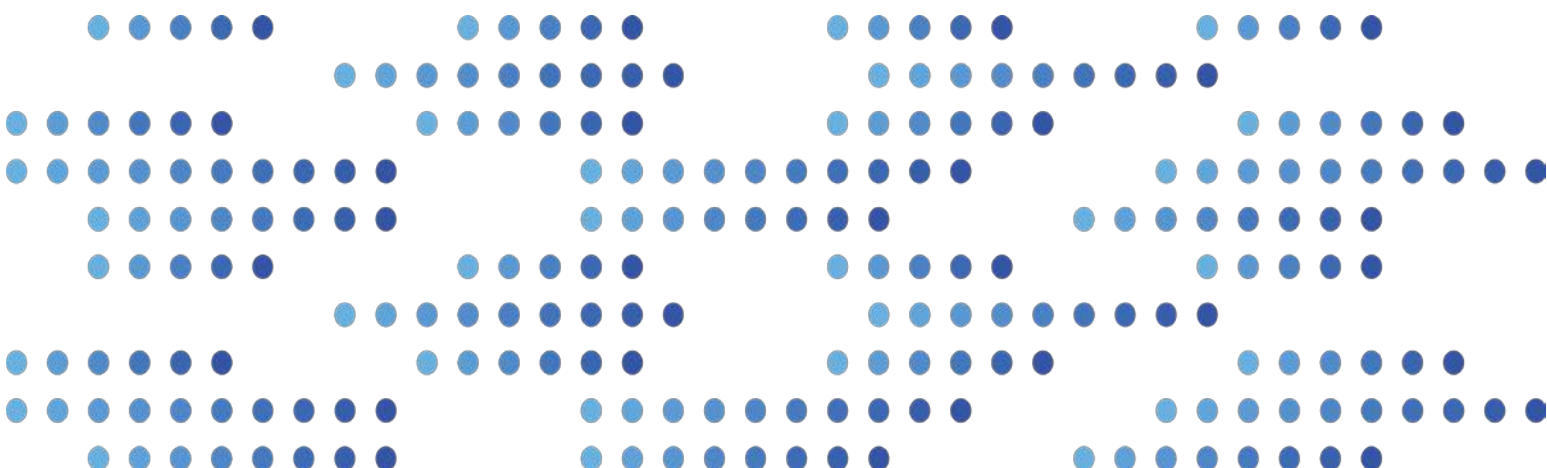




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Guidance on Preventing the Spread of MRSA

3RD EDITION



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Guidance on Preventing the Spread of MRSA

3rd edition

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1 Introduction

1.1 Introduction and reading guidance

This guidance is a revision of the Guidance on preventing the spread of MRSA, 2nd edition, published by the Danish Health Authority in 2012. The revision process has taken into account the experience of complying with the 2nd edition of the guidance and the development in the prevalence of MRSA. The most important changes are summarised below (section 1.3).

Chapter 2 describes the purpose etc., Chapter 3 the background and Chapter 4 the notification procedure.

Chapters 5, 6 and 7 describe the three procedures: Screening, treatment and control.

Chapter 8 on MRSA and healthcare staff is new and brings together the rules that apply when healthcare staff is examined and when they are tested positive for MRSA.

Like the last edition of the guidance, this edition also contains special chapters on LA-MRSA (livestock-associated MRSA) (previously called pig MRSA) (Chapter 9) and MRSA in newborns (Chapter 10). The information is divided into separate chapters as the conditions concerning the spread of infection and treatment are not the same.

The following tables describe:

- 1) The 4 general high-risk situations and the special high-risk situations (Table 1a, section 5.1.1 and Table 1b, section 5.1.2)
- 2) Times for control after treatment (Table 2, section 7.4)
- 3) Swabbing and isolation in connection with hospitalisation (Table 3, section 11.3).

The tables are included in the respective chapters, but are also available on the Danish Health Authority's website as separate documents.

In addition to the guidance on the Danish Health Authority's website, there are five separate, detailed infection hygiene documents for hospitals, assisted living facilities, home care and home nursing care, clinics as well as public health nurses on the SSI (Statens Serum Institut) website: <http://www.ssi.dk/smitteberedskab/infektionshygiejne.aspx>.

All documents appear from the list of appendices (Chapter 14).

1.2 Legal status of this guidance

A guidance from the Danish Health Authority is action-oriented. It explains and clarifies the requirements for care and conscientiousness made on healthcare staff in their work. In case deviations are made from the guidance due to special circumstances and a clinical estimate in the specific case, this should be documented in the patient records.

1.3 The most important changes in this edition of the guidance

- The target group and purpose of the guidance has been specified.
- A section has been added on how on to avoid stigmatisation (section 2.1) and it is emphasised that persons with MRSA have the same right to treatment as everybody else, and that examination and treatment, including surgery, may not be postponed only because a person is an MRSA carrier.
- It has been specified that the responsibility for treatment of carriage of index person as well as household lies in the general practice/MRSA units in accordance with local agreements (section 2.5.1).
- To emphasise the importance of complying with general infection hygiene guidelines, a section on hygiene is included in a new section 'Strategy of action' (section 2.2). Furthermore, the chapter on infection hygiene guidelines (Chapter 11) includes a separate section on 'The primary care sector in general' – in addition to the sections on 'Assisted living facilities' and 'Home care and home nursing care'. This section points out the fact that people are generally unaware of their carrier status and it is thus crucial to preventing spread that general infection hygiene guidelines are rigorously observed.
- Disclosure of health information is described in further detail so as to provide improved coherence between the issues of to whom information concerning MRSA status may be disclosed and the purpose of such disclosure.
- A special risk situation is added, which involves having worked on mink farms or being a household member of someone who has (Table 1b, section 5.1.2).
- Pig MRSA is now called LA-MRSA (livestock-associated MRSA).
- In the event of hospitalisation at certain psychiatric departments, it is now possible to dispense with asking about high-risk situations (section 5.2.2).
- Household members of persistently positive MRSA carriers no longer need to be swabbed every year. The department of clinical microbiology/infection hygiene unit/MRSA unit provides advice on the handling of persistently positive MRSA carriers.
- The chapter on healthcare staff starts with a definition of the relevant healthcare staff. The rules on when staff is required to undergo an examination are largely unchanged from the 2012 edition, but have been clarified in relation to healthcare staff living on a farm with a pig herd but not working in the herd. Healthcare staff who has been diagnosed with MRSA and have no signs of infection may attend work, but must as soon as possible receive oral and written instructions (Chapter 8).
- The section on 'Home visits etc. to newborns with MRSA' has been replaced by the section 'The primary care sector in general' (section 11.7), where emphasis is placed on the fact that preventing infection is first and foremost a matter of rigorous compliance with the general guidelines on infection hygiene.
- Table 3 (section 11.3) has been changed, so that individuals who have been in direct contact with a pig herd within the past 6 months must be isolated when hospitalised, until a test result is available.
- Individuals who have received treatment at a clinic or hospital outside the Nordic countries for a duration of more than 24 hours are still required to be swabbed but no longer isolated in connection with hospitalisation if the treatment was provided more than 7 days ago. If the treatment was provided within the last 7 days, the patient is still required to be isolated until a negative swab result is available (section 11.3, Table 3).

- There is no longer any requirement for annual submission of MRSA isolates from patients who are persistently positive.
- Terms relating to the medical officers of health have been replaced by 'The Danish Patient Safety Authority'.

2 Purpose

The overall purpose of this guidance is to maintain a low prevalence of disease caused by the resistant staphylococcus bacterium, the Methicillin-resistant *Staphylococcus aureus* (MRSA). It is also the purpose of the guidance to contribute to limiting the spread of MRSA infections in Denmark, both out of consideration for the individual citizen/patient and the health service as well as to maintain the possibility of being able to treat serious MRSA infections with antibiotics.

