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An interventional study to evaluate the impact of a rapid on-admission screening strategy in preventing nosocomial MRSA infection

Objectives Assess if the use of a molecular technique enabling rapid on-admission screening and early detection of methicillin-resistant *Staphylococcus aureus* (MRSA) carriage among surgical patients can reduce the rate of nosocomial MRSA infections as well as increase individual patient safety by improving adequacy of antibiotic prophylaxis and treatment.

Conclusions

1 There was excellent compliance with the molecular screening technique enabling rapid detection of MRSA. This strategy allowed screening of 93% of admitted patients. Without on-admission screening, a majority of MRSA patients (77%) would have been missed, because they were not previously known MRSA carriers.
2 The results of the study intervention were disappointing, rejecting the initial study hypothesis. The intervention (rapid MRSA screening upon admission) was not successful and failed to decrease health-care-associated MRSA infections. Only a small decrease in MRSA colonisation was observed. The number of severe surgical site infections was not reduced and remained stable across the study phases. After adjustment for MRSA colonisation pressure and antibiotic selection pressure, the results remained unchanged.

Main results and findings

Molecular methodology A real-time molecular screening technique enabling rapid detection of MRSA was used.

Clinical trial

– The first phase of the project was in a large part dedicated to preparing the intervention phase, which started on October 1, 2004. The first 3 months (July to September 2004) were used to start and validate prospective surveillance of MRSA infections and to establish the baseline incidence rate of nosocomial MRSA infections in the surgical department at Geneva University Hospitals (HUG). Moreover, these 3 months were used to establish data collection and surveillance tools in order to be able to gather all necessary clinical and epidemiological data.
– The second phase of the project (October 2004–June 2005) comprised the intervention phase in the divisions of neurosurgery, orthopaedics and cardiothoracic surgery. Data collection for the identified MRSA cases and follow-up of MRSA infections was continued throughout the next 3 months (wash-out period).
– The third phase of the project (September 2005–June 2006) was a cross-over phase with rapid screening of patients in urology and abdominal surgery. Furthermore, there was follow-up of MRSA infections for those patients who were operated on before June 2006.
– Problems and difficulties that occurred during this clinical trial were as follows:
  - Computer support: It was difficult to retrieve patient data to find out which patient had already been screened prior to admission.
  - Time delay: Patients admitted for emergency surgery may not receive their screening results prior to their surgical intervention.
  - Great heterogeneity of stakeholders, i.e. different interests, priorities (clinical routine vs. research) and commitments (for instance, no laboratory coverage is provided for rapid testing on weekends, leading to an artificial delay between admission and notification of the MRSA-status of a patient during weekends).
  - Dependence: The research team needed full support by the chief nurses involved.
  - Communication problems: Not all staff members were aware of the study. Therefore, a news bulletin was created to inform all involved parties.

Main results of the clinical trial

Overall, there was excellent compliance with the screening strategy (93% of all admitted patients were screened with the rapid molecular test) in the intervention units, and only few patients refused to be screened. The results can be summarised as follows:

- 10,193 of 10,844 patients were screened using the rapid qMRSA test.
- 491 patients were not screened, because they were considered at low risk of MRSA carriage.
- 160 patients were not screened for other reasons (time constraints, early discharge).
- 1,331 patients were screened during visits to the surgical outpatient clinic.

Concerning the MRSA detection rates, data are as follows:

- During the total study period (phase I and phase II combined), a total of 1,193 MRSA-positive patients were detected among 10,193 admitted and screened patients (prevalence, 12%). The majority of those patients (918 of 1,193; 77%) were not previously known MRSA carriers and would have been missed without on-admission screening. 275 of 1,193 (23%) MRSA-positive patients were previously known and would have been detected using the standard detection strategy.

Concerning MRSA infection rates, data are as follows:

- A total of 220 nosocomial MRSA infections acquired at HUG were documented. During the 2 study phases (without baseline and washout periods), 169 healthcare-associated MRSA infections could be observed (incidence rate of nosocomial MRSA infections, 1.52 per 100 admissions, or 1.01 per 1000 patient-days). Unfortunately, the intervention (rapid MRSA screening upon admission) was not successful and failed to decrease healthcare-associated MRSA infections (relative risk, 1.2; P = 0.21). Only a small decrease in nosocomial MRSA colonisation could be observed during the intervention period (relative risk, 0.75; P = 0.07). The number of severe surgical site infections was not reduced and remained stable across the study phases. After adjustment for colonisation pressure, antibiotic selection pressure and study year, the main outcome estimate remained unchanged (adjusted IRR, 1.2; P = 0.16).

Publications of the NRP 49 project

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Ethics roundtable debate: a patient dies from and ICU-acquired infection related to methicillin-resistant *Staphylococcus aureus* – how to defend your case and your team?
Crit Care. 2005 Feb;9(1):5-9. Epub 2004 Dec 15.

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