one: RTI_{30}. Compliance with the alert is evaluated by comparing RT_{30} and RTI_{30}.

Results

During the "before intervention" period (January 2004 to June 2006), there were 3,671 results for HBV tests in 2,682 patients. 12.3 % (nb = 450) of the results were obtained within 30 days after a previous one (RT_{30}). During a preliminary "after intervention" period from July 2006 to April 2007, there were 1302 results for HBV tests

in 823 patients. 13.8% (nb = 180) results were obtained following the repetition of the test within 30 days (RT_{30}).

The preliminary segmented regression analysis of the time series for the rates of HBV repeated tests suggested no effect of the intervention. However, since only 5 bi-monthly rates were available for the post intervention period (and since neither seasonal variation nor autocorrelation of the data were observed), we preferred to perform nonparametric tests. Wilcoxon rank-sum test results showed no significant change in rates after the setting up of the alert-system (p-value=0.11)."

An analysis of the system's traces for the preliminary "after intervention" period revealed 1430 intents to prescribe, 165 (11.5%) of which corresponded to repeat tests within 30 days (RTI_{30}). The median interval between the previous test and the repeat test was 123 days, with an interquartile interval of 26.75 to 287 days. The comparison of RT_{30} and RTI_{30} showed a compliance with the alert of 8.3%.

Discussion

The alert was successfully implemented but its evaluation could not prove any effect on the HBV tests repetition. We hypothesized that doctors are not aware of the existence of a previous result at the time of prescribing. The effectiveness of the alert depended on the relevance of this hypothesis. Indeed, biological results are linked to a particular stay in hospital in our computerized information system. Consequently, a HBV test prescribed during a consultation is not visible during any subsequent hospitalization (considered as another hospitalization) unless the prescriber actively searches for previous biological results. Our hypothesis turned out to be insufficient and balanced by the fact that HBV tests have to be prescribed periodically according to predefined protocols. Moreover, there is no fully acknowledged delay for repletion of serology: the delay of 30 days was decided with the collaboration of one clinician of the Cardiovascular Surgery Department and a virologist. This was probably not sufficient to warrant a consensus of all prescribers.

Evaluation of the response of users to this support is based on the recorded traces of its functioning. The quality of these traces was ensured as part of the design of this support system, independent of the information system. Conversely, the impact of the alert on the repetition of HBV testing can only be evaluated using biological results extracted from the DxCare® database. The quality of the data used for evaluation depends entirely on the correct use of the information system. The interpretation of both indicators is therefore limited by the quality of their respective data sources.

Conclusion

The capacity of a computerized prescription system to alert the doctor to the unnecessary repetition of examinations and potential prescription errors is one of the characteristics included in evaluations of the quality of such a system [5]. However, although this type of intervention is generally effective [1], the implementation of alerts and the evaluation of their impact must be adapted to the local context. Indeed, it remains to be demonstrated that alerts are effective regardless of the context in which they occur.

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