The guidance focuses on the health service's efforts to limit disease and spread of MRSA in hospitals, nursing homes and other places where ill and frail persons are staying, as their already being ill and frail exposes them to a greater risk of serious disease caused by MRSA. It is first and foremost the staff, through their observance of the infection hygiene guidelines, who must prevent the spread from one patient to another in a hospital, from a resident in an assisted living facility or from a citizen who receives home care.

The more members of the population that are carriers of MRSA, the more ill and frail persons can get MRSA and the more people can get serious disease caused by MRSA. Therefore, it is important to limit the spread of MRSA in the population, but the precautions must also take into account the fact that MRSA is only in very rare cases the cause of serious disease in otherwise healthy people.

2.1 Avoid stigmatisation

It is very important that persons who test positive for MRSA are not stigmatised and thereby subjected to additional discomfort. This applies in the health service as well as society at large. Healthcare staff has an important role in this connection; they can act professionally and with the knowledge that MRSA, just like other staphylococci, only rarely gives rise to serious disease. Generally, people with MRSA:

- are entitled to the same health services as everyone else.
- can receive treatment, including invasive procedures. Treatment may not be postponed just because a patient is an MRSA carrier.
- may be admitted to any hospital department. This means that a patient with MRSA may not be rejected at a hospital department if hospitalisation in that particular department is most appropriate for the treatment of the patient's basic disease.
- may participate freely in social activities, rehabilitation etc., also if they live in an assisted living facility or are receiving care in the primary care sector.
- may come to schools and childcare institutions if they are otherwise healthy according to the general rules in this regard, see also Guidance on infectious diseases in children and adolescents (Chapter 12).

2.2 Strategy of action

The strategy has two components: Hygiene and treatment of MRSA carriers.

2.2.1 Hygiene

The Danish Health Authority considers consistent compliance with the general guidelines on infection hygiene to be the most important tool in preventing the spread of infections in the entire health service and nursing care sector. This also applies to MRSA.

However, the Danish Health Authority finds that in some situations it is necessary to examine persons who are at an increased risk of having MRSA, and in case of positive findings to initiate supplementary infection hygiene measures. The latter is particularly relevant in hospitals and assisted living facilities and in the context of home care where many patients and residents are ill and frail.

The general and supplementary infection hygiene guidelines appear from the SSI website. Reference is also made to Chapter 11.

Experience shows that observance of the general guidelines on infection hygiene requires constant attention from the management and among the individual staff members.

Other sets of rules on hygiene in hospitals¹, childcare institutions² as well as on the use of workwear³ appear from the reference list (Chapter 12).

2.2.2 Treatment of MRSA carriage

Based on an assessment of the risk, a test is made for MRSA (Chapter 5), carriers are treated (Chapter 6) and follow-up is provided on the treatment (Chapter 7).

2.3 Target group

The guidance is aimed at management and staff in the entire healthcare and nursing care sector, i.e. hospitals, including private hospitals, the nursing care sector, the municipal health service as well as clinics outside hospitals, including general practitioners and specialist doctors, dentists, physiotherapists, chiropractors, podiatrists etc.

Healthcare and nursing staff plays a special role because they are in close contact with people who are ill and frail, and because they can transfer infection and be infected. When the guidance uses the term healthcare staff, it refers to all staff working with care, examination, treatment, rehabilitation etc. The guidance also applies to service staff with day-to-day work in patient-centered surroundings in hospitals, home care and in assisted living facilities.

¹ National infection hygiene guidelines for the treatment of patients with infectious diseases, including isolation, 4th edition, from the SSI, Central Unit for Infection Control 2011.

² Hygiene in childcare institutions. Recommendations on prevention and health promotion for children within hygiene, environment and safety, 4th edition, the Danish Health Authority 2013.

³ Guidance on workwear within the healthcare and nursing care sector, the Danish Health Authority 2011.

The primary care sector refers to the healthcare and nursing care sector outside hospitals.

2.4 Organisation

Regions and municipalities have overall responsibility for ensuring that the infection hygiene effort is of a quality that contributes to ensuring that no infection can be passed on in connection with the examination, treatment, care and nursing of patients and citizens. This is an interdisciplinary task that requires good cooperation, including establishing what tasks are carried out and by whom.

The organisation of hygiene measures and the efforts aimed at MRSA may vary in the individual regions and municipalities, and it is therefore important to be familiar with the local organisation and the local agreements. This also applies to assistance from the regional infection hygiene units. A region may have one or more departments of clinical microbiology and hygiene units as well as perhaps a special MRSA unit. The functions of infection hygiene units may differ, e.g. as regards agreements on assistance to the municipalities. Municipal and regional agreements with private providers should include a specification of the requirements concerning the level of infection hygiene and any directions or guidelines on which the performance of a given task must be based.

Experience shows that it is very important to ensure coordination between hospitals and between the hospitals and the primary care sector/municipalities, as patients are often transferred between the hospitals and move between hospital and home/assisted living facility. The Danish Health Authority therefore recommends that the measures taken against MRSA in each region be coordinated between the infection hygiene unit/department of clinical microbiology, the Danish Patient Safety Authority, general practitioners, municipal health services(s) and other relevant stakeholders, e.g. by establishing a special MRSA unit. The guidance on preventive measures to be taken by the regions⁴ includes a section on advice on hygiene, emphasising the cooperation between region and municipalities.

It is proposed that local agreements for enhanced infection hygiene measures may be concluded in situations with spread, including screening for a limited period, e.g. in the event of an outbreak in neonatal departments or outbreaks in assisted living facilities (see Chapter 11).

The management of the various units (e.g. hospital departments, assisted living facilities, home care, home nursing care, clinics) is responsible for ensuring that the staff has the required knowledge of the new MRSA guidance and are trained in and comply with it, as well as for ensuring the existence of the necessary framework in this regard. The staff is also responsible for their own compliance with the rules.

⁴ Preventive measures to be taken by the regions – a guide to Section 119(3) of the Danish Health Act. The Danish Health Authority 2009.

2.5 Who does what?

2.5.1 The doctor providing treatment

The doctor will determine risk situations for MRSA, if required, take a swab and if MRSA is found:

- treat any clinical infections.
- instruct the patient about the treatment of carriers and provide written material (see Chapter 6) and inform the patient about the use of the MRSA card, including that it is up to the individual patient to decide whether he/she wants to use the card.
- provide notification according to the applicable rules, see also guidelines on notification (Chapter 4).
- inform the patient about subsequent control and follow-up (see Chapter 7), including who will be responsible for this.

For patients where MRSA is found in a hospital or a specialist's practice, the continued treatment of and follow-up on the carrier condition will mainly be handled by the patient's general practitioner or possibly via an MRSA unit if there is a local agreement to that effect. This also applies to household members (see section 5.4 on disclosure of health information).

2.5.2 The Danish Patient Safety Authority

- ensures the existence of regional monitoring of the MRSA prevalence in cooperation with relevant parties.
- contributes to the local coordination of cooperation across sectors, including ensures the existence of relevant cooperation agreements.
- In case of a suspected outbreak in the primary care sector:
 - ensures delimitation of the relevant group of persons in consultation with the department of clinical microbiology/infection hygiene unit/MRSA unit
 - ensures that the department of clinical microbiology/infection hygiene unit/MRSA unit and other relevant providers, including the municipal health service, implement special measures.

2.5.3 The department of clinical microbiology/infection hygiene unit/MRSA unit

As the organisation handling MRSA cases is not the same in the various regions, the organisation and division of responsibilities between the relevant parties in the individual region must be described in local agreements.

