Hospitals

Policy for Methicillin-resistant *Staphylococcus aureus*

Dutch Workingparty Infection Prevention
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Introduction and definitions

Methicillin-resistant *Staphylococcus aureus* (MRSA) was first reported in 1961, less than 1 year after the introduction of methicillin [1]. The first MRSA epidemics were reported in the literature soon afterwards. An increase in the problem has been observed in Europe and the United States since the 1970s. In most countries the percentage of MRSA in hospitals is now higher than 20% [2, 3].[4]. Percentages greater than 50% have even been reported in some countries. Along with the Scandinavian countries, the Netherlands has proven capable of keeping the MRSA percentage to a minimum (<1%). This has been achieved partly thanks to the national policy described in this guideline. To ensure the success of such a policy, it is important that all the hospitals in the country comply with it.

The insensitivity of *Staphylococcus aureus* to methicillin is caused by the presence of the mec A gene. The presence of this gene makes these strains insensitive to all beta-lactam antibiotics. There are also varying degrees of sensitivity to aminoglycosides and many other groups of antibiotics. Methicillin resistance can be confirmed in the laboratory by means of sensitivity testing. The Dutch Society for Medical Microbiology has drawn up a guideline for this purpose. The National Institute of Public Health and the Environment (RIVM) carries out surveillance on the prevention of MRSA in the Netherlands. To this end, one isolate from each patient or staff member found to have MRSA is sent to the RIVM. In special cases, it is possible to have several isolates from one patient typed in consultation with the RIVM. The person submitting the isolates does not have to pay for the investigation.

MRSA in hospitals must be combated to prevent prophylaxis and treatment of S. aureus infections from becoming ineffective. Moreover, since the appearance of strains that are insensitive or have reduced sensitivity to glycopeptides, there is a very real danger of the development of even greater resistance [5-8]. These VRSA strains are difficult to impossible to treat with existing antibiotics. MRSA is just as virulent as methicillin-sensitive *Staphylococcus aureus*. Some MRSA strains spread more rapidly in hospitals than other strains, which can lead to hard-to-control epidemics.

On the one hand the fight against MRSA is focused on optimising the detection of MRSA by specifically searching for it, while on the other hand aiming to curtail the problem by implementing isolation measures when MRSA is found. Early identification of patients with MRSA is essential in order to be able to take measures as quickly as possible. Therefore, the hospital hygiene/ infection prevention department must be informed as soon as possible in the event of suspected MRSA. The hospital hygiene/infection prevention department can take measures immediately. Because patients admitted to foreign hospitals have a greater chance of being colonised with MRSA, it is important to take precautions for these patients as soon as they enter the hospital or nursing home. These precautions should also be taken for patients who have an increased chance of MRSA colonisation for other reasons. These measures are not necessary for patients transferred from Dutch hospitals or nursing homes unless an epidemic is occurring in the institution in question at the

time. For the time being, MRSA still occurs sporadically in Dutch nursing homes.

Staff who have worked in a foreign hospital or nursing home can also be colonised with MRSA, as can visitors who work in foreign hospitals.

Definitions

As a rule a distinction is made between colonisation and infection. Colonisation occurs when microorganisms grow after contamination. An infection occurs when the host experiences an (inflammatory) reaction with the accompanying symptoms as a result of colonisation. Colonisation of patients and staff members and the transfer of bacteria by the hands play an important role in the spread of *Staphylococcus aureus*. Therefore the fight against MRSA should not be limited to people with infections.

This guideline describes the measures that need to be taken to prevent the spread of MRSA in the hospital. We have tried to find a certain balance between the desired and practical feasibility of the measures to be taken. The measures described in this guideline should be viewed as a guide for the development of the local policy. With that, care should be taken to ensure that this guideline in no way leads to a patient with (suspected) MRSA not receiving the care he/she requires [9].

The current MRSA policy in the Netherlands has been pursued for more than 10 years. Surveillance carried out in the year 2000 showed that less than 0.3% of patients were carriers of the bacteria upon admission, which is reason to continue pursuing this policy.

