Outbreak investigation and epidemiology - from practice to science - .
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Controlling an alleged outbreak of meticillin-resistant *Staphylococcus aureus* (MRSA) in a Dutch nursing home

7.1 ABSTRACT

This chapter discusses the controlling of an alleged outbreak of meticillin-resistant *Staphylococcus aureus* (MRSA) in a Dutch nursing home. Following the identification of an index patient with MRSA in a Dutch nursing home with 175 residents in the south of the province of Limburg (the Netherlands), microbiological diagnosis having been obtained from a foreign laboratory, a survey was carried out to trace contacts by means of the ‘ring principle’ of outbreak management. Whenever positive cultures were found in the first ring of residents, the contact and source tracing procedure was extended. In accordance with the Dutch guidelines for MRSA in nursing homes, a range of preventive measures was taken regarding colonised residents and employees and the cleaning of rooms. Ten days after the occurrence of the index case, 29 persons, 9 employees and 20 residents, were found to be colonised with MRSA. Because of this extraordinary count compared with earlier Dutch findings (only 0.16% of inhabitants colonised), there were doubts about the laboratory results. A counter-expertise from the Regional Public Health Laboratory (PHL) and the National Institute of Public Health and the Environment (RIVM) showed no MRSA, but meticillin-sensitive *S. aureus*.

This alleged outbreak had very serious consequences for residents and employees and major financial consequences for the nursing home. There was a very adequate response to the crisis by a multidisciplinary team including external specialists. Incorrect identification of MRSA is not restricted to this incident, as proficiency-testing programmes have shown that MRSA has not always been reported accurately. The Inspectorate of Health Care (IGZ) emphasised the importance of standardised quality and interpretation of laboratory results by microbiological experts. This should be kept in mind when contracting foreign laboratories, particularly because the Dutch policy is to avoid MRSA in intramural settings. The verification of the diagnosis once again proved to be an essential step in outbreak management.
7.2 INTRODUCTION

In March 1998, an outbreak of MRSA occurred in a Dutch nursing home. This chapter describes this outbreak, which, in view of its cause, course and outcome, can be regarded as remarkable.

7.3 THE INDEX PATIENT

On Wednesday March 4, MRSA was discovered in a wound on an elderly female inhabitant; this was the first such case in the history of this nursing home, which houses 175 residents. Subsequently, the guidelines on MRSA infection in nursing homes, drawn up by the Dutch Working Group for Infection Control, were applied. These guidelines indicate the measures to be implemented when a resident is colonised with MRSA. In accordance with this procedure, the affected female inhabitant was treated with mupirocine ointment in the nose and on the wound for five days, and her entire body was washed with chlorhexidine soap, including the hair on her head. Additional hygienic precautions for the nursing staff were put into practice, such as wearing surgical masks, gowns and gloves. General procedures were introduced for the disposal of linen and the use of sanitary rooms. No isolation measures were taken, which is consistent with the national guidelines.

Ring investigation

According to the ‘ring principle’ of contact tracing in infectious disease control, samples for culture were taken from wounds, nose, throat and perineum of the patient sharing the room with the index case, as well as from nine patients residing in the same department who were considered to be at risk (i.e., patients with wounds, transurethral or suprapubic urine catheters or naso-gastric feeding tubes). After three days, two residents were found to have MRSA in a wound, while a culture from the perineum of the patient sharing the room with the index case proved positive for MRSA. To assess the extent of transmission, a crisis team decided on Saturday March 7 to extend the source and contact tracing to a further ring, by collecting nose and throat swabs for culture from the 22 other residents (on a total of 32) and 53 staff members of the department. On Tuesday March 10, an additional five residents and nine staff members were diagnosed as colonised with MRSA. Employees found to be positive for MRSA were sent on sick leave and could only resume their duties after treatment.
7.4 THE OUTBREAK

Because of the large number of MRSA colonised residents and staff, the nursing home decided on Wednesday March 11 to upgrade the local crisis team to a multidisciplinary outbreak-control steering committee of healthcare professionals. This team included the managing director, the physician in charge, two departmental managers, the hygienist, the occupational health physician and the press officer of the nursing home, as well as the Consultant on Communicable Disease Control (CCDC), and a secretary. This team had to formulate, implement and co-ordinate an outbreak management strategy.

Characteristics of the causative agent

Because of the exceptional number of MRSA infections, it was immediately queried whether the outbreak was actually caused by MRSA. These doubts arose since a prevalence survey in 1992 demonstrated that MRSA scarcely occurs in Dutch nursing homes; it found only 0.16% (3/1973) of all *S. aureus* to be meticillin-resistant. MRSA is also rarely detected among healthy employees because the natural bacterial flora limits colonisation by MRSA. In the outbreak described here, however, 17% (9/53) of the staff were found to be colonised. Furthermore, the initial antibiograms of the first four patients in this outbreak showed three different patterns of resistance. Upon explicit inquiry, the commercial laboratory in a neighbouring country that had performed the analysis assured that positive MRSA cultures had been identified with certainty. In the same batch of samples, meticillin-sensitive strains of *S. aureus* had been found in six cultures of employees and three cultures from residents. In the case of one staff member and one resident, MRSA was discovered in the throat, while meticillin-sensitive bacteria were located in the nose. It was agreed to send the isolates returned by the foreign laboratory to the PHL for counter-expertise. These strains were also sent to the RIVM for phage typing of the bacteria and determination of the mecA gene by polymerase chain reaction (PCR). The presence of the mecA gene in the bacteria is a marker for MRSA.