The department of clinical microbiology/infection hygiene unit/MRSA unit contributes to monitoring and management of MRSA. The local monitoring and outbreak management take place in cooperation with the Danish Patient Safety Authority and other relevant providers.

If a patient tests positive for MRSA, the department of clinical microbiology/infection hygiene unit/MRSA unit will ensure:

- that, if required, advice is provided to the doctor providing treatment with regard to screening, treatment and subsequent control examination.
- that advice on infection hygiene guidelines is provided according to applicable local agreements.
- that healthcare staff who is tested positive for MRSA are instructed orally and in writing about how to prevent the spread of MRSA.

The department of clinical microbiology:

- performs laboratory testing for MRSA.
- sends the partially completed notification form with the test result, the personal MRSA card and the written information material to the doctor providing treatment.
- submits MRSA isolates to the SSI for the purposes of monitoring and genetic typing according to the applicable rules (Chapter 4).

2.5.4 Municipalities

- secure the general infection hygiene level in the municipality's institutions, see the Danish Health Authority's health promotion package for hygiene.
- cooperate with the managements of the individual institutions on the implementation of the rules of the MRSA guidance, in particular with respect to infection hygiene measures.
- In the event of an MRSA outbreak in a municipal institution, the municipality will cooperate with the Danish Patient Safety Authority, the department of clinical microbiology/infection hygiene unit/MRSA unit and the institution's management on the implementation of the adopted measures.

2.5.5 The SSI (Statens Serum Institut)

- performs genetic typing and monitors the development.
- reports the results of genetic typing to the department of clinical microbiology.
- informs departments of clinical microbiology/infection hygiene units/MRSA units and the Danish Patient Safety Authority about interregional build-up/outbreaks.
- provides advice on infection hygiene issues.
- publishes national infection hygiene guidelines.

2.5.6 The national advisory service for LA-MRSA, operated by the SSI

As a result of the special issues relating to LA-MRSA, a special advisory service has been established for this area. The advisory service is operated by the SSI.

The purpose of the advisory service is – through infection hygiene advice – to contribute to limiting the spread of MRSA from livestock to the surrounding society and to hospitals.

Healthcare staff may contact the service to obtain advice on infection hygiene measures (www.ssi.dk/MRSA).

Citizens with LA-MRSA – or persons working with livestock – may contact the advisory service to obtain infection hygiene advice on preventing the spread of LA-MRSA.

3 Background

3.1 About MRSA

MRSA (Methicillin-resistant *Staphylococcus Aureus*) is staphylococci that are resistant to the antibiotics normally prescribed to treat staphylococci infections. On a worldwide scale, MRSA is one of the most frequent causes of serious hospital-acquired infections caused by resistant bacteria.

After many years with a stable, low occurrence of new MRSA cases in Denmark, the number of cases rose sharply from 2003, which caused the Danish Health Authority to issue an MRSA guidance in 2006. The number of people infected with MRSA in Denmark has since increased substantially, but despite this, the occurrence of hospital-acquired MRSA continues to be at a stable, low level.

The sharp increase seen in the number of people with MRSA is partly due to community-acquired MRSA and partly to LA-MRSA. Community-acquired MRSA became a global problem in the early 00s. Community-acquired MRSA originates from abroad and is brought to Denmark by persons infected during stays abroad. From them, the bacterium is spread in Denmark to persons with no connection with other countries. LA-MRSA has since the mid-00s spread among livestock in all parts of the world. LA-MRSA is primarily spread to people working with livestock, but also to a certain extent to people who have no contact with livestock. In Denmark, LA-MRSA is primarily seen in relation to pigs, but to a lesser extent infection has also been seen in people who work with mink (see also Chapter 9).

3.2 About infection with MRSA and hygiene

MRSA spreads like other staphylococci. The most important source of infection is close contact with other people who are carriers of MRSA. For LA-MRSA, the source of infection is first and foremost daily and close contact with live animals carrying MRSA. MRSA bacteria can survive for a long time (months) in the environment (e.g. in bed linen, on furniture, floors and objects). Healthy carriers often have the bacterium in their nose and on skin areas (hands, groin/crotch) as well as in their throat.

MRSA is primarily transmitted by close contact with people or animals and only to a smaller extent by touching MRSA-contaminated objects. Single exposure to MRSA will not automatically make a person a carrier. In practice, this means that an increased infection risk is primarily seen in people who have frequent and close physical contact with people with MRSA, e.g. in the same household or with MRSA-infected animals, while the risk of becoming a carrier by ordinary social contact or single visits to livestock buildings is very small.

The number of bacteria on the skin determines the infection risk. Staphylococci can bind to skin cells, which may end up in dust that can be stirred up into the air. Cleaning and removing dust is thus important to keep the number of bacteria in the environment down. Staphylococci can also be found in the throat and may be dispersed in the surroundings by coughing.

Healthcare staff can transfer MRSA from one patient to another, from contaminated objects to a patient or from themselves to a patient. Transfer of MRSA by hand contact is by far the most common infection route. The infection risk can thus be minimised through consistent observance of correct hand hygiene.

4 Notification of MRSA

This guide on notification has been prepared in connection with the Danish Health Authority's Executive Order on doctors' notification of MRSA⁵. The Executive Order and the Guidance on notification of infections are currently undergoing revision, including notification of MRSA.

4.1 Criteria for notification

Cases where persons are tested positive for MRSA for the first time or are tested positive for an MRSA subtype for which such person has not tested positive before ('new subtype') must be notified.

Notification is required irrespective of whether or not the person displays any symptoms. This means that both cases with a clinical infection and cases with asymptomatic carriage must be notified.

4.2 Notification procedures

MRSA is detected by laboratory testing. The notification procedure and the laboratory diagnostics are therefore integrated, which is reflected in the Danish Health Authority's Form No. 5001, which must be used for the notification of MRSA.

4.2.1 The laboratory

The laboratory that processes a positive MRSA test or a new subtype of MRSA in a person for the first time, must:

- fill in the top part of the integrated form.
- send the form (pages 1-3) to the doctor who submitted the test sample for him/her to complete*.
- submit page 4 of the form to the SSI, the Staphylococcus laboratory.

* A personal card (list of appendices, Chapter 14) stamped by the laboratory and an information letter from the Danish Health Authority (list of appendices, Chapter 14) must be included with the form. In the case of LA-MRSA (MRSA 398), the SSI forwards a special information letter from the Danish Health Authority (list of appendices, Chapter 14) directly to the doctor providing treatment.

First time the laboratory finds MRSA in a person, the laboratory must immediately submit an isolate to the SSI for subtype determination (together with page 4 of the notification form). In addition, an MRSA isolate must be submitted in case of subsequent MRSA bacteraemia. The

⁵ The Danish Health Authority's Executive Order No. 1002 of 6 October 2006 on doctors' notification of cases of Methicillin resistant Staphylococcus aureus (MRSA) demonstrated in people.

SSI will regularly inform the submitting laboratory about the result of the subtype determination. In the case of MRSA 398, the SSI will also notify the requisitioning doctor about the subtype.

4.2.2 The notifying doctor

If a patient tests positive for MRSA for the first time or if a new subtype is found, the doctor must complete the rest of the form received from the laboratory and:

- send page 1 to the SSI, Department of Infectious Disease Epidemiology.
- send page 2 to the Danish Patient Safety Authority, Supervision and Guidance for the patient's address.
- keep page 3.
- give the MRSA card and information letter on treatment of MRSA as well as, if relevant, the information letter on LA-MRSA from the Danish Health Authority to the patient.

If the patient has been discharged, the card and information letter are forwarded to the patient's own doctor.

