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ADMITTED IN INTENSIVE CARE UNITS:
ETHICAL CONSIDERATIONS**

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Screening for the Detection of Methicillin-Resistant *Staphylococcus Aureus* Carriers Admitted in Intensive Care Units: Ethical Considerations

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Abstract

The high prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in Romania and the emergence of community acquired methicillin-resistant *S. aureus* (CA-MRSA) highlights the need for special approaches for the prevention of MRSA transmission. These special approaches consist in performing a screening for the detection of the MRSA carriers in patients admitted in services where there are individuals with high risk of infection (with prosthetic devices, after surgery, severely ill). The screening includes nasopharyngeal culture followed by the isolation of the patients until the result of culture, associated with measures of infection control. These interventions raise the following ethical considerations: the need for informed consent, limitation of personal liberty, consequences on individual rights, analysis of quality improvement characteristics of the activity in health care, identification of financial resources, publication of some specific results of the screening.

Keywords: *Staphylococcus aureus*; infection control; ethical considerations; public health.

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Introduction

In the past 20 years the epidemiology of severe infections suffered a major modification with an increasing involvement of Gram-positive bacteria. This etiological profile is specific mainly to systemic infections where Gram-positive are isolated in 70% of cases and, also, to post-surgery infection. In the same period of time methicillin – resistance (MRSA) and the emergence of vancomycin – intermediate (VISA) isolates of *S. aureus* and fully vancomycin –resistant strains has become a worrying reality. Staphylococci remain pathogens extremely virulent, at the origin of an important and divers morbidity being involved in hospital-acquired and, also, in community-acquired infections. The resistance to the major classes of antibiotics (betalactams, fluoroquinolones, glycopeptides), resistance which is multiple, transmissible and heterogenous has a great impact to the morbidity and mortality of staphylococcal infections and threatens the options of therapy in the future.

Clinical importance of MRSA

S. aureus produces a wide variety of pathologies: skin and soft tissue infections, invasive infections (osteomyelitis, endocarditis, bacteremias, etc), and toxin mediated syndromes (toxic shock syndrome, scalded skin syndrome, staphylococcal food poisoning, purpura fulminans). Methicillin-resistance, identified in 1961, emerged in many areas but with considerable variations in the prevalence between institutions, and between geographic areas. The highest prevalence in Europe, was seen in hospitals in Portugal (54%) and Italy (43-58%), whereas the lowest prevalence was observed in hospitals in The Netherlands, Scandinavian countries and Switzerland (<2%). In general, the prevalence was very high in hospitals from Mediterranean countries (>40%), and intermediate rate of prevalence were registered in Poland (4-30%), Austria (21%), Belgium (25%), Great Britain (28%). The rate of methicillin resistance in Romania in 2007 was 39% in Bucharest, and very high in Timisoara - 53% and in Iasi -56% (Cochior et al., 2008; Miftode et al., 2007; Popescu, et al., 2008).

The emergence of MRSA strains was a characteristic of hospital - acquired infections, but recent data, reveal that the normal microflora from the skin or mucous membrane may represent an important reservoir for the antibiotics resistant strains, and the transfer of resistance elements may appear in these complex microbial communities. Consequently, MRSA could appear ‘de novo’ in community -acquired strains by horizontal acquisition of *mec A* gene.

In intensive care units (ICU) the level of nasal colonization with MRSA vary between 8 and 35% and postoperative wound colonization between 30 and 82%

(Mishal et al., 2001). The major tendencies in the epidemiology of community-associated MRSA are: an increasing prevalence in hospitals, the capacity to produce very severe infections (necrotizing fasciitis, pyomyositis, “pelvic syndrome”- hip septic arthritis, pelvic abscesses, trombophlebitis in children, Waterhouse–Friederichsen syndrome, rapid progressive pneumonia, ocular infections), pattern of susceptibility which is different from a region to other, transcontinental transmissibility of community-acquired MRSA considered to be specific to a certain continent (Diep et al., 2008, O’Hara et al., 2008). Colonized or infected persons could be considered vehicles and reservoirs of MRSA that can be introduced in ICU and in surgery services where are admitted immunosupressed patients and individuals with prosthetic devices-persons susceptible to develop staphylococcal infections. Transfers between hospitals may contribute to the dissemination of the resistant germs in other services with disastrous consequences on the methicillin-resistance rate.

The prevention of MRSA transmissibility

A strategy for the reduction of antibiotic resistance in *S. aureus* includes the identification of colonized or infected patients from the admission in order to implement appropriate precautions to prevent spread of MRSA. One of the infection measures is active screening culture consisting of cultures from nares. It is recommended to place the patient on contact precautions while awaiting culture results unless there is a strong suspicion that the person has MRSA based on clinical or epidemiological criteria: single-patient room, use of clean nonsterile gloves, gown, perform hand hygiene after glove and gown removal, etc (Harbarth et al., 2006). Policies type “search and destroy” could reduce the endemicity of MRSA <1% in 6-12 years but combined interventions are most likely to be successful (Bootsma et al., 2006). Such screening programs are difficult to perform and raise the following ethical considerations: indication for informed consent, the right to private life and personal autonomy, defining quality improvement methods in health-care, identification of financial resources, feasibility and publication of the data regarding local specificity.

