Surveillance and outbreak reports

REFLECTIONS ON AN EVALUATION OF THE DUTCH INFECTIOUS DISEASES SURVEILLANCE INFORMATION SYSTEM

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The Netherlands' Infectious diseases Surveillance Information System (ISIS) was developed 12 years ago as an early warning system for the country. The initial objective was to establish a surveillance system that gathered the test results of all micro-organisms from all medical microbiology laboratories (MMLs) in the Netherlands on a daily basis in order to create an early warning system. This paper analyses the most important results of a recent evaluation of the system. The evaluation was based on an analysis of early warning signals to detect outbreaks, number of visits to the ISIS website, and interviews with stakeholders, documentation on the ISIS system, and analyses of the ISIS MML database. While the daily collection of data on all micro-organisms for early warning has been achieved, the connection of all 85 MMLs in the Netherlands to the central ISIS MML database has not been achieved – only 18 MMLs have been connected. This has resulted in a low coverage and non-representative selection of MMLs for the Netherlands and therefore national outbreaks were missed. Data were used to determine trends in antimicrobial resistance over time. The ISIS system was not found suitable for early warning since outbreaks were detected via other systems. However, with some adaptations the ISIS system could be suitable for the surveillance of antimicrobial resistance. Furthermore, the discontinuation of this network would cause the loss of the most important data system for antimicrobial resistance in the Netherlands, since there is no other national system that gathers data on this topic. This evaluation resulted in a restart of the network.

Introduction

ISIS presents current information on the presence of infectious diseases in the Netherlands online. The system was developed by the National Institute of Public Health and the Environment (RIVM) as an information technology infrastructure for the continuous collection and analyses of data, the distribution of surveillance information and early warning of outbreaks, and monitoring of trends. MMLs play an important role in early warning of outbreaks of infectious diseases since results from MMLs are on average faster available than results from disease notifications gathered by Municipal Health Services.

The idea was that all 85 medical microbiology laboratories in the Netherlands would send data on all micro-organisms on a daily basis.

At the ISIS website, professionals were able to view daily updated trends in the occurrence of certain micro-organisms via algorithms. The complete surveillance cycle was computerized [1].

The ISIS MMLs' database contained both positive and negative test results, unlike most laboratory surveillance systems, which only contain positive test results. The daily transport of data took place from the Laboratory information management systems (LIMS) to the central database at RIVM. As a result of technical problems that required investments in maintenance and doubts about the cost-effectiveness and usefulness of ISIS MMLs for the Centre for Infectious Diseases Control (CIDC), it was decided to evaluate the system and report the most important results of that evaluation in English in this paper [2].

Methods

The evaluation was done by comparing the original objective with the current situation [3], partly using guidelines for the evaluation of public health surveillance system as defined by CDC [4]. Information concerning ISIS MMLs and the performance of the system is based on an analysis of early warning signals [5]. ISIS website visits and interviews by means of an open-structured questionnaire with stakeholders, documentation on ISIS MMLs, and analyses of ISIS MMLs' data. The evaluation focused on the contents of the system: representativeness, quality of data, and use of the system for public health purposes.

Results

The original objective was to set up a surveillance system that gathered test results of all micro-organisms of all MMLs on a daily basis. The daily collection of data on all micro-organisms for early warning has been fully achieved. However, the participation of all 85 MMLs has not been achieved: only 18 MMLs participated over the 12-year period. The connection of MMLs to the central system turned out to be a custom-made procedure and the time schedule for connecting all MMLs was too optimistic. Laboratory information management systems (LIMS) of seven software providers were linked to ISIS MML. Participation was voluntary, which resulted in a low coverage and a non-representative sample of MMLs for the Netherlands. Coverage changed over the years due to new connections and disconnections since a change in LIMS implied a reconnection of that LIMS to ISIS MML. A comparison between all early warning signals of ISIS MMLs and outbreaks notified by other networks such as the early warning committee showed that

all 10 nationwide outbreaks that were described in the Netherlands in 2004 and 2005 were missed by ISIS MMLs [6]. In the same period, ISIS MMLs produced 222 early warning signals, but none of them induced any response from the national outbreak management team or any other response actions.

In addition to the non-representativeness of the system, the evaluation revealed that the quality of the data was insufficient. This was due to several reasons. Firstly, the standards for notation and data structure, as defined by the Dutch Society of Clinical Microbiology, were only partly followed. Secondly, routine data quality control was not performed and thirdly recoding from local LIMS to the central database system contained errors.

The main advantage of ISIS was that the system collected both positive and negative test results from MMLs and relevant epidemiological information so that diagnostic strategies and testing behaviour could be evaluated. However, the disadvantages of ISIS MMLs were that data not routinely gathered in a LIMS were not available. The interpretation of trends, especially for microorganisms where no other surveillance systems are available in the Netherlands (such as *Giardia*, *Cryptosporidium* and *Yersinia*), was hampered by low coverage and lack of clinical information, reason for diagnostic tests, type of test and the interpretation of a test result. Data in the ISIS MMLs' database were most suitable for analyses on the level of test results (micro-organisms and not patient level) as is necessary for the surveillance of antimicrobial resistance. Although the system was not primarily and not optimally designed for the surveillance of antimicrobial resistance, it was most often used for that purpose [7].

Discussion

The design of ISIS can be considered as path-finding. Despite the fact that the original objective was not met, much has been learned from the project. The objective was defined too broadly, which brought the project out of control. It is possible to design a system like ISIS, but regular investments in hardware and software are essential for the continuity of such a system. The control and maintenance of a fully computerized surveillance system such as ISIS MML is costly. Sustainable financial support is therefore essential. Surveillance benefits from standardization. Control of the data process and its translations needs to be a continuous process. Quality control should precede computerized data-analyses. Furthermore, communication between stakeholders of such a complex system is the key to success. The organisation of the system and communication between stakeholders are the limiting factors, rather than the information technology. The quality of the system could easily be improved if the collaboration and communication between stakeholders were improved, a clinical microbiologist was part of the project team and regular feedback to the connected MMLs was given. However, these improvements would be costly.

All of these issues should be carefully considered when launching an early warning surveillance system based on data originating from several laboratory systems.

Conclusion

ISIS MML was not found suitable for early warning, since outbreaks were detected via other networks. The system is suitable for the surveillance of antimicrobial resistance, and its discontinuation would cause the loss of the most important data

system for antimicrobial resistance in the Netherlands. This is not a desirable option, as antimicrobial resistance is increasing and the European Union strongly recommends the surveillance of antimicrobial resistance.

Based on the results of the evaluation, it was decided to discontinue ISIS by the end of 2007. A new system will replace the old one, focusing on the prevalence of resistance in clinical-relevant bacteria and the monitoring of trends in resistance. Feedback to participating MMLs will be given regularly; close collaborations with medical microbiologists have already been established. In the new system, data will be gathered in a technically simple way, with a focus on quality control. All stakeholders approved the new format. The new system will start modestly, with possibilities for expansion in the future (See the box below).

Recommendations for national electronic laboratory surveillance systems:

- One SMART (Specific, Measurable, Attainable, Results-focused and Timely) objective;
- Standardization of data;
- Personal communication between participating laboratories and national centre;
- Continuous developments and adaptations necessary.

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