4.3 Notification of MRSA to Labour Market Insurance and the Danish Working Environment Authority

According to an Executive Order from the Danish Ministry of Employment⁶, doctors are required to report symptomatic MRSA infections to Labour Market Insurance and the Danish Working Environment Authority, if there is a possibility that the patient was infected in connection with his/her work. Asymptomatic carriage is, per se, not notifiable to Labour Market Insurance and the Danish Working Environment Authority (but is notifiable to the SSI and the Danish Patient Safety Authority as described above). If an MRSA carrier develops an infection (i.e. there are signs of an MRSA-conditioned disease), the case must be notified in accordance with the applicable rules on the notification of occupational diseases.

The assessment of whether or not the infection in the specific situation was contracted in connection with the patient's work must be made by the National Board of Industrial Injuries and not by the notifying doctor.

⁶ Executive Order on doctors' and dentists' duty to notify occupational diseases to the Danish Working Environment Authority and Labour Market Insurance, Executive Order No. 605 of 27 May 2010.

5 Screening for MRSA

Screening for MRSA includes a clarification of any high-risk situations as well as a swab, if relevant. Both persons with a relevant symptomatic infection (clinical examination, e.g. in case of a skin infection) and persons without any visible infection may be examined. Examinations carried out after treatment of MRSA carriage are referred to as control examinations (see Chapter 6).

5.1 Increased risk of MRSA

Situations that predispose people to infection with MRSA are referred to as high-risk situations. However, it is important to keep in mind that many people who have not been in a high-risk situation may be MRSA carriers.

High-risk situations are divided into 4 general and a number of special high-risk situations. The time frame for all high-risk situations is 6 months.

Persons with MRSA can be declared MRSA-free when they have been tested negative minimum 6 months after completion of the treatment.

5.1.1 General high-risk situations for MRSA (Table 1a)

Patients must be asked about the general high-risk situations in connection with all admissions to hospital, including same-day surgery, and in case of relevant symptomatic infections that may be caused by MRSA.

Table 1a: The 4 general high-risk situations for MRSA Patients must be asked in connection with hospitalisation, same-day surgery and relevant symptomatic infections	
In case of hospitalisation or before an invasive procedure and in relevant clinics, the following 4 questions must be asked:	If the patient answers 'yes', the following conditions must also be fulfilled:
1. Has the person <u>previously</u> been diagnosed with MRSA?	And has not been declared MRSA-free*
2. Has the person within the past 6 months lived together with or had household-like contact with <u>a person who has tested positive for MRSA?</u>	
3. Has the person within the past 6 months received treatment at a hospital or clinic <u>abroad</u> (outside the Nordic countries)?	And a) The stay at the hospital or clinic lasted for more than 24 hours <u>or</u> b) The patient underwent an invasive procedure** regardless of the duration of the stay.

4. Has the person himself/herself or a household member had weekly or more frequent contact with live pigs within the past 6 months?***	
<p>* Being MRSA free implies that a person who was previously MRSA-positive has been tested MRSA-negative at least 6 months after treatment.</p> <p>** For the purposes of this guidance, invasive procedures also include e.g. drains or catheters as well as dialysis etc., but not injections, peripheral venous catheter or blood sampling.</p> <p>*** Unless the hospital management has dispensed with this rule because of a low local prevalence of LA-MRSA, see section 5.2.2.</p>	

5.1.2 Special high-risk situations for MRSA (Table 1b)

In addition to the high-risk situations mentioned in Table 1a, there is a number of well-known high-risk situations that are not so frequent as to require doctors to ask about them routinely, but only if the doctor (typically the patient's general practitioner) believes them to be relevant. This would typically require e.g. more detailed knowledge of the patient, or the patient himself/herself may know about a high-risk situation, e.g. due to his/her work. The same applies in case of a number of well-known individual factors that increase the risk of MRSA. These are mentioned under 5.1.3.

<p style="text-align: center;">Table 1b: Special high-risk situations</p> <p style="text-align: center;">Questions concerning high-risk situations are only asked if the doctor (typically the patient's general practitioner) believes them to be relevant, e.g. on the basis of his/her knowledge of the patient. The person may also know about a high-risk situation, e.g. due to his/her work.</p>	
<p>Within the last 6 months, the person has:</p>	<ul style="list-style-type: none"> - lived or resided on a daily basis in assisted living facilities or similar institutions (e.g. for disabled persons) with MRSA outbreaks or been admitted to a hospital with an MRSA outbreak - worked (including had a student job or internship with patient contact) at: <ul style="list-style-type: none"> • a foreign hospital, assisted living facility or similar institutions outside the Nordic countries. • a department at a hospital, assisted living facility or similar institutions in Denmark and other Nordic countries, such department having experienced an outbreak of MRSA. - has resided or stayed in confined spaces or under poor hygienic conditions (e.g. asylum centre, hostel for the homeless, war zones, refugee camps or in foreign children's homes)

	<ul style="list-style-type: none"> - worked on mink farms or is a household member of a person who has worked on mink farms - had household-like contact with people who live/have lived outside the Nordic countries within the past 6 months (e.g. foreign adopted children, au pair or household members who have been on a long trip abroad outside the Nordic countries) - been abroad and displays signs/symptoms of a staphylococcal infection, especially if the person has had a tattoo or piercing, shared equipment (e.g. diving) or has been in prison.
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5.1.3 Individual factors that increase the risk of MRSA

For the individual person, it is possible to find individual factors that increase the risk of contracting MRSA, and which make it difficult to treat the carrier condition. These include:

- wounds, including recurrent abscesses.
- chronic skin diseases.
- chronic respiratory infections, including sinusitis.
- foreign objects (e.g. urinary catheters, drain, PEG probes).
- intravenous drug abuse.

5.2 Who should be screened for MRSA?

5.2.1 In case of infection

A swab should be taken from persons with a symptomatic infection that may be caused by staphylococci, and who have been in a high-risk situation within the past 6 months. An examination should also be carried out if infections are not cured as expected, even if there is no known high-risk situation.

The choice of treatment follows the general/local guidelines for treatment with antibiotics.

5.2.2 In case of hospitalisation

Anybody admitted to hospital must be asked whether any of the 4 general high-risk situations apply, see Table 1a.

If the patient's answer is 'yes', the patient is swabbed. If one of the special high-risk situations is known to apply, a swab is also taken. An overview and the isolation rules appear from Table 3 (section 11.3).

In case of planned hospitalisation, the referring doctor will carry out the examinations for MRSA. The test result must be noted on the referral, or the information passed on according to local agreements. A negative test result may not be older than 4 weeks.

As MRSA has been shown to spread very quickly in neonatal departments, the Danish Health Authority recommends an increased focus on MRSA in case children are transferred between

neonatal departments, including, if required, that regional agreements be concluded to the effect that infants transferred between neonatal departments must be examined for MRSA (Chapter 10).

Parents/spouses/relatives etc. hospitalised together with the infant need not be questioned about high-risk situation and MRSA status.

The individual hospital management may dispense with the requirement to ask about the general high-risk situations in connection with admissions to child and adolescent psychiatric departments and psychiatric departments for adults where the patient himself/herself and the other patients in the department are self-reliant and otherwise somatically healthy.

Depending on the local prevalence of LA-MRSA, the individual hospital management may also dispense with the rule that all patients routinely to be asked about contact with live pigs when they are admitted to hospital.

5.2.3 In case of same-day surgery

In case of same-day surgery at hospitals, including private hospitals, clinics etc., the same rules apply as for hospitalisation.

5.2.4 In case of outpatient examination and treatment

Outpatient examination and treatment at hospitals or clinics are exempt from the requirement to ask about high-risk situations, except in case of surgical procedures, see above. The insertion of catheters, peripheral venous catheter or the like in connection with e.g. diagnostic imaging examinations does not require questions to be asked about MRSA high-risk situations, unless the procedure involves prophylactic antibiotics.

