

Hospitals

MRSA Hospital

Infection Prevention Working Party
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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 [2]. 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% [3-5]. Percentages greater than 50% are even reported in some countries. The Netherlands and the Scandinavian countries have proven capable of limiting the percentage of MRSA (<1%). This is achieved in part thanks to a national policy, which is described in this guideline. To ensure the success of such a policy, it is important that all 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 incidence 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 must be combated in hospitals to prevent prophylaxis and treatment for *S. aureus* infections from becoming ineffective. Moreover, since the appearance of strains that are less sensitive or insensitive to glycopeptides, there is a real danger of even greater resistance developing [6-9]. 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 others, 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 searching for it specifically, while on the other, it is aimed at curtailing 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 if MRSA is suspected. The hospital hygiene / infection prevention department can then immediately take measures. Because patients who have been 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. These precautions are also necessary for patients who have an increased chance of being contaminated with MRSA for other reasons. These measures are not necessary for patients transferred from Dutch hospitals or nursing homes, unless there is an MRSA epidemic 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 is said to occur only once the host develops a (inflammatory) reaction with accompanying symptoms. Colonisation of patients and staff members and the transfer of bacteria via 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 must be taken to prevent the spread of MRSA in hospitals. We have tried to find a balance between the desirability 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. This taken into consideration, care should be taken to ensure that this guideline in no way leads to a patient with (suspected) MRSA not receiving the care that he/she requires [10].

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

Some of the measures given in this guideline are based on well-executed studies. However, sometimes such data are not available. Therefore, for a number of recommendations a survey was conducted among the users of the WIP guidelines. This was done to help define guidelines for:

1. the time between discharge from a foreign hospital and admission to a Dutch hospital; the most commonly used value was 2 months.
2. taking culture samples before discontinuing isolation
3. taking culture samples among staff members
4. discontinuing control cultures of people contaminated with MRSA.

For the specific implementation of the isolation measures, please refer to the WIP guideline 'Isolation measures'[11].

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 elevated risk of being a carrier
4. no elevated risk of being a carrier

In case of doubt, experts in the hospital (clinical microbiologist, infectious disease specialist or 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 and staff members that fall into each category are shown in overviews 1 and 2 below.

1.1 Overview 1, Patients per risk category

Category 1

- Patients demonstrated as being MRSA carriers.

Category 2

- Patients who were cared for in a foreign hospital for more than 24 hours less than 2 months ago, or who had surgery or who were given a drain or catheter abroad, or who were intubated, or who have skin lesions or possible sources of infection such as abscesses or furuncles.
- Foreign patients in the dialysis department (i.e. guest dialysis patients).
- Patients from a different Dutch hospital or nursing home, from a department or unit experiencing an MRSA epidemic that has not yet been brought under control.
- Patients who have stayed in the same room with an unexpected MRSA carrier.
- Category 1 patients after being treated for carrying MRSA, the results of whose control cultures are not yet known.
- Children who are adopted have an increased risk of carrying MRSA, but screening is only recommended if these children have an illness that requires them to be admitted to hospital or if they have to pay regular visits to the outpatients' clinic. In this context, it is important to realise that carrying MRSA is not a disease in itself.
- People who come into close contact with live pigs at pig farms in a professional capacity, and people who live at such pig farms.
- If screening takes place prior to admission to hospital and the results are negative, the patient is admitted in category 3 and he/she is screened again for carrying MRSA on the day of admission. No protective measures then have to be taken in category.

Category 3

- Dutch haemodialysis patients given dialysis abroad.
- Patients during the first year following treatment for carrying MRSA, 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.
- People who come into close contact with live veal calves at veal calf farms.

Category 4

- Patients who were cared in a foreign hospital more than 2 months ago, unless persistent skin lesions are still present.

- 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 have spent less than 24 hours in a foreign hospital who did not have surgery or receive a drain or catheter, who were not intubated and who have no skin lesions or possible sources of infection such as abscesses or furuncles.
- Patients staying in a department in which one or more patients with MRSA are being cared for, where adequate precautions have been taken.
- Patients treated for carrying MRSA, whose control cultures have remained negative for a year.

1.2 Overview 2, Staff in each risk category

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

Category 1

- Staff proven to be MRSA carriers.

