

Concise Healthcare-Associated Infection Reporting and Benchmarking with Minimal Staff Resources

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Abstract. We report on intelligent information technology tools that produce fully-automated surveillance reports of high precision for 12 intensive care units (ICUs) without relevant time expenditure of infection control or ICU staff. This is accomplished by MONI-ICU, a computerized system for automated identification and continuous monitoring of ICU-associated infections, which makes surveillance data readily accessible and presents them in easily perceptible reporting format.

Keywords. Infection control, automated surveillance, reporting, MONI-ICU

Introduction

Surveillance and documentation of healthcare-associated infections (HAIs) in most institutions is a time consuming task, and experienced medical staff need to manually collect information from patient history, ward documentation, laboratory, radiology, pharmacy, specialist consultations, discharge documents, administration, and billing as well as from post-discharge and readmission-events. Data collected by such means implies much redundancy in documentation [1]. Electronic management of all relevant medical, bedside and administrative patient data in coded format is a key requisite for intelligent information technology (IT) support and for avoiding redundant documentation. The intensive care units (ICUs) of the Vienna General Hospital (VGH), our model partners, long use of electronic patient data management systems (PDMSs) provide such coded information. MONI-ICU has been established and is in operation for automated identification and monitoring of ICU-associated septicemia, pneumonia, urinary tract infections, and central-venous-catheter-induced infections. We reported elsewhere on how data are collected and processed and how MONI surveillance results and performance compare with manual surveillance by human experts [2–5]. Here we present the specific reporting tools developed for MONI-ICU.

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1. Methods

MONI-ICU's reporting tools were designed to generate HAI surveillance reports "with a few mouse clicks" and are meant for use by either a member of the hospital infection control team (ICT) or by an authorized member of the ICU in question.

For *routine surveillance reports* an access database tool with programmed and completely preformatted output was designed and called "routine reporting tool (RRT)". It is very easy to operate as it only demands on-screen selection of a defined time window for triggering standard surveillance reports.

For *advanced surveillance reports* we designed an "advanced reporting tool (ART)" which demands from the user more knowledge and planning as it allows for individually designed and specialized reports. Again, this is accomplished by on-screen selection among a number of options.

2. Results

The RRT starts with an overview on all 12 ICUs of the hospital and is followed by the corresponding specific reports for each unit:

The overview presents tables and corresponding graphs for *denominator data* (number of (#) patient admissions, # patient days, means for length of stay (LOS), as well as device days (urine catheter, central venous catheter (CVC), respirator) for each unit as well as in total, followed by tables and graphs for *numbers and rates of HAI* (ventilator-associated pneumonia, bacteremia and septicemia, CVC-related infections (CRI), and urinary tract infections (UTI)) for each unit as well as in total. The unit specific report exposes the set of data for one specified ICU against anonymised and tabled infection data of all other ICUs. Results are visualized in bar graphs with an arrow pointing to the bar showing the "own" results of the ICU in question.

To prevent misinterpretation or targeted misuse, specific RRT outputs are designed for use only by ICT members who personally present the printout to the members of the respective ICU and discuss it with them. ICU staff gets disclosed results only of their respective unit.

With the ART, not only the time span but also a number of criteria can be selected: accepted degree of fuzziness (cf., [2]), prevalence/incidence, name and short description of actual analysis, ward(s), patient characteristics, admission and discharge date, LOS.

Further selections as for diagnoses and method, sub diagnoses, organ specific conditions, physical, biochemical, clinical and bacteriological findings/parameters can be defined by clicking on specific items in several pull down windows. ART output is organized in windows showing tabled numbers with corresponding graphs formatted suitably to the selected features.

3. Discussion

The reporting tools presented here are extremely useful for keeping unnecessary documentation tasks away from caregivers in their daily routines. Surveillance with MONI-ICU requires from ICT staff only a time fraction of 15% compared with conventional infection surveillance [4]. Ward staff does not need to enter additional data for surveillance purposes.

By presenting the anonymised results of all units, individual outputs do not only support follow up of own results over time but do also support benchmarking against the results of other “players” from the same setting.

ART enables the user to get answers on specific questions and may help in outbreak investigation, in testing specific hypothesis, and in a broad range of research tasks. ART thus supports scientific investigations and teaching in VGH being the largest university hospital in Austria.

So far, MONI tools are used by ICT staff and by a few clinicians with specific – mainly research – interests. With improved feedback to our ICUs by the recently introduced tools described here we expect increasing interest and demands and increasing awareness of infection matters.

Advanced interface management, compliance with accepted IT standards, intelligent software and modern IT architecture are important prerequisites. The aim must be to have data input embedded as good as possible into the bedside workflow and to avoid any redundant data entries; outputs of clinical relevance and interactive features should motivate caregivers to use the system in daily routine.

Provided all relevant input is accessible, MONI is more accurate than human observers [5]. The above-described benefits are important prerequisites for acceptance by clinicians – which is a condition for any successful surveillance activity.

Possible limitations of our system are shortcomings or breakdowns in the IT structures, unwillingness or lack of interest by clinicians, staff shortage or lack of expertise (clinical as well as IT expertise) in the respective institution, impediments by financial restrictions and similar factors which compete with the need for continuous adaptation of such a system.

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