7.5 OUTBREAK MANAGEMENT

A plan was drafted to address the further investigations and public relations management. Arrangements were made for the follow-up examinations of colonised residents and employees. An infection control protocol was developed, stipulating strict hand disinfection for all persons in the nursing home, describing the required disinfection of contaminated rooms and materials and defining specific nursing activities. A system was organised to provide information to residents of the nursing home and their relatives, resident patients with outpatient or clinical appointments at the local hospital, staff, the municipal authorities and the IGZ. The press officer made a press plan and distributed press releases to the local news-
papers and television stations. The physician in charge of the nursing home and the CCDC made an inventory of the data of the colonised persons. At the same time, other parties were consulted, such as the National Co-ordination Centre for Communicable Disease Control (LCI), the IGZ, expert microbiologists and the RIVM.

Common hand hygiene was improved throughout the nursing home. After performing any activity in the rooms, everybody had to disinfect their hands with alcohol, after regular washing and drying of the hands. All nursing procedures were performed inside the rooms and only while wearing surgical masks, gowns and gloves. In all areas, surfaces were disinfected after being cleaned in the usual fashion. Contaminated materials were washed at 60°C or hung outside when washing was not possible. Checking every room for the level of contamination with the help of culture plates was not considered useful: a general disinfection would take place after the department was declared MRSA-free or when the outbreak was subsiding.

Another 54 residents with risk factors for MRSA (wounds, catheters or tubes) in other departments of the nursing home were examined by means of cultures from the nose and throat, together with a culture of the loci at risk. Because some employees worked in other homes for the elderly as well, cultures from nose, throat and possible loci at risk were taken from 12 residents there. As soon as new cases among residents were discovered as a result of the screening, treatment as specified in the national MRSA guidelines was put into practice. Results of the protocol treatment were checked by taking culture samples from the noses, throats, perineums, groins and armpits of the eight MRSA-positive residents (one MRSA-positive resident died suddenly from another cause) and the MRSA-positive employees. All MRSA-positive patients were nursed in one part of the department and attended to as much as possible by a permanent team of employees. No special measures were considered necessary for the relatives. All communications with the hospital (ward or outpatient department) went via the hospital hygienist.

An inventory was made of the characteristics of all colonised residents and employees in the nursing home, on a specially designed form. Data included name, date of birth, department, room number, date of admission, individual risk factors (wounds, dermatological diseases, catheters and tubes, number of treatments with antibiotics in the previous year), type of accommodation before admission (home, hospital, nursing home, home for the elderly), previous microbiological diagnoses, medical history, number of hospital admissions in the preceding year and any stays abroad during the past year, result of cultures with place and date, as well as the antibiogram.

**Public relations and information**

Special meetings were organised to provide information to residents and their relatives. Information for employees was disseminated at the regular team meetings. The general practitioners, authorities of neighbouring municipalities and the IGZ were briefed by means
of a newsletter. The public relations and information team consisted of the press officer of the nursing home, the director and the CCDC. This team communicated with the local newspapers and television stations through the press officer.

7.6 COURSE OF THE OUTBREAK

On Saturday March 14, ten days after the infection of the index patient had been found, another eight residents with risk factors proved to be MRSA-positive. They resided in four of the five remaining departments. In two homes for elderly belonging to the same foundation, three residents were found to have been infected with MRSA as well. Thus, the outbreak now included 29 colonised persons: 9 employees and 20 residents. All cases were treated according to the protocol. On Monday March 16, the outbreak-control steering committee planned the strategy for the service flats: the co-ordination of additional screening, the arrangements for monitoring by means of cultures, the setting up of treatment clusters, the organisation of disinfection of rooms and other areas, the cancellation of all admissions and the dissemination of information. Since the result of the counter-expertise was expected on Tuesday March 17, it was decided to halt the screening of an additional 500 people (the remaining residents of the nursing home and the service flats, other employees and the volunteers at the various departments) who had not yet had samples taken. They would be considered for further investigation if contamination should also appear to have occurred in the other parts of the nursing home.

The counter-expertise

On Tuesday March 17, the counter-expertise at the PHL showed the 15 isolates analysed to be meticillin-sensitive \textit{S. aureus}. Because of these findings, the outbreak-control steering committee postponed all new activities until the results of the tests by the RIVM would be known as well, which were expected to become available the next day. On Wednesday March 18, two weeks after the first resident had been diagnosed as MRSA-positive, routine analysis by the RIVM also identified only meticillin-sensitive bacteria. The 15 isolates examined all had different phage types, which does not suggest a MRSA outbreak, but is rather consistent with various common strains of human \textit{S. aureus}.