Category 2

- Staff who have had unprotected contact with MRSA carriers.
- Staff members who were cared for in a foreign hospital less than 2 months ago, or who had surgery or were given a drain or catheter abroad, or who were intubated, or who have skin lesions or possible sources of infection such as abscesses or furuncles.

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 who 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 have been successfully treated for being carriers more than a year ago, and whose cultures have remained negative for a year.
- Staff whose cultures are negative following the last protected contact with an MRSA carrier (these cultures are taken during the first 3 weeks of isolation).

2 Measures with regard to 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 sites)

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

In the event of an epidemic, 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 [12].

A cotton swab, 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 multiple 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 with regard to category 1 and 2 patients (proven MRSA carriers and high carrier risk)

- ☞ A category 1 or 2 patient must be cared for in strict isolation, in accordance with the WIP guideline ‘Isolation measures’.
- ☞ A surgical mask must be worn while caring for a patient in strict isolation.
- ☞ To prevent contamination of the hair, staff must wear a cap.
- ☞ A coat with long sleeves and cuffs must 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 category 2 patients (see section ‘Bacteriological examination’).
- ☞ The patient should be cared for by the smallest possible regular team of experienced nurses, and contact with staff from other disciplines should be kept to a minimum.
- ☞ Staff with skin disorders such as eczema or psoriasis may not come into contact with patients with MRSA.

People with such skin disorders 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 patients should be drawn up. For category 2 patients, the prescribed measures can be discontinued if the screening cultures are negative.

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

2.3 Measures with regard to category 3 patients (moderately increased risk)

Category 3 patients do not have to be placed 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. Note that the patient must 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 can be regarded as category 4 and additional measures are no longer necessary.

2.4 Measures with regard to category 4 patients (no increased risk)

No additional measures are required for category 4 patients.

2.5 Measures with regard to patients unexpectedly colonised with MRSA

- ☞ Naturally, an unexpected MRSA-positive patient should be treated as a category 1 patient.
- ☞ Patients who have stayed in the same room with a patient with unexpected MRSA are considered category 2 patients and should be cared for in strict isolation. If necessary, this can take place in cohort isolation.

Cohort isolation is defined as caring for several patients potentially contaminated with the same pathogens in the same room.

In some departments it is difficult to distinguish between a room and a ward, e.g. the ICU or the CCU. Therefore, the decision may be made to care for all patients in isolation and to close the department to new admissions.

- ☞ In addition, 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 with regard to staff’, paragraph ‘Screening cultures’).

Admissions to the department should be limited until the results of these cultures are known.

There will then be two possibilities:

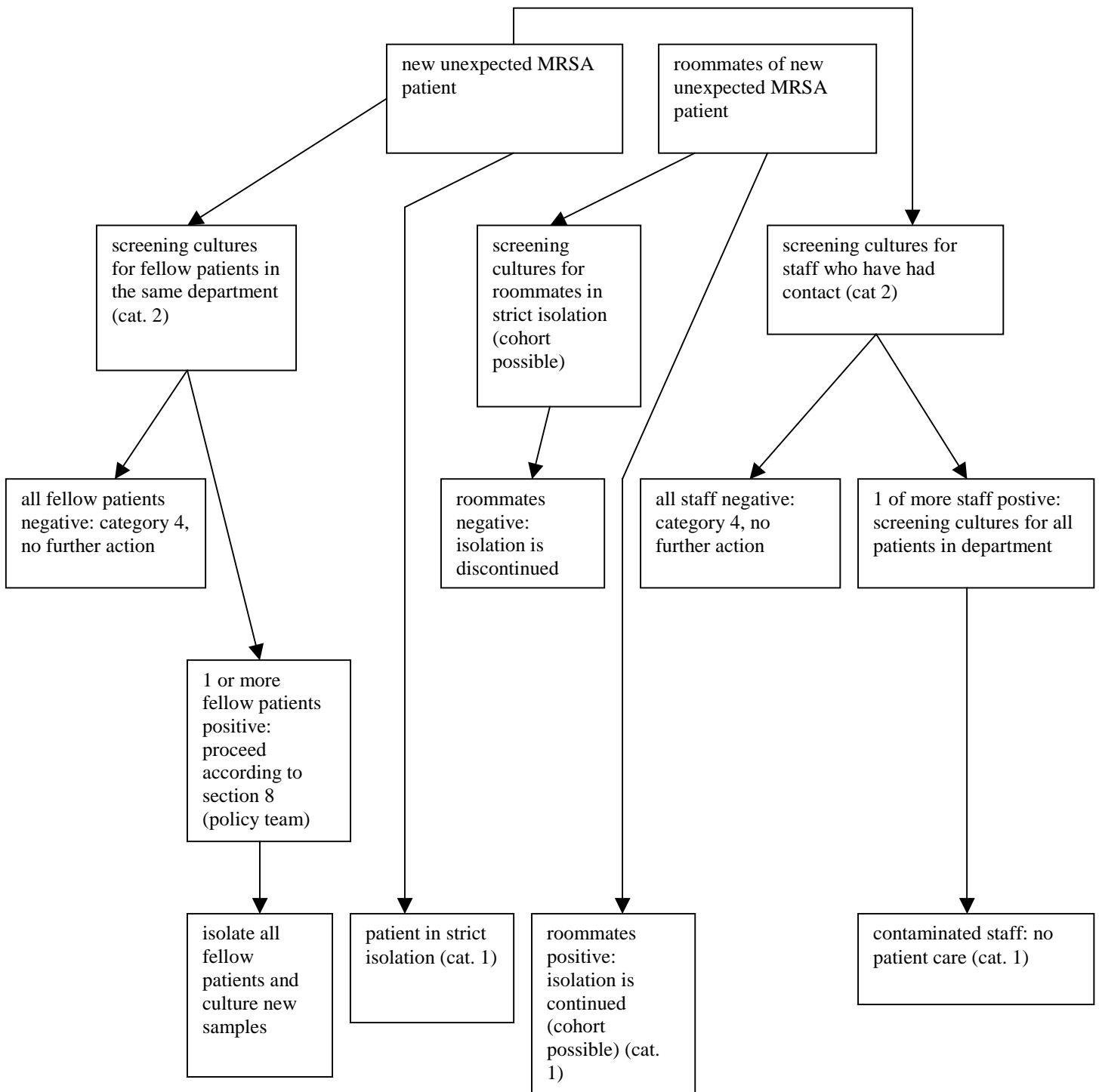
1. All cultures are negative: isolation is discontinued for all these patients (category 4).
2. The cultures from one or more patients or staff members are positive: In this case there is an epidemic. For additional measures, see section ‘Proclaiming an epidemic’.

- ☞ 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 assigned to category 1 and should be cared for in strict isolation, 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 results of the last non-individually isolated patients are negative.

For staff, see the section ‘Measures with regard to staff’.

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

Figure 1: Procedure for new unexpected MRSA patient



2.6 Transferring patients

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

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

- ☞ The general practitioner should inform the patient of the reasons for the additional measures that have to be taken during hospital admission to visits to the outpatients' clinic.

3 Measures for outpatients' clinic and accident & emergency department

The general practitioner can play an important role in taking screening culture samples before referring the patient to an outpatients' department. The hospital will then have to make arrangements with the general practitioners who are referring the patients to the hospital. The general practitioners will have to be kept informed of the policy.

See the WIP guideline 'Examination and treatment of patients in isolation' for the measures to be taken [1].

Category 1 and 2 patients are treated as patients in strict isolation, in accordance with the rules described in the abovementioned guideline.

4 Treatment of MRSA-positive patients

For the treatment of MRSA carriers, refer to the Dutch Working Party on Antibiotic Policy (SWAB) guideline for the treatment of methicillin-resistant *Staphylococcus aureus* carriers (www.swab.nl).

4.1 Treating patients with infections

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

5 Discontinuing isolation measures

- ☞ Isolation measures may not be discontinued until the patient can be reasonably assumed to be MRSA-negative. This is the case if the control cultures (at least 3 times with 7-day intervals) remain negative *and* if none of the risk factors below are still present

[12]:

- the use of antibiotics
- skin disorders 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 colonised 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 another hospital [10].

☞ The patient's case history, including any outpatient history, should mention that the patient is or has been contaminated with MRSA.

This can be done by means of a note in the case history itself. But it is better to pass the information on by means of the Hospital Information System (ZIS).

☞ The patient's room must be thoroughly cleaned and disinfected, as described in the WIP guidelines "Isolation measures" and "Cleaning and disinfection of rooms, furniture and objects" [11,13].