Principle of informed consent

Health-care sector should ensure that the patient is aware of the rationale for restrictive measures and for the benefit of compliance (if the result of the culture is positive decontamination could be performed) and the consequences of noncompliance. Decontamination of MRSA is recommended in the following situations: (1) patients with MRSA recurrent infections despite an adequate treatment, (2)

limitation of MRSA diffusion in vulnerable groups, (3) carriers of MRSA with recent exposure to the health care system or with substantial risks of future hospitalization. The importance of these activities is underlined by recent studies which suggest that 33% of patients with newly acquired MRSA develop invasive disease in the ensuing 12 months, with a 27% risk in the second year of carriage and a 16% risk thereafter. Individuals who have harbored MRSA for >1 year are, also, at high risk for subsequent MRSA morbidity and mortality (Datta et al., 2008). In UK, the national effort for implementation of basic infection control measures was associated with a dramatic reduction of MRSA (> 50%) over 2 years (Edgeworth, 2011). Compulsory testing must remain as a final resort and it could be done if the less restrictive measures remain without results. The management plan of the detection and isolation of colonized or infected patients must be done by a group of experienced persons (infection diseases specialist, microbiologist, epidemiologist) who must evaluate the importance of the implementation of MRSA detection policies in certain services. Researches that analyze public benefit and involve no more than a minimum risk for human subjects are excepted from the informed consent. Contact precautions and active surveillance culture of MRSA may be considered standard of medical care, so it is sufficient the signed informed consent at the admission and this will include the screening for drug-resistant germs.

The right to private life and personal autonomy

The screening also poses privacy risks and collected information must be confidential (traveling in endemic areas - North America, contacts with persons infected with MRSA, history of colonization or recent infections with MRSA, antibiotic treatments in the previous 12 months, etc) (Nathwani et al., 2008). Only in some crisis situations, when use of the information for the benefit of the public health is necessary, a minimum of data could be exposed, but with the protection, as much as possible, of the person in cause. Maintaining corporal integrity, a basic request of research ethics doesn't rise any problem when performing the pre-emption of nasal swab except some particular situations such as preexistent lesions that contraindicate this intervention.

Limitation of individual liberty

The period of isolation and quarantine until the culture results are available could determine a status of discomfort and depression because of the reduction of contact with medical staff and family, with negative influences on the patient compliance (<http://ohsr.od.nih.gov/guidelines/45cfr46.html>. Accesed on 4.01. 2009).

Defining quality improvement methods in health-care

Quality improvement activities in health-care are systematic, data-guided activities designed to bring immediate improvement in health-care delivery in certain services. Both clinicians and patients have an ethical responsibility to participate in activities of quality improvement. Even if the majority of quality improvement activities are not human subject research such methods must be supervised by professionals in clinical practice: they have to define key characteristics of the projects and to classify it as quality improvement, or human subject research or both. Patients must be informed about the importance of active surveillance cultures in improving quality of health care; consent to receive care should include consent to participate in routine, minimal-risk quality improvement activities (Astărăstoae, 2007; Lynn et al., 2007).

Feasibility and identification of the financial support

Implementation of screening methods and isolation to control MRSA transmission is an activity that requires resource allocation, a qualified personal, a laboratory which can provide all the tests and the existence of isolation rooms with one bed. The prediction of carriage at the admission could be formulated if the following conditions are present (for each – one point): (a) age > 80 years, (b) hospitalization in the previous 12 months, (c) antibiotic treatments in the previous 6 months, (d) urinary catheter at the admission. The probability of the carriage could be approximated as 8% if 0 points, 18% if 1 point, 31% if 2 points are present; this score could be used to select the population which is recommended to be tested at the admission (Harbath et al., 2008). Because resources constraints and logistical difficulties are likely to impede such a program, MRSA screening could be limited to the admission in the intensive care units where the proportion of vulnerable patients is very high and in neonate services (Azoică, 2008).

Publication of data

Special situations with the detection of very high rate of MRSA at the admission, or the detection of vancomycin resistant *S. aureus* impose publication of results for the benefit of health system in a certain area, because these findings require supplementary control measures of the resistant pathogen. This activity is an ethical and professional duty that impose to preserve the confidentiality of patients data (Santos et al., 2008).

Conclusions

The accurate detection of incidence of MRSA infections it is difficult to achieve and further studies are required to better understand the impact of control intervention of MRSA; more research is needed to establish whether and for which type of patients and settings MRSA screening offers more benefit than other general preventive measures. Epidemiological methods, rapid molecular tests, application of new decontamination regimens and restriction of some classes of antibiotics are promising strategies for limiting MRSA transmission. The screening of MRSA carriers at the admission could be included in the quality improvement activities, but performance of this test must be guided by ethical principles.

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