5.2.5 In case of taking up permanent residence in assisted living facilities

Outbreaks of MRSA in assisted living facilities have been shown to be difficult to control. There may be a connection between outbreaks in assisted living facilities and at hospitals in the same area, which is due to the fact that residents at nursing homes and citizens that are about to take up residence in assisted living facilities are often hospitalised. It is recommended that regional/municipal agreements be concluded in areas with MRSA outbreaks to the effect that citizens who are referred for permanent residence at an assisted living facility are offered an MRSA swab. Such decisions are made by the Danish Patient Safety Authority and the departments of clinical microbiology/infection hygiene units/MRSA units in collaboration with the municipal/regional health service.

5.2.6 In case of findings/outbreaks in hospitals

In case of any finding of MRSA, the infection source should be identified based on an identification of any existing high-risk situations.

An outbreak is defined as at least two cases of the same MRSA type within the same time frame, which may indicate a spread of infection.

In case a hospitalised patient is diagnosed with MRSA or in case of an outbreak in a patients' unit, fellow patients with whom the patient has shared a unit during his/her current hospitalisation are examined. Fellow patients are not isolated until tested positive.

It is recommended to keep unit lists, so that it is possible to identify with whom any patient who turns out to be MRSA-positive shared a unit.

In case of spread outside a patients' unit, all patients in the department and the department staff who has contact with patients must be examined (including cleaning staff).

In case of an outbreak, swabs should also be taken from fellow patients who have been discharged.

In case a patient in a neonatal department is diagnosed with MRSA, special precautions apply – see Chapter 10.

5.2.7 In case of findings/outbreaks of MRSA in assisted living facilities and other institutions

In case of any finding of MRSA, the infection source should be identified based on an identification of any existing high-risk situations.

In case of a single finding of MRSA, an assessment must be made of whether or not the infection hygiene guidelines are complied with. Swabbing the other residents for MRSA should be considered.

In case of an outbreak, i.e. two or more cases of the same type of MRSA in the same group of persons, possible contacts must always be defined and examined as arranged with the department of clinical microbiology/infection hygiene unit/MRSA unit and the Danish Patient Safety Authority. Carrying out a coordinated examination of residents and staff should be considered.

Persons who are to be examined must be informed orally and in writing about the examination, see the rules on professional secrecy and disclosure of health information⁷.

5.2.8 Pregnant women

MRSA carriage does not constitute a particular risk for pregnant women or for the foetus. Pregnant women follow the same rules for MRSA screening as others. It is recommended to ask pregnant women about high-risk situations and possibly take a swab for MRSA in connection with their first contact with the health service, typically their general practitioner or according to local agreements.

Pregnant women with MRSA who are not persistently exposed to MRSA are offered treatment for carriage.

Pregnant women who are persistently exposed to MRSA e.g. in the household, when working with live pigs or who have not become MRSA-negative at the beginning of their pregnancy, are re-examined 4 weeks before their due date with a view to treating their carrier condition, if relevant.

⁷ The Danish Health Act, Consolidated Act No. 1202 of 14/11/2014, Chapter 9 Professional secrecy, disclosure and collection of health information etc.

If an MRSA-positive woman requires surgery for a Caesarean birth, the doctors must keep in mind that any prophylactic antibiotic treatment must also cover MRSA.

The risk of infection spread in connection with joint events, including antenatal classes, is considered to be so negligible that no supplementary infection hygiene measures are required in addition to the general infection hygiene measures, including good hand hygiene.

5.3 How to screen for MRSA

Take a swab from:

- nose.
- throat (tonsils).
- perineum (for hospitalised patients and citizens in 24-hour care).

For people who are not hospitalised or in 24-hour care, there is no requirement for a swab from the perineum. To increase the probability of diagnosing MRSA carriage, swabbing the perineum, alternatively *crena ani*, may be offered.

In addition swab any:

- wounds/boils.
- skin affections as e.g. eczema.
- location of IV line or drain.
- probes/foreign objects (e.g. urinary catheter/drain/intravenous catheters, PEG probes, tracheotomy).
- urine if the patient has a urinary catheter.
- tracheal secretion if the patient is intubated.
- locations where MRSA has previously been found.
- other locations with signs of infection.

Use:

- the same swab for both nostrils, the same swab for both tonsils and one swab for the perineum.
- one swab for each of any of the other locations.

For urine, tracheal secretion and the like, the sample is taken according to the regulations applicable to these sample categories.

Self-examination increases the risk of false negative tests and is not recommended.

Simultaneous treatment with antibiotics, or use of products with antibiotic-like effect (e.g. chlorhexidine soap or tea tree oil) increases the risk of false negative samples. A negative result is not valid in such situations. For this reason, swabs should not be taken earlier than 7 days after completing a treatment of infections with antibiotics or products with antibiotic-like effects.

Swabs from patients who are undergoing antibiotic treatment may be false negative. Pay special attention to this problem in case of patients transferred from hospitals abroad.

The use of quick diagnostics, e.g. PCR examinations, may be considered to avoid/minimise the isolation time for the patient. As PCR examinations can give both false negative and false positive results, the tests must be cultivated as well.

5.4 Disclosure of information about MRSA

- The general rule is that persons who have been diagnosed with MRSA are encouraged to notify healthcare and nursing staff that they have been diagnosed with MRSA. The personal MRSA card can be used for this purpose.
- When the doctor providing treatment wishes to disclose information about a positive MRSA patient to relevant healthcare and nursing staff, the doctor must ask for the patient's consent. If the patient consents, the doctor may disclose information about the patient's MRSA status.

If the patient does not want his/her information to be disclosed by the doctor, but such disclosure is found to be important to the patient's continued treatment and/or the staff's precautions to avoid infection of other particularly vulnerable and frail persons, the doctor may still notify relevant healthcare and nursing staff about the patient's MRSA status. This applies to hospitals, nursing homes and home care, but not to the rest of the primary care sector, such as e.g. public health nurses, see sections 11.5, 11.6 and 11.7. In such case, the patient must be notified that his/her information has been disclosed.

6 Treatment of MRSA-positive patients

6.1 Upon receipt of the first positive MRSA laboratory test

The doctor receiving the positive test result must inform the patient about the further process, both in terms of treatment and the continued procedures. Please note that special rules apply to persons with LA-MRSA (see Chapter 9) and in connection with MRSA in newborns and children up to 2 years (see Chapter 10).

The doctor:

- gives the personal card received from the department of clinical microbiology to the patient. The patient's name and 1st positive test date are written on the card before it is given to the patient. Explain to the patient that the purpose of presenting the card upon contact with the health service is to ensure correct treatment of infections and avoid spreading of infection. Use of the card is voluntary.
- give the information letter 'Treatment of MRSA carriers' to the patient. This letter was also received from the department of clinical microbiology. The information letter is also available on the Danish Health Authority's website.
- explains to the patient how to reduce the risk of spreading MRSA to others, including frequent hand hygiene, cover wounds etc. in accordance with the information letter.
- explains that MRSA only rarely causes serious infections in otherwise healthy people.

6.1.1 General practice

Typically, it will be the general practitioner who takes the swab and receives the first positive test result, and he/she will then inform that patient as described above. If a local MRSA unit is in charge of treatment of a carrier condition and the subsequent control swab, the patient will be informed about this.

If the patient is tested positive by a specialist doctor or hospital, it is most expedient for both patient and household that the treatment of the carriage condition and the subsequent follow-up is provided in general practice, possibly assisted by e.g. the MRSA unit according to local agreements.

6.1.2 Specialist doctor

For patients who have been tested positive for MRSA by a specialist doctor, it is most expedient that the specialist doctor refers the patient for carriage treatment and follow-up with the patient's general practitioner/MRSA unit according to local agreements.