7 Measures with regard to staff

7.1 Bacteriological examination

Bacteriological examination can be divided into screening cultures and control cultures.

For screening cultures, samples are cultured from the nose and throat and any skin lesions such as eczema. For control cultures, samples are cultured from the throat, nose, perineum and any skin lesions or other sites which tested positive previously.

The culture samples should preferably be taken before the start of the shift.

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 (up to 10 days), a 'ring investigation' may be chosen. This investigation is only indicated for staff members who had the closest contact with an MRSA-contaminated patient, e.g. the attending nurse, staff who have provided medical care, or physiotherapists.

If the patient was in the department for a longer period of time, it is recommended that samples from all staff in the department be cultured. Staff from outside the department 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 disorders

☞ Staff in whom MRSA has been diagnosed and who also have a skin disorder may not work, i.e. they may not carry out any activities in departments in which patients are present.

On the day the staff member is found to be MRSA-positive (day 1), culture samples should again be taken from the throat, nose, perineum and any skin disorders.

Furthermore, carrier treatment takes place from this day. See the 'SWAB guideline for the treatment of methicillin-resistant *Staphylococcus aureus* carriers' (www.swab.nl).

☞ 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 disorders

- ☞ Staff members diagnosed with MRSA who have no skin disorders, may not carry out any activities for two days in departments in which patients reside. Treatment should be initiated immediately.

On the first day the results of the culture are known, cultures should again be taken from the throat, nose and perineum before commencing treatment. Furthermore, carrier treatment takes place from this day. See the 'SWAB guideline for the treatment of methicillin-resistant *Staphylococcus aureus* carriers' (www.swab.nl).

- ☞ 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.

The Working Party recommends that the staff member be tested one more time, three months after the last set of control cultures. Longer-term testing may be necessary in the event of skin disorders (e.g. eczema).

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 with expertise in this area.

7.4 Category 2 staff

- ☞ On returning to the Netherlands, a category 2 staff member who was admitted to a foreign hospital (see paragraph 1.2) may only resume working if screening cultures have shown that he/she is MRSA-negative.
- ☞ Screening samples are cultured for staff members who have had unprotected contact with an MRSA-positive patient. If these cultures are positive, this results in a ban from working, as in the case of a category 1 staff member.
- ☞ Further treatment of a category 2 staff member colonised with MRSA should take place in the same way as for a category 1 staff member.

7.5 Category 3 staff

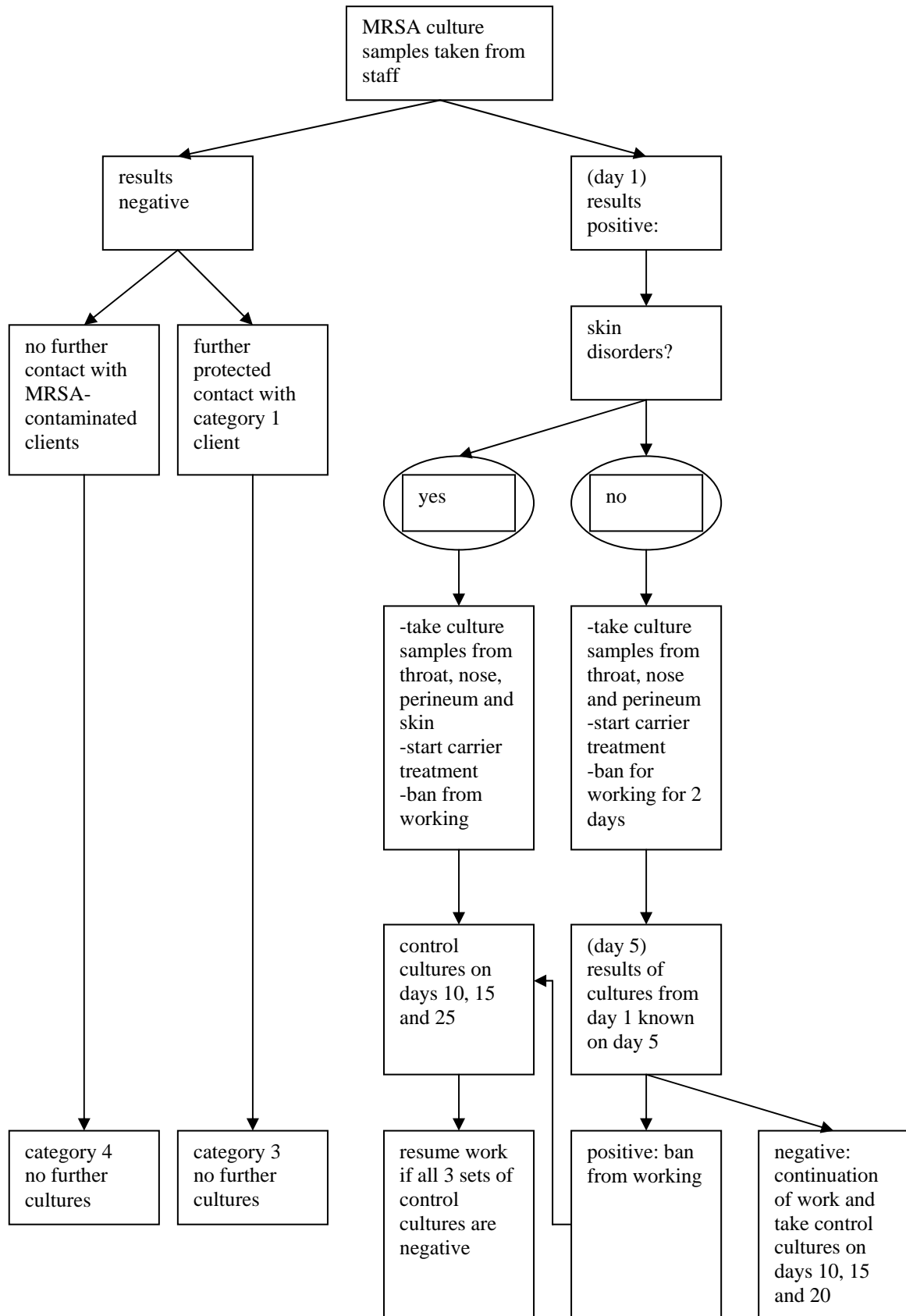
- ☞ Culture samples must be taken from a category 3 staff member. This staff member may continue to proceed with work as usual.
- ☞ Samples must also be cultured regularly from staff members who regularly work in foreign hospitals. The frequency must be discussed with the staff member in question beforehand, taking into account the work situation and the degree of exposure. This staff member may continue 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 is put together on the recommendation of the infection committee and can consist of representatives of management and staff members charged with the day-to-day execution of the work.

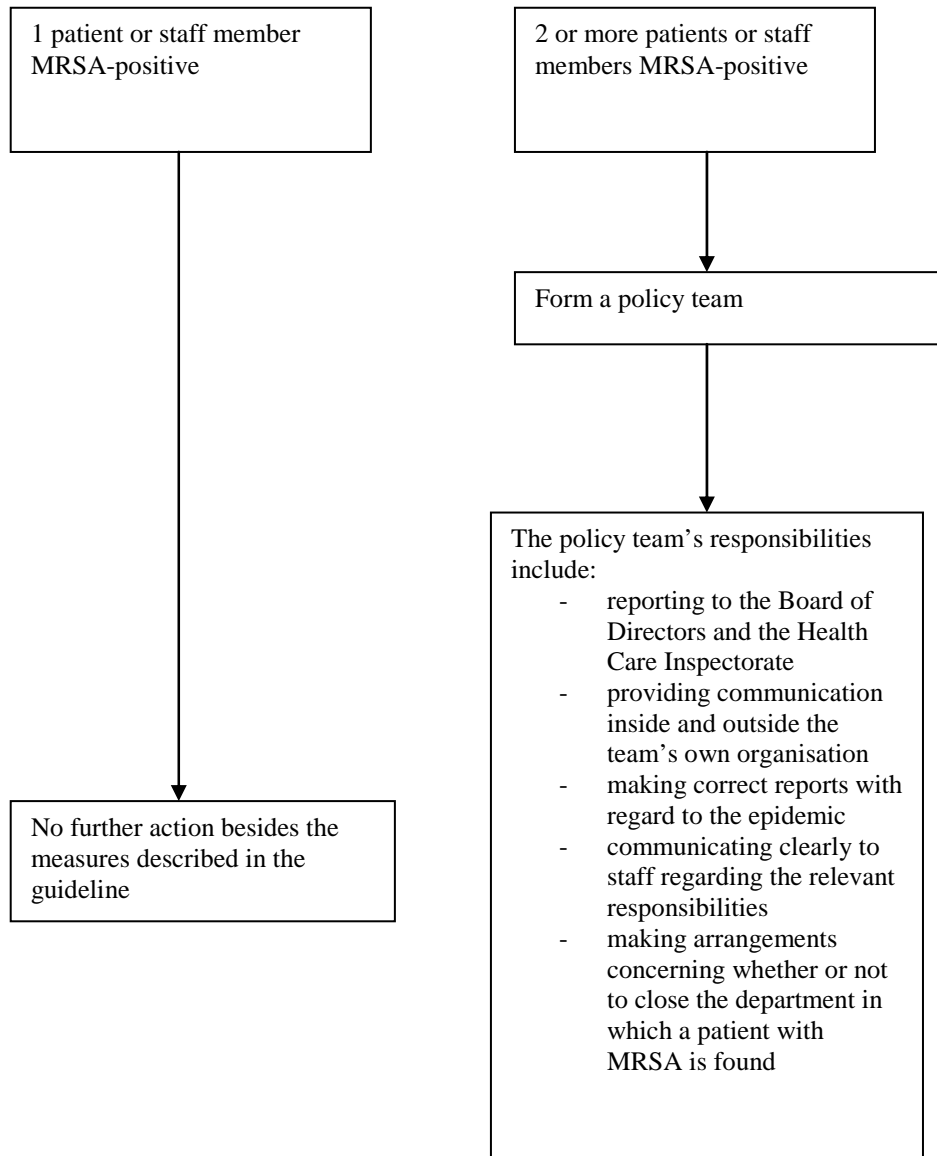
The measures to be taken by this team include organising cohort nursing and putting together a designated group of nurses, for instance nurses who are already colonised with MRSA.

The policy team is responsible for the following:

- reporting to the Board of the Directors and the Health Care Inspectorate
- providing communication inside and outside the team's own organisation
- making correct reports with regard to the epidemic
- communicating clearly to staff regarding the relevant responsibilities
- making arrangements concerning whether or not to close the department in which a patient with MRSA has been found

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

Figure 3: Procedure for MRSA in the hospital



Appendix A. References

- 1 W.I.P. Onderzoek en behandeling van geïsoleerde patiënten. 2004.
- 2 Jevons M. Celbenin resistant Staphylococci. *British Med Journal* 1961; i:124-125.
- 3 EARSS. *Staphylococcus aureus*. 2001;39-46.
- 4 Voss A, Doebbeling BN. The worldwide prevalence of MRSA. *Int J Antimicrobial agents* 1995; 5:101-106.
- 5 Wannet W, de Neeling A, Geubbels E. MRSA in Nederlandse ziekenhuizen: Surveillance-resultaten in 2000 en eerste resultaten moleculaire typeringen. *Infectieziekten bulletin* 2001; (12)3:82-85.
- 6 Hiramatsu KN, Aritaka H, Hanaki H, Kawasaki S, Hodoso I, Hori S et al. Dissemination in Japanese hospitals of strains of *Staphylococcus aureus* heterogeneously resistant to vancomycin. *Lancet* 1997; 350:1670-1673.
- 7 MMWR. Public Health Dispatch: Vancomycin-Resistant *Staphylococcus aureus*-Pennsylvania, 2002. *CDC-MMWR* 2002; 51(40):902.
- 8 MMWR. *Staphylococcus aureus* Resistant to Vancomycin. *CDC-MMWR Morbidity and Mortality Weekly Report* 2002; 51-26:565-567.
- 9 Tenover FC, Lancaster MV, Hill BC, Steward CD, Stocker SA, Hancock GA et al. Characterization of *Staphylococci* with reduced susceptibilities to vancomycin and other glycopeptides. *J Clin Microbiol* 1998; 36:1020-1027.
- 10 I.G.Z. Brief m.b.t. MRSA-beleid. 2002; IGZ 2002-07.
- 11 W.I.P. Isolatierichtlijnen. Richtlijn 4b 2001.
- 12 NVMM. Richtlijn Detectie van Meticilline resistente *Stafylococcus aureus* in Nederland. 2002.
- 13 W.I.P. Reiniging en desinfectie van ruimten, meubilair en voorwerpen. 2000.