Some of the measures described in this guideline are based on proper research. However, sometimes such data are lacking. Therefore, as far as a number of recommendations are concerned a survey was conducted among the users of the WIP guidelines. This method was used to try to find a policy for:

1. the period between discharge from a foreign hospital and admission to a Dutch hospital; the most commonly used value was 2 months
2. taking samples for culture to determine when to discontinue isolation
3. taking samples for control cultures from staff
4. discontinuing control cultures from people contaminated with MRSA.

For information on the specific implementation of isolation measures, please refer to the WIP guideline Isolation measures [10].

1 Risk categories

The risk of the presence of MRSA is not the same in all cases. Therefore, we distinguish between four categories:

1. proven MRSA carrier
2. high risk of being a carrier
3. moderately increased risk of being a carrier
4. no increased risk of being a carrier

In case of doubt, experts in the hospital (clinical microbiologist, infectious disease specialist or Infection Control Practioner (ICP) hospital hygienist) should be involved in the classification into a risk category. The difference between categories 3 and 4 in particular often requires consideration by experts.

The groups of patients or staff that fall into each category are shown in summaries 1 and 2 below.

1.1 Summary 1, Patients in each risk category

- Category 1
  - Patients demonstrated as being MRSA carriers.
- Category 2
  - Patients who were treated in a foreign hospital for more than 24 hours less than 2 months ago, or who had surgery or were given a drain or a catheter abroad, or who were intubated or have skin lesions, or possible sources of infection such as abscesses or furuncles/boils.
  - Foreign patients in the dialysis department (‘visiting dialysis patients’).
  - Patients from another Dutch hospital or nursing home, from a department or unit experiencing an MRSA epidemic that has not yet been brought under control.
  - Patients who were treated in the same room with an unexpected MRSA carrier.
  - Category 1 patients after being treated for carrying MRSA, whose control culture results are not yet known.
  - Adopted children have a higher chance of carrying MRSA. However, screening is only recommended if these children have an illness that requires them to be admitted to hospital or to visit an outpatients’ clinic on a regular basis. It is important to realise that being an MRSA carrier is not a disease in and of itself.
- Category 3
  - Dutch haemodialysis patients given dialysis abroad.

    - Patients during the first year following treatment for being MRSA carriers, with negative control cultures.
    - Patients cared for in a foreign hospital more than 2 months ago, who still have persistent skin lesions and/or risk factors, such as chronic respiratory or urinary tract infections. This should be determined by experts.

- Category 4
    - Patients cared for in a foreign hospital more than 2 months ago, unless they still have persistent skin lesions.
    - Patients cared for in a foreign hospital more than 2 months ago who have no persistent skin lesions and/or risk factors, such as chronic respiratory or urinary tract infections. This should be determined by experts.
    - Patients who spent less than 24 hours in a foreign hospital and did not have surgery or receive a drain or a catheter, who were not intubated and have no skin lesions or possible sources of infection such as abscesses or furuncles/boils.
    - Patients cared for in a department where one or more patients with MRSA are being treated, whereby adequate precautions have been taken.
    - Patients treated for being carriers, whose control cultures have remained negative for a year.

1.2 Summary 2, Staff in each risk category

This refers to staff who come into contact with patients or who work in departments where patients reside.

- Category 1
    - Staff proven to be MRSA carriers.
- Category 2
    - Staff who have had unprotected contact with MRSA carriers.
    - Staff admitted to a foreign hospital less than 2 months ago, who had surgery abroad, or were given a drain or catheter abroad, or were intubated or have skin lesions, or possible sources of infection such as abscesses or furuncles/boils.
- Category 3
    - Staff who have had protected contact with MRSA carriers.
    - Staff who worked in a foreign hospital or nursing home for more than 24 hours less than 2 months ago.
    - Staff who regularly work in a foreign hospital or escort patients from a foreign hospital to a Dutch hospital.

- Staff who have been carriers, and whose control cultures are negative, for 1 year after the control samples are cultured.

- Category 4
  - Staff who were successfully treated for being carriers more than a year ago, and whose cultures have remained negative for a year.
  - Staff whose cultures were negative following the last protected contact with an MRSA carrier (samples should be cultured during the first 3 weeks of isolation).