6.1.3 Hospital

Hospitalised patients often have individual risk factors which hamper the eradication of carriage. Treatment of carriage may be initiated in case of expected long-term hospitalisation in order to be able to terminate isolation measures. The infection risk can be reduced by using chlorhexidine 4% to wash 1-2 a week. In special situations, e.g. in case of major invasive procedures, treatment of carriage may be used as preoperative prophylaxis. Patients who have undergone preoperative carriage treatment and have tested negative after 1 month, need not be isolated, but

a swab must be taken upon hospitalisation, see section 11.3, Table 3. Such treatment should only be initiated following agreement with the department of clinical microbiology/MRSA unit. If the patient is discharged before the test result is available, the MRSA card, information letter and, if relevant, type information, are forwarded to the general practice.

6.2 Treatment of MRSA carriage

Spread within the household occurs frequently. Therefore, the Danish Health Authority recommends that the entire household undergo treatment for MRSA carriage. The intention is to prevent infections as well as to stop spread of MRSA. Treatment includes both the person who has been diagnosed with MRSA and other household members, regardless of whether or not they have tested positive for MRSA. This means that there is no general recommendation to screen household members before starting treatment.

In case of LA-MRSA, swabs are always taken of the household, and only the household members who test positive for MRSA are treated, not all members who have day-to-day contact with live pigs. In case of suspected LA-MRSA, the doctor should therefore await the type test result before starting carriage treatment (Chapter 9).

6.2.1 Before treatment

Before treatment is begun, the person and close contacts must complete treatment of any infection. If individual risk factors exist, they must be treated or dealt with as well as possible before beginning the treatment, e.g.:

- by referring the patient to a dermatologist for treatment of eczema.
- intensive treatment of wounds.
- treatment of bronchial infection.
- refrain from using a permanent bladder catheter as long as the urine contains MRSA (instead a uridome, intermittent catheterisation or diaper may be used).
- necessary foreign objects, e.g. PEG, CVK and tracheostomies must be kept clean or replaced while using antibiotics.

If the above-mentioned conditions cannot be alleviated, treatment of carriage must be considered. During the period prior to the treatment, the risk of spread from the infection and skin may be reduced by the patient performing whole-body washing with chlorhexidine soap 1-2 a week. Mupirocin may not be used before starting the actual treatment of carriage, as long-term/repeated treatment involves a risk of development of resistance.

6.2.2 Treatment of MRSA carriage

Special rules apply in case of LA-MRSA (Chapter 9) and newborns and children up to 2 years (Chapter 10).

All members of the household are treated simultaneously to prevent cross-infection. The standard treatment normally lasts 5 days, but throat carriers often benefit from being offered a 10-day treatment. The treatment includes:

- Mupirocin nasal ointment, 2 % (Bactroban® Nasal), apply in both nostrils. Recommended dose is twice a day, but the dose may be adapted individually. Each person in the household must have his/her own tube.
- Daily whole-body washing, including hairwash, using chlorhexidine soap 4 %.
- No other types of soap may be used for whole-body washing during the treatment period, as soaps contain anionic substances that reduce the effect of chlorhexidine.
- Chlorhexidine soap with glycerol is recommended because glycerol protects the skin against dehydration.
- Ordinary soap can be used for hand washing.

Hair conditioning, deodorant, aftershave etc. may be used. If using moisturising cream, it must be non-anionic (a list of creams that may be used is available on the SSI website).

In addition, reference is made to the information notice 'Treatment of MRSA carriers' from the Danish Health Authority (available on the Authority's website), including information on cleaning and washing clothes.

Experience from Denmark shows that you may have to repeat the treatment to eradicate MRSA carriage. The risk of treatment failure is greater if there are individual risk factors (see section 5.1.3) or in case of MRSA in the throat/perineum.

As serious complications following systemic antibiotic treatment of MRSA carriage have been experienced in certain cases, topical treatment of MRSA carriage is recommended to be given twice before considering to supplement with systemic antibiotic treatment.

Any systemic treatment must be provided in consultation with the department of clinical microbiology/infection hygiene unit/MRSA unit based on an antibiotic sensitivity test.

6.3 Failure of treatment

If the patient/citizen is still MRSA-positive after treatment, the following must be assessed:

- Have all close contacts been screened and tested negative for MRSA?
- Are there any individual risk factors (section 5.1.3)?
- Does the patient wear/use foreign bodies such as e.g. piercing jewellery or hearing aid?
- Does the patient lack the motivation or ability to complete the treatment?
- Could the patient be a throat carrier?
- In case of repeated treatment failure, pets may be examined.

The cause of the treatment failure should be eliminated and the topical treatment repeated. Extending the treatment to 10 days may be considered. Only MRSA-positive household members are to be treated again.

If two treatment attempts fail, the doctor providing the treatment should consult the department of clinical microbiology/infection hygiene unit/MRSA unit; partly with a view to discussing whether a supplementary systemic treatment should be provided and partly with a view to discussing whether additional measures are required.

If the department of clinical microbiology/infection hygiene unit/MRSA unit finds that it is not possible to eradicate carriage, the risk of spread of MRSA from infection and skin may be reduced by the patient in question performing/having a whole-body washing with chlorhexidine soap 1-2 times a week as long as the person is MRSA-positive. This treatment should be provided in collaboration with the department of clinical microbiology/infection hygiene unit/MRSA unit, which also provides advice about follow-up on persistent carriers.

7 Post-treatment follow-up on MRSA carriers

Post-treatment follow-up on MRSA carriers serves the following purposes:

- Examine whether the treatment was successful, and whether a person can be declared MRSA-free (follow-up after 6 months) (section 7.1)
- Termination of supplementary infection hygiene measures in hospitals and assisted living facilities (section 7.2)

The follow-up differs, depending on whether the patient is admitted to hospital, lives in an assisted living facility or not, see below.

Swabbing to declare a person MRSA-free cannot be done until 6 months after completion of treatment at the earliest. Even if a person is declared MRSA-free, the person still needs increased clinical attention, e.g. in connection with infections.

Swabs are as a minimum taken from the nose, throat and any wounds as well as from the locations where MRSA has previously been found. For patients in hospital/in the care sector, also the perineum is swabbed.

7.1 MRSA in patient living in own home and household members

- Everyone in the household, i.e. both the MRSA-positive patient and the other household members, are swabbed no earlier than 1 month after completion of the treatment.
- Household members who have not tested positive and who are negative at the 1-month check-up are considered to be MRSA-free and need not be checked again after 6 months. Persons who test positive at the control swab are advised to undergo another course of treatment and follow-up. If two treatments have failed, the department of clinical microbiology/infection hygiene unit/MRSA unit must be consulted.

7.2 MRSA in hospitalised patient, patient in assisted living facility or person receiving care

To terminate the supplementary infection hygiene measures in hospitals and assisted living facilities/home care, the patient must have tested negative in minimum 3 sets of tests taken at intervals of minimum 1 week, the first of which is taken 1 week after completion of carriage treatment at the earliest.

Patients should be examined on day 7, 14, and 21 after completing treatment. Test results must be recorded in such a way that it clearly appears when the supplementary infection hygiene measures may be terminated.

In addition, a follow-up swab must be taken 6 months after completion of treatment with a view to declaring the person MRSA-free.

For long-term patients in hospitals and citizens in assisted living facilities with an MRSA outbreak, it is recommended that an individual plan be established in collaboration with the department of clinical microbiology/infection hygiene unit/MRSA unit detailing the follow-up provided between the test taken on day 21 and the check-up after 6 months.