Because of these results, it seemed beyond doubt that the MRSA outbreak did not exist, and the outbreak-control steering committee decided to lift all interventions, except the treatment of 11 patients. The residents, the employees, the general practitioners, the municipal authorities, the press, the LCI and the RIVM were informed of these developments. On Thursday March 19, the PCR revealed that the bacteria lacked the \textit{mecA} gene. Furthermore, none of the follow-up cultures demonstrated MRSA.
7.7 DISCUSSION

As far as the employees were concerned, more rigorous measures than indicated by the MRSA protocol were implemented in several situations. As the spread of the outbreak seemed extraordinary, hand hygiene in the nursing home was intensified by disinfection with alcohol under all circumstances, and not only when attending to colonised residents. Although the wearing of surgical masks was not required while nursing MRSA-colonised residents, it was nevertheless put into practice in view of the number of MRSA-positive employees. As a result of the unusual situation, microbiological examination included the staff as well.

Good collaboration within a multidisciplinary MRSA outbreak-control steering committee, which included external specialists from the start, resulted in an appropriate response to the crisis. This alleged MRSA outbreak had very serious consequences for both the residents and staff of the nursing home, while the employment of additional staff and equipment, together with the costs of the microbiological analyses, led to a high financial burden.

It should be noted, however, that incorrect identification of MRSA is not restricted to this incident. Proficiency testing programmes in Canada have shown that MRSA has not always been identified accurately. A questionnaire-based survey conducted in Germany revealed that approximately one-third (8 of 22 respondents) of laboratories applied inadequate methods for the identification of MRSA [Peters et al., Second Symposium on 'Infektionsmanagement', Berlin 1998]. In the Netherlands and the neighbouring country where the isolates were misidentified, proficiency-testing programs are obligatory, but data regarding the outcome (including MRSA identification) are not made public. A survey by Streulens and Mertens, with voluntary participation, indicated adherence to MRSA detection methods, but only 34% of all laboratories performed disk diffusion testing under optimal conditions for the detection of heterogeneous resistance.

This alleged outbreak prompted the IGZ to discuss the subject in a circular sent to the directors of health care facilities, microbiologists and laboratories, dated July 16, 1998. The Inspectorate emphasised once more the importance of standardised quality and accurate interpretation of laboratory results by microbiological experts. This warning by the Inspectorate should be kept in mind when contracting foreign laboratories. This is particularly important in the Netherlands, where, unlike in other countries, the policy is to avoid MRSA in intramural settings. This report also reminds us that verification of diagnosis may be an essential step in outbreak management.
7.8 REFERENCES

De bacteriën komen

Sproei-installaties, slappe winters en bloedtransfusies bieden micro-organismen een buitenkans. De geïndustrialiseerde samenleving verliest terrein op de ziektekiemen.

De hardnekigheid van infecties

Door onze redacteur

Nederland vreest virus-aanslag

Nederland beter opdagen tegen bioterreur

Mug met dodelijk virus kwelt New York

In het verleden heeft de griep al vele miljoenen mensen gekweld en teweer. Er bestaat een grote kans dat de opnieuw massaal toesaalt, meent viroloog Winzaard. Nederland is daar dus goed voorbereid op griepexplosie.


Regio heeft draaiboek voor massavaccinatie

Een draaiboek 'massavaccinatie pokken' moet in Zuid-Limburg in werking worden gesteld voor de tweede opeenvolgende ziektekiemen. De regio heeft draaiboek voor massavaccinatie, maar ziektekiemen worden gehandhaald indien landelijk wordt besloten tot een massavaccinatie.


In de regio Parkstad Limburg heeft de Griekse overheidszaken van de ziektekiemen nog beter gedaan, omdat landelijk wordt besloten tot een massavaccinatie. De regio heeft draaiboek voor massavaccinatie, maar ziektekiemen worden gehandhaald indien landelijk wordt besloten tot een massavaccinatie.

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Heerlen: gevolg van grotere alertheid bevolking en instellingen

Ontbreken en rookwekkende golf na explosie

Heerlen: gevolg van grotere alertheid bevolking en instellingen

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De schrik over de longziekte SARS zit er goed in, al is het virus voor een echte epidemie waarschijnlijk te zwak. Maar landelijk is afgesproken met negatief revisieadvies af te kondigen dat er al dan niet in één van de verspreidingsgebieden. Ik kan me de ongerustheid voorstellen, ze zoekt de haard op. Maar landelijk is afgesproken met negatief revisieadvies af te kondigen dat er al dan niet in één van de verspreidingsgebieden. Ik kan me de ongerustheid voorstellen, ze zoekt de haard op. Maar landelijk is afgesproken met negatief revisieadvies af te kondigen dat er al dan niet in één van de verspreidingsgebieden. Ik kan me de ongerustheid voorstellen, ze zoekt de haard op.