2 Measures for patients

2.1 Bacteriological examination

Within the framework of bacteriological examination, two types of culture can be used: screening cultures when MRSA is suspected or to rule out MRSA contamination, and control cultures after treatment for MRSA contamination.

☞ Samples should be cultured from:
- nose
- throat
- faeces (rectal swab) or perineum
- sputum, if coughed up
- urine (if a urinary catheter is present)
- skin lesions and wounds (including insertion openings)

☞ The first MRSA isolate from each person should be sent to the RIVM, where it will be examined free of charge to confirm or rule out MRSA and for national surveillance purposes.

In the event of epidemics, one strain should be sent from all contaminated people. In special cases, it is possible to have several isolates from one patient typed in consultation with the RIVM, for instance following readmission to hospital or during a long-term episode of negative cultures.

2.1.1 Screening cultures

The number of screening cultures depends on the method used in the laboratory.

☞ If no accumulation medium is used, all culture samples must be taken at least twice within 24 hours.

If an accumulation medium is used, one set of cultures is sufficient [11].

A cotton bud, which can be moistened with tap water or sterile physiological saline, should be used to make a smear of the mucous membranes.

☞ For patients with extensive wounds, additional attention must be paid to ensure that smears are made properly from all wounds.

2.1.2 Control cultures

☞ Control cultures are only indicated once carrier treatment has been completed. See section Treatment of MRSA-positive patients.

2.2 Measures for category 1 and 2 patients (proven MRSA carriers and high carrier risk)

☞ A category 1 or 2 patient should be cared for in strict isolation, in accordance with the WIP guideline Isolation measures [10].

☞ A mask should be worn while treating a patient in strict isolation.

☞ Staff should wear caps to prevent contamination of the hair.

☞ A long-sleeved coat with cuffs should be worn as protective clothing.

Fairly intensive skin contact can occur, particularly during activities such as lifting the patient.

☞ Screening samples should be cultured from a category 2 patient (see section Bacteriological examination).

☞ The patient should be cared for by the smallest possible set team of experienced nurses, and contact with other disciplines should be kept to a minimum.

☞ Staff with skin defects such as eczema or psoriasis may not come into contact with MRSA patients.

People with such skin defects are more likely to become colonised with staphylococci and are more difficult to treat.

☞ A list of staff who (have) come into contact with the patient should be drawn up.

For category 2 patients, the prescribed measures can be discontinued once the screening cultures are negative.

However, if the patient's condition changes, for example by administration of antibiotics or a change in the course of the disease, there is a chance that the MRSA cultures will still turn out positive. Therefore it is advisable to culture samples again in such situations. An expert should assess this risk for each situation.

2.3 Measures for category 3 patients (moderately increased risk)

Category 3 patients do not have to be cared for in isolation.

☞ Screening cultures should be taken upon admission (see section Bacteriological examination).

☞ Restraint should be exercised with regard to transfer, examination and treatment of the patient until the results of the cultures are known. Please note that the patient should always be given the care and treatment he/she needs.

☞ If the results of a culture are positive for MRSA, the patient is assigned to category 1.

If all cultures are negative, the patient may be regarded as category 4 and additional measures are no longer necessary.

2.4 Measures for category 4 patients (no increased risk)

No additional measures are required for category 4 patients.

2.5 Measures for patients unexpectedly colonised with MRSA

☞ Naturally, an unexpected MRSA-positive patient should be treated as a category 1 patient.

☞ Patients who have been in the same room with a patient with unexpected MRSA are considered category 2 patients and should be cared for in strict isolation. This can be done in cohort isolation if necessary.

Cohort isolation is defined as caring for several patients potentially contaminated with the same pathogen in the same room, and keeping them strictly isolated from the outside world.

In some departments, it is difficult to make a distinction between room and ward, for example the ICU or the CCU. In such departments the decision may be taken to immediately isolate all patients and to close the department to new admissions.

☞ Furthermore, screening cultures should be taken from all patients in the department and from staff who have been in contact with people in the department (see section Measures for staff, paragraph Screening cultures).

Admissions to the department should be kept to a minimum until the results of the cultures are known.

There will then be two possibilities:

1. All cultures are negative: discontinue isolation for all of these patients (category 4).
2. The cultures from one or more patients or staff are positive. In this case there is an epidemic. For additional measures, see section Proclaiming an epidemic.

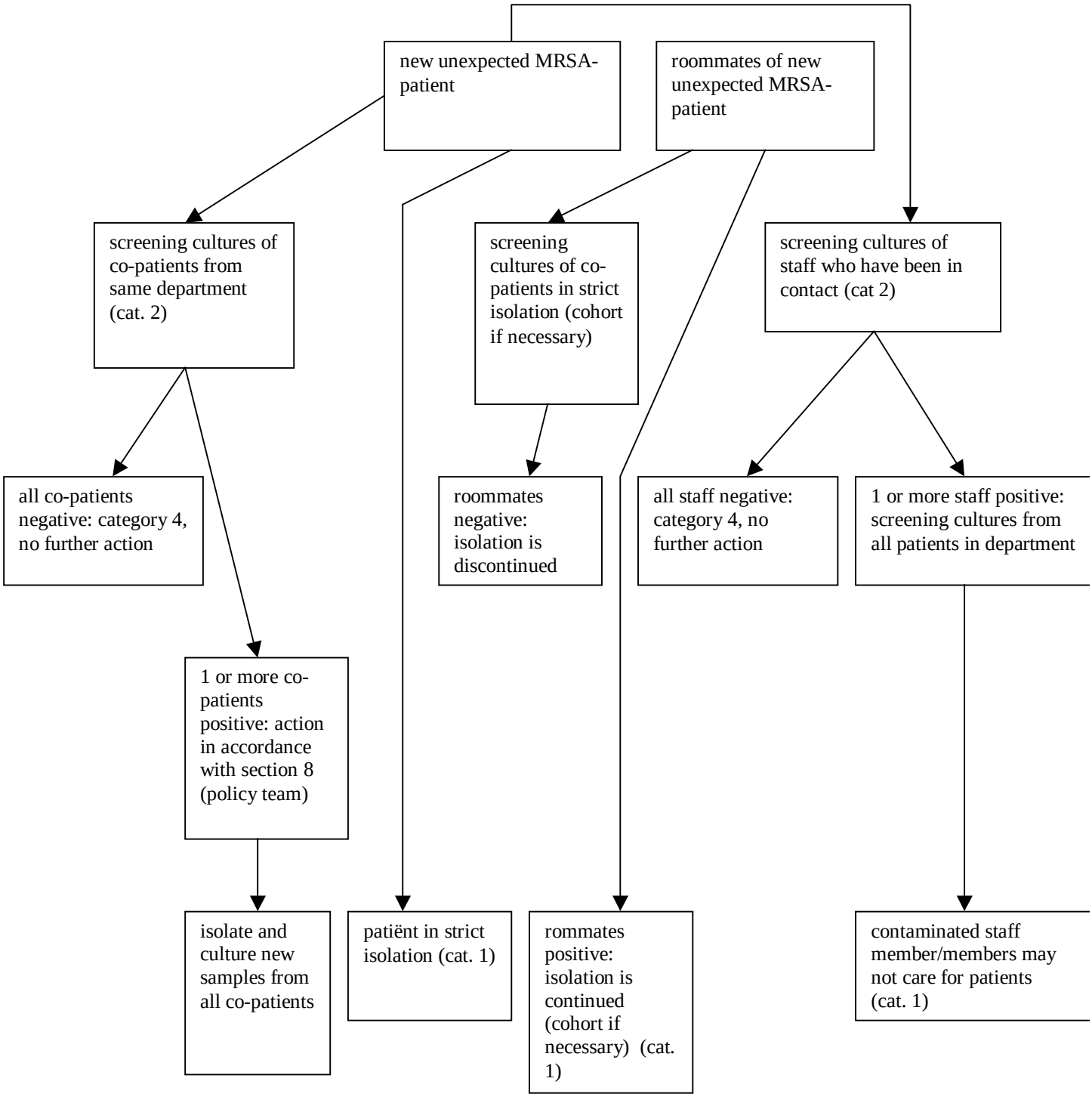
☞ If MRSA is found in patients who are not in isolation, the department should be closed to new admissions.

- ☞ The new MRSA-positive patients are considered category 1 and should be cared for in strict isolation, either individually or in cohort, and must be separated from the MRSA-negative category 2 patients.
- ☞ New samples should be cultured from the remaining patients. If these cultures are negative, the former roommates can be taken out of isolation.
- ☞ This procedure should be continued until the last non-individually isolated patients' results are negative.

For staff, see the section Measures for staff.

The diagram below shows the procedure for a new unexpected MRSA patient.

Figure 1: Procedure for new unexpected MRSA patient



2.6 Transfer of patients

☞ If possible MRSA transmission has occurred in a department, clear information must be provided beforehand when a patient is transferred to another department, hospital or nursing home.

Of course, if necessary, the rehabilitation clinic, home care, home for the elderly, and other parties involved in the chain of care must also be informed and advised.

3 Measures for outpatients' clinic and accident & emergency department

The general practitioner can play an important role by taking screening cultures before referring the patient to an outpatients' department. The hospital will then have to make arrangements with the general practitioners who refer the patients to the hospital. The general practitioners will have to be kept informed on the policy.

☞ Visits to outpatients' clinics by category 1 and 2 patients should be scheduled for the end of the day as much as possible. There must be enough time afterwards to thoroughly clean and disinfect the room. The patient should be taken to a room immediately and may not sit amongst the other patients in the waiting room.

4 Treatment of MRSA-positive patients

4.1 Treatment of carriers

Treating a carrier is only useful if the patient has no infections, no wounds (including IV lines) and no skin defects (eczema).

4.1.1 Skin and hair disinfection

☞ The skin and hair should be disinfected by washing with povidone-iodine shampoo or a chlorhexidine soap solution every day for 5 days.

4.1.2 Nose disinfection

☞ The nose should be treated with mupirocin nasal ointment.

The ointment should be applied in the Vestibulum nasi, or nose picking area, 3 times a day for 5 days. The application should then be discontinued and control cultures taken 48-96 hours afterwards. If the cultures are still positive, a doctor with specific knowledge of infectious diseases (clinical microbiologist or infectious disease specialist) should be consulted.

It would be irresponsible to apply mupirocin for more than 5 days unchecked in view of the possible selection of resistant strains.

4.1.3 Treatment with systemic antimicrobial drugs to combat MRSA

A doctor with specific knowledge of infectious diseases (clinical microbiologist or infectious disease specialist) should be consulted if a systemic antimicrobial therapy is chosen.

After treatment of the patient, one can never be entirely certain that the MRSA has disappeared. If control cultures (3 sets of negative cultures, taken at 7-day intervals) remain negative and the patient's condition is reasonable, isolation can be discontinued. However, if the patient's condition changes, for example by administration of antibiotics or a change in the course of the disease, there is a chance that the MRSA cultures will be positive again. Therefore it is advisable to take new culture samples in such a situation and to consider putting the patient in isolation until the results of the cultures are known. An expert should assess this risk for each situation.

4.1.4 Unsuccessful carrier treatment

Carrier treatment can be unsuccessful for a number of reasons, such as a source outside the hospital. In that case, a doctor with special knowledge of infectious diseases (clinical microbiologist or infectious disease specialist) should be consulted.

4.2 Treating patients with infections

☞ MRSA patients with infections should be treated in consultation with a doctor with special knowledge of infectious diseases (clinical microbiologist or infectious disease specialist). This also applies to MRSA patients infected with microorganisms other than MRSA.

4.3 Patient information

☞ The attending physician should inform the patient on the reason for the extra measures that have to be taken during hospital admission and visits to the outpatients' clinic.

5 Discontinuing isolation measures

☞ Isolation measures cannot be discontinued until it can be reasonably assumed that the patient is MRSA-negative. This is possible when the control cultures (at least 3 times with 7-day intervals) remain negative and when none of the risk factors below are present anymore [11]:

- the use of antibiotics
- skin defects, such as wounds, eczema or psoriasis
- drains, catheters, intravascular lines.

6 Discharge of a patient colonised with MRSA

- ☞ The general practitioner and other care providers such as ambulance staff must be informed of the fact that the patient is contaminated with MRSA.
- ☞ Data exchange is necessary in order to be able to pursue the MRSA policy successfully. Therefore, the attending physician and the infection prevention department (if present) must be consulted before the patient is discharged to a nursing home, psychiatric institution or other hospital [9].
- ☞ The patient's case history, including any outpatient history, should mention that the patient is or has been contaminated with MRSA.
- ☞ This can be mentioned in the case history itself. However, it is better to pass this information on by means of the Hospital Information System (HIS).
- ☞ The patient's room must be cleaned and disinfected thoroughly as described in the WIP guidelines Isolation measures and Cleaning and disinfection of rooms, furniture and objects [10, 12].

7 Measures for staff

7.1 Bacteriological examination

Bacterial examination can be divided into screening cultures and control cultures. In both cases, preferably before the shift commences, samples should be cultured from the nose, throat, perineum and any skin lesions such as eczema. In general it cannot be certain whether culture samples taken by the staff member himself/herself are taken correctly.

7.2 Screening cultures

The extensiveness of the investigation among staff depends on the findings at the time.

If the patient was only in the department for a short period of time, a 'ring investigation' may be chosen. This investigation is then only indicated for the staff members that had the closest contact with a patient contaminated with MRSA, such as staff members who provided direct nursing or medical care, or physiotherapists.

If the patient was in the department for a longer period of time, it is recommended that culture samples be taken from all the staff in the department. Staff members from outside the department itself who had contact with the patient are often difficult to identify at such a late stage. In this case, a situation-specific policy should be determined by experts (MRSA committee).

7.3 Category 1 staff

7.3.1 Staff with MRSA, with skin defects

☞ Staff members diagnosed with MRSA who also have skin defects may not work.

On the day the staff member is found to be MRSA-positive (day 1), culture samples should again be taken from the throat, nose and any skin defects. Furthermore, carrier treatment should be initiated on the same day, consisting of skin and hair disinfection and treatment of the nose with mupirocin ointment, as described for patients in paragraph 4.1.

☞ Control cultures should be taken on the 10th, 15th and 20th day. The staff member may not resume working until all 3 sets of control cultures are negative.

7.3.2 Staff with MRSA, without skin defects

☞ Staff members diagnosed with MRSA and who have no skin defects may not work for 2 days. Treatment should be initiated immediately.

On the first day the culture is known, before commencing treatment, culture samples should again be taken from the throat and nose. Furthermore, carrier treatment should be initiated on the same day, consisting of skin and hair disinfection and treatment of the nose with mupirocin ointment, as described for patients in paragraph 4.1.

☞ If the cultures from day 1 are positive on the 5th day, the staff member should again be banned from working temporarily. Subsequently, control cultures should be taken on the 10th, 15th and 20th day. The staff member may not resume working until all 3 sets of control cultures are negative.

If the cultures from day 1 are negative on the 5th day, the staff member may continue working. However, control cultures should still be taken on the 10th, 15th and 20th day.

☞ Cultures from treated MRSA-positive staff should proceed as follows:

- weekly for the first 3 months
- monthly after 3 months.

Culturing can be discontinued after a year.

This policy is not applicable with regard to transient colonisation.

7.3.3 Procedure in the event of unsuccessful treatment with mupirocin ointment

☞ If treatment with mupirocin ointment is not effective, the staff member should be referred to a doctor who specialises in this area.

7.4 Category 2 staff

☞ Category 2 staff may only work in their own department until screening cultures confirm that they are not MRSA carriers.

For practical members who have worked or been treated in a foreign hospital or nursing home the practical execution depends on the possibilities. This also applies to surgeons who have worked abroad for a short period of time, but more than a day. Culture samples can be taken from them on their first day of work.

☞ Further treatment of a category 2 staff member colonised with MRSA should take place in the same way as a category 1 staff member.

7.5 Category 3 staff

☞ Culture samples must be taken from a category 3 staff member. This staff member may be allowed to proceed with work as usual.

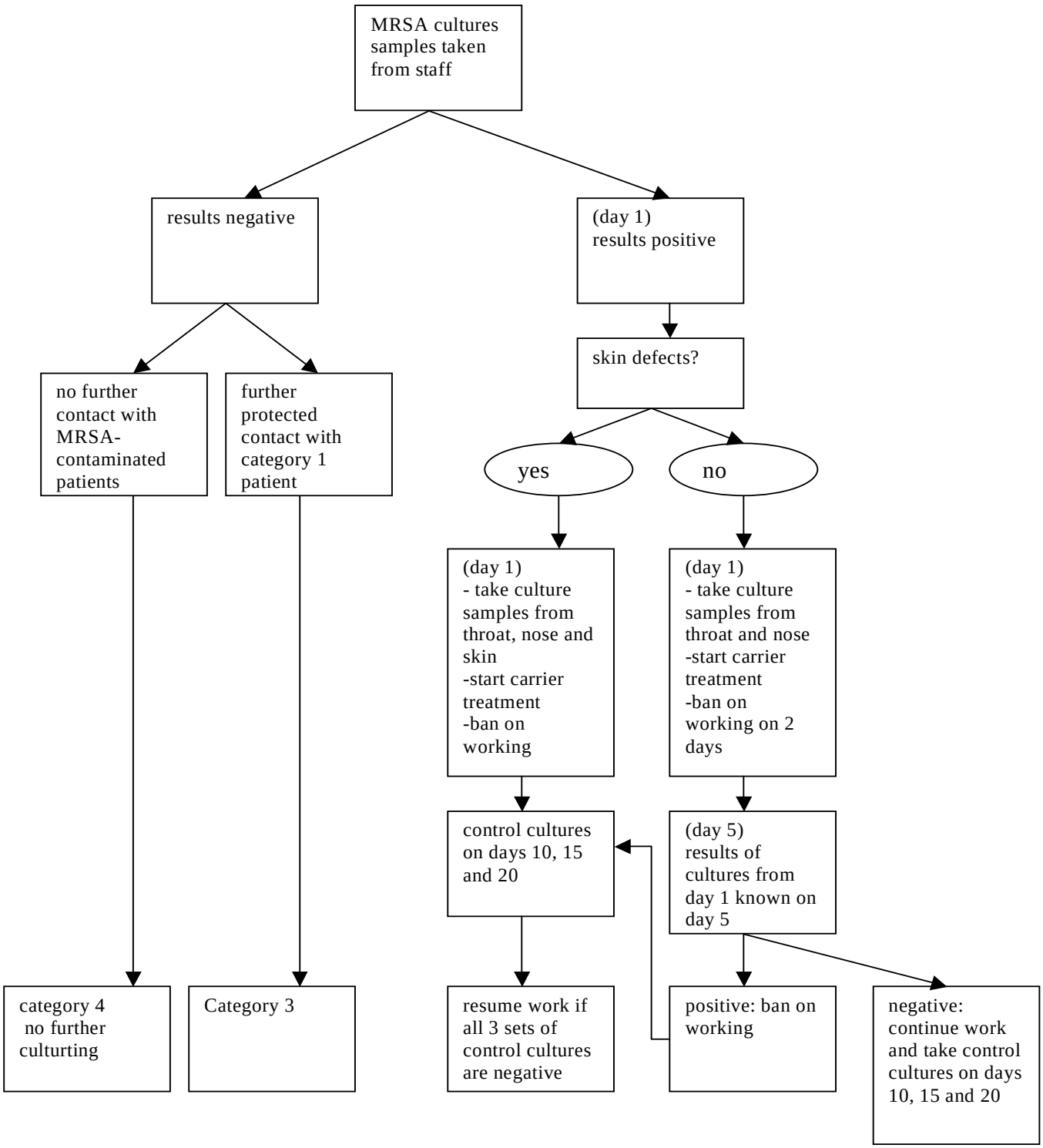
☞ Culture samples must be taken regularly from staff members who regularly work in foreign hospitals. The frequency should be agreed with the staff member in question beforehand, taking into account the work situation and degree of exposure. This staff member may be allowed to proceed with work as usual (see also 7.2).

7.6 Category 4 staff

No special measures are required for category 4 staff.

The diagram below shows the procedure for (potentially) contaminated staff.

Figure 2: Procedure for (potentially) contaminated staff



8 Proclaiming an epidemic

☞ By definition an epidemic exists if two or more patients in the hospital are colonised or infected with the same strain of MRSA. A policy team must then be formed in order to handle the situation effectively. This policy team should be put together as recommended by the infection committee and can consist of management representatives and staff members charged with day-to-day execution of the work.

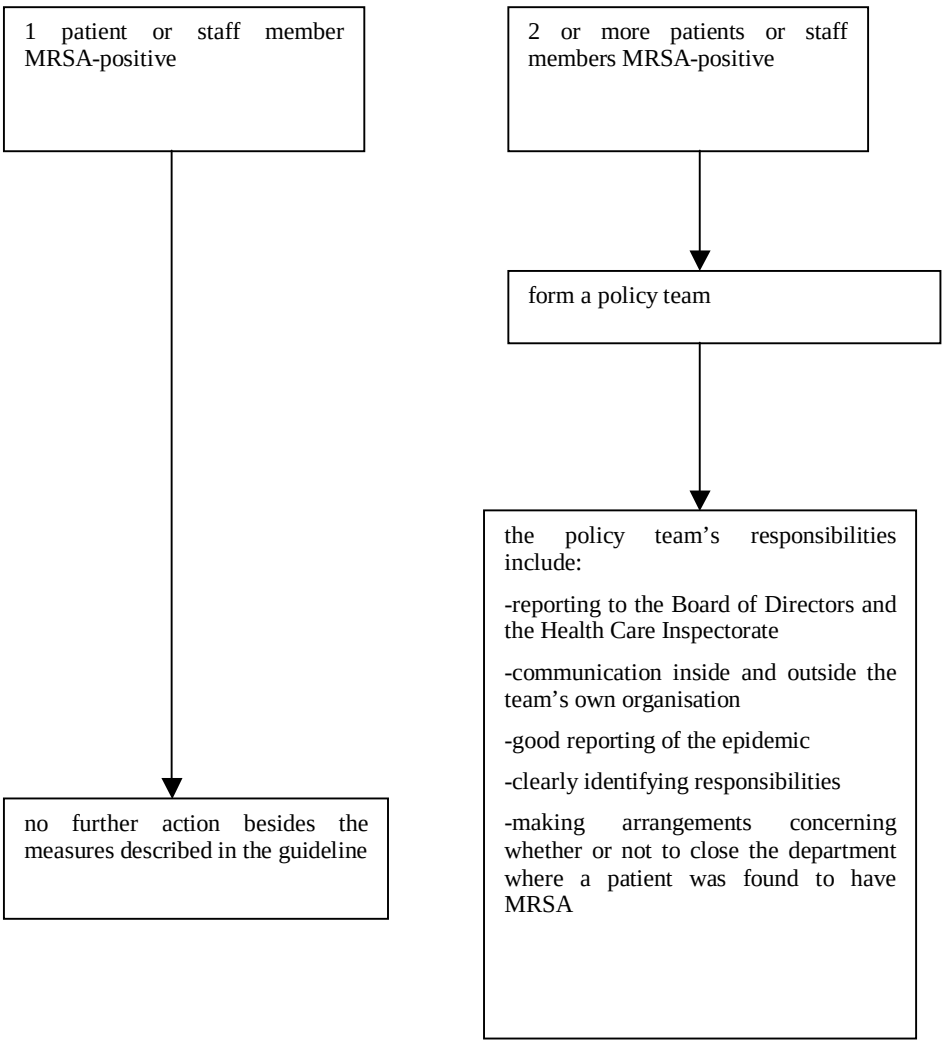
The measures to be taken by this team include organising cohort nursing and putting together a set group of nurses, for example nurses already colonised with MRSA.

The policy team is responsible for the following:

- reporting to the Board of Directors and the Health Care Inspectorate
- communication inside and outside the team's own organisation
- good reporting of the epidemic
- clearly identifying responsibilities
- making arrangements concerning whether or not to close the department where a patient was found to have MRSA.

The diagram below shows the procedure for MRSA in the hospital.

Figure 3: Procedure for MRSA in the hospital



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