7.3 Times for follow-up (Table 2)

Table 2: Times for follow-up after treatment and in case of persistent carriage or regular exposure to infection		
	Day	Month
An MRSA-positive person in his/her own home.		After 1 and 6 months*
MRSA-positive patient in hospital and residents of assisted living facilities/persons receiving care.	7, 14, 21	After 6 months*
Healthcare staff who is MRSA-positive.	7, 14, 21	After 6 months*
Healthcare staff who is MRSA-negative, but who live in a household with an MRSA-positive person. Healthcare staff who is regularly exposed to MRSA, e.g. staff frequently working outside the Nordic countries or staff assisting in the transport of patients from hospitals/clinics outside the Nordic countries or who regularly work in a pig herd.		Every 6 months
* Being MRSA free implies that a person who was previously MRSA-positive has been tested MRSA-negative 6 months (or later) after treatment		

7.4 Healthcare staff

Special rules apply to healthcare staff, see Chapter 8.

8 Healthcare staff

In this context, healthcare staff is defined as staff handling tasks involving care, examination and treatment, and who work at hospitals, nursing homes or in home care.

8.1 Testing healthcare staff for MRSA

Healthcare staff must be tested if they have been in one or more of the following situations within the past 6 months:

- have worked (including study visit/internship) at a hospital, assisted living facility, institution or at a clinic outside the Nordic countries, or have worked under poor hygiene conditions, such as e.g. in war zones and refugee camps.
- have worked at a department in the Nordic countries where there has been an outbreak of MRSA.

Furthermore, healthcare staff employed in Denmark must be tested every 6 months if they:

- assist in transferring patients from hospitals and clinics outside the Nordic countries on a monthly or more frequent basis.
- work in the healthcare sector outside the Nordic countries on a monthly or more frequent basis.
- work in a pig herd on a weekly or more frequent basis.

Healthcare staff must also be tested if, within the past 6 months, they:

- have lived together with a person who is MRSA-positive, has been hospitalised > 24 hours and/or has had an invasive procedure⁸ at a hospital outside the Nordic countries (regardless of the duration, including outpatient procedures). Healthcare staff who lives with people who are MRSA-positive must be tested every 6 months.

The test may be made at the workplace or at the person's general practitioner. Self-swabbing must be avoided as it increases the risk of false negative tests.

In addition, the workplace may, if so arranged with the Danish Patient Safety Authority/local infection hygiene unit/department of clinical microbiology/MRSA unit, decide that healthcare staff must be tested for MRSA if there are several cases of MRSA (outbreak) at the place of work.

Healthcare staff living on a farm with a pig herd (who do not work with the herd weekly or more frequently) only need to be tested if a member of his/her household has been tested

⁸ For the purposes of this guidance, invasive procedures include e.g. drains or catheters as well as dialysis etc., but not injections, peripheral venous catheter or blood sampling.

MRSA-positive, see Chapter 9 of this guidance. If this is the case, the healthcare staff must be tested every 6 months until the household is MRSA free.

Healthcare staff who has been exposed to MRSA in connection with outbreaks at the workplace must as far as possible be tested before starting the day's work to prevent that staff who is only temporarily contaminated in connection with a work situation are considered to be MRSA carriers.

Persons who are to be tested at the place of work must be notified orally and in writing of the examination, see the rules on professional secrecy and disclosure of health information (see Chapter 12), also see below regarding the exemption from the Danish Health Information Act.

The recommendation is for foreign healthcare staff (excluding Nordic countries) who during their employment, study visit or the like has contact with patients to be tested for MRSA and, if necessary, be treated for MRSA carriage in their home country. In the absence of documentation of an MRSA test within the past month, a test must be made before starting work.

8.2 Healthcare staff diagnosed with MRSA

Healthcare staff diagnosed with MRSA regardless of the cause must inform their employer.

Healthcare staff without signs of infection may attend work, but they must as soon as possible receive oral and written instructions from the department of clinical microbiology/infection hygiene unit/MRSA unit.

For healthcare staff who continues to test positive for MRSA, the management and the local infection hygiene unit may consider whether relocating the person in question to a less sensitive area of work might be appropriate. This applies primarily to healthcare staff working at hospital departments with patients with a decreased immunity (e.g. intensive care units and neonatal departments).

Otherwise, healthcare staff must be informed and treated in the same way as other patients who are tested positive for MRSA, see Chapters 5 and 6.

8.3 Follow-up

Healthcare staff is examined on day 1, 7, 14 and 21, as well as 6 months after completion of treatment. The frequent testing of healthcare staff is based on an aim to detect any treatment failure as early as possible with a view to repeating the treatment.

8.3.1 Exemption from the Danish Health Information Act concerning the examination of healthcare staff for MRSA

The duty of disclosure to the employer in connection with detection of MRSA and examination in connection with outbreaks at the place of work are based on an exemption from the Danish Health Information Act.

The Danish Ministry of Employment has authorised (by means of an exemption, see the Danish Health Information Act) the testing of the staff for MRSA and the disclosure of positive test results for MRSA in staff to the employer in accordance with the Danish Health Authority's Guidance on the prevention of MRSA (list of appendices, Chapter 14).

The period of 2 days between information and consent stipulated in Section 9 of the Danish Health Information Act needs not be observed, but the examination must be made, so that account is taken of the underlying consideration of the employee, which appears from Section 9 of the Danish Health Information Act. Furthermore, it is a precondition that the medical examination is conducted using the least extensive method that fulfils the purpose, see Section 4(3) of the Danish Health Information Act.

The individual staff member to be tested for MRSA must be informed orally and in writing about the following:

- that the examination will be conducted, and the reasons.
- that MRSA-positive staff members will be instructed to undergo treatment to remove the bacterium together with their household, see the Danish Health Authority's information letter concerning treatment of MRSA carriers (list of appendices, Chapter 14).
- that MRSA-positive staff members will be control swabbed minimum 5 times after completion of the treatment (Table 2, section 7.4).
- that the test results will be disclosed to their employer in accordance with the exemption from the Danish Health Information Act.

In addition, the general rules concerning the legal status of patients must be observed, including in connection with disclosure of health information and patient records.

Finally, attention is called to Section 4 of the Danish Health Information Act to which the exemption refers (infection risk that constitutes a substantial risk to other people's health), to Section 3(4) (the employer's obligations, including to pay the expenses in connection with the examination and to ensure that the examination can take place without loss of income for the employee and, as far as possible, within the working hours) and Section 11(2) (disclosure of information must be necessary in order to avert risks mentioned in Section 4(1)).

8.4 If a healthcare staff member becomes ill, needs to be hospitalised or have surgery

If a healthcare staff member becomes ill, needs to be hospitalised or have surgery, it is (as for all other MRSA carriers) important that he/she states that he/she has been tested positive for MRSA or, within the past 6 months, has been in an unsafe situation, e.g. if a household member has MRSA or works with live pigs, see the 4 general high-risk situations (Table 1a) and the special high-risk situations (Table 1b). This information will ensure that the healthcare staff member gets the correct treatment and that the staff will take supplementary precautions to avoid the spread of MRSA.

9 LA-MRSA

LA-MRSA (livestock-associated MRSA) (previously called pig MRSA) is mainly seen in pigs in Denmark and to a lesser extent in mink, but it may also be found in poultry, cattle and horses.

For persons with LA-MRSA who on a weekly or more frequent basis have contact with livestock, special conditions apply for the treatment of carriage. This is due to the fact that continued frequent work in a herd with MRSA exposes the person in question to the bacterium constantly. This means that it is, as a basis, not possible to eradicate carriage in such patient unless the MRSA bacteria are removed from the herd or the patient stops working with the herd.

Otherwise, the same precautions as for the other MRSA types apply. Furthermore, reference is made to the special information letter from the Danish Health Authority (list of appendices, Chapter 14) about LA-MRSA, which e.g. describes how to avoid carrying MRSA from livestock buildings to household. See also the section on schools, childcare institutions, family day-care etc. (section 11.9).

Citizens and healthcare staff can obtain advice from the regional MRSA unit or from the SSI advisory service for LA-MRSA.

9.1 Procedure

When LA-MRSA is found in the household, the following procedure applies:

- Swabs from nose and throat are taken of all household members.
- People who are in daily or more frequent contact with pigs only need decolonisation therapy if they stop working in livestock buildings. If there are special factors, e.g. planned surgery, hospitalisation or serious illness in the surroundings, this should be discussed with the patient's general practitioner.
- Treatment is recommended for household members who are not regularly in the livestock buildings and who have tested positive for LA-MRSA to eradicate carriage.
- If the person develops an infection (i.e. there are signs of an MRSA-conditioned disease), the case must be notified in accordance with the applicable rules on the notification of occupational diseases (see section 4.3).

In addition, information is provided on infection hygiene, infection spread and on the need to mention the infection in connection with contact with the health service. The patient is given the special information from the Danish Health Authority, Information on LA-MRSA, which is forwarded from the SSI to the doctor who is providing the treatment together with the test result. This information is also available on the Danish Health Authority's website.

The risk of becoming an MRSA carrier by making a single, short-term visit to livestock buildings is very low. This also applies even though one might test positive immediately after such a visit, as one will lose the bacterium spontaneously within a few days. Short-term and single vis-

its to a pig herd are therefore not considered to be a substantial high-risk factor in relation to becoming a carrier of LA-MRSA. Farms with pig herds may thus be used as petting farms for generally healthy people, regardless of whether or not MRSA has been found in the livestock. The owner must make sure that hygiene measures are observed. About visits to livestock, see also the Danish Veterinary and Food Administration's website www.fvst.dk.

9.2 Pregnant women with contact with livestock

Like other types of MRSA, carriage of LA-MRSA does not constitute a special risk for pregnant women or the foetus. Pregnant women follow the same rules for MRSA screening as others. It is recommended to ask pregnant women about high-risk situations and possibly take a swab for MRSA in connection with their first contact with the health service, typically their general practitioner or according to local agreements.

Pregnant women with LA-MRSA:

- who do not have direct contact with livestock are offered treatment to eradicate carriage and are re-examined 4 weeks before their due date. Treatment of carriage is implemented in persons without contact with MRSA-positive animals even if there are positive household members who are not treated at the same time.
- who are in direct contact with livestock are re-examined 4 weeks before their due date, or when they go on maternity leave. If they still have MRSA, they are offered treatment to eradicate carriage.

Pregnant women who have tested negative 1 month after completed treatment of carriage need not be isolated during hospitalisation.

If an MRSA-positive woman requires surgery for a Caesarean birth, the doctors must keep in mind that any prophylactic antibiotic treatment must also cover MRSA.

See also section 5.2.8 on pregnant women.

9.3 Healthcare staff and LA-MRSA

As is the case for other MRSA variants, healthcare staff who carries LA-MRSA and who is in contact with patients must:

- receive individual hygiene instruction from their local infection hygiene unit
- receive decolonisation therapy and follow-up. If they continue to test positive for LA-MRSA, they must be referred to the local infection hygiene unit with a view to an individual treatment and follow-up plan.

Healthcare staff who lives in a household where one person is an LA-MRSA carrier but who are themselves MRSA-negative must be tested for MRSA every 6 months (as for other MRSA variants). Healthcare staff who regularly works in a pig herd must be examined every 6 months. In addition, reference is made to the chapter on healthcare staff.

10 MRSA in newborns and children up to 2 years

Since 2008, there have been several outbreaks of MRSA in neonatal departments in Denmark. In this context, MRSA has spread to other hospitals and departments in connection with transfer of infected children between neonatal departments.

Only in very few cases does MRSA in newborns give rise to infections. Furthermore, Danish experience has shown that it is difficult to eradicate MRSA carriage in newborns and young children under the age of 2. As a general rule, it is therefore recommended not to treat the child or its family; this also applies to preventive chlorhexidine baths.

In case of recurring MRSA infections in the household, carriage treatment may be considered.

10.1 If MRSA is found during hospitalisation

In case of a single finding of MRSA, an assessment must be made of whether or not the infection hygiene guidelines are complied with. This assessment includes a review of the physical environment to make sure that the infection hygiene guidelines can be complied with. As a minimum, all children in the same unit and their parents must be tested for MRSA. See also section 5.2.6.

10.2 Transfer of newborns between neonatal departments

The Danish Health Authority recommends that agreements be made to examine children who are transferred between neonatal departments with MRSA occurrence. Any isolation/supplementary infection hygiene measures depend on a specific risk assessment.

10.3 Follow-up after discharge

- In order to see whether MRSA disappears without treatment, the family may be offered an MRSA test 1-2 times a year, such test to be carried out by the family's general practitioner.
- If the family is still positive after 2 years, a plan will be made for treatment of the family.
- If they are asymptomatic carriers, children and parents will be able to participate in mothers' groups and baby swimming, and the children may come to childcare institutions in the usual manner. However, the child may not have infected wounds, and the general rules concerning infectious disease in childcare institutions must be followed. Children with a common cold may attend the institution.
- The parents are given general information about infection hygiene and infection spread, and they are encouraged to inform healthcare and nursing staff if they have contact with the health service.

Infection hygiene guidelines in connection with public health nurses' work appear from section 11.7.

11 Infection hygiene guidelines for contact with people with a risk of MRSA or who have tested positive for MRSA

Application of the general infection hygiene measures in connection with patient contact is one of the cornerstones of preventing the spread of MRSA and other microorganisms.

Experience shows that compliance with the general infection hygiene measures requires that the implementation is given constant attention, both by the individual staff member and by the management. Therefore, the management must ensure that all staff involved in the examination, care or treatment of patients is familiar with these guidelines. This also applies to cleaning staff etc. The staff must be instructed in the application of the general infection hygiene guidelines and in the supplementary initiatives specific to MRSA.

All work procedures should, on the basis of the general infection hygiene guidelines, be planned and carried out with as much attention on limiting any infection risk as possible. Work and place of work should be organised in such a way as to encourage compliance with the precautionary measures.

The general infection hygiene guidelines are based on safe work routines, organisational measures and an appropriate physical and technical environment that can prevent the spread of infection to the greatest extent possible. They include:

- hand hygiene.
- use of personal protective equipment in relevant situations (e.g. disposable gloves, plastic apron/disposable coat, mask and safety goggles/face shield).
- handling, cleaning and retreatment of equipment.
- handling of dirty clothes and waste.
- cleaning.

It should be emphasised that hand hygiene is the most important single factor in preventing the spread of infection, including MRSA and other microorganisms.

Furthermore, the Danish Health Authority's Guidance on workwear in the healthcare and nursing care sector explains in which situations the use of workwear is required/should be considered. In addition, it appears that all staff in the healthcare and nursing care sector working with patients/citizens, their secretions, their immediate surroundings or their things should:

- have easy access to perform correct hand hygiene.
- wear clothing with short sleeves.
- have easy access to relevant personal protective equipment.

In order to prevent the spread of MRSA in hospitals, assisted living facilities and in home care, it is necessary to supplement the general infection hygiene guidelines with additional measures, including private unit and increased use of personal protective equipment (e.g. liquid-repellent

disposable coat and disposable gloves). These initiatives are collectively referred to as supplementary infection hygiene guidelines (see the National Infection Hygiene Guidelines on supplementary measures in case of infections and carriage in the health care sector).

MRSA is mainly spread by direct and close contact, e.g. in connection with care and treatment as well as in connection with contact with the immediate surroundings (e.g. bed and bedside tables).

Infection routes are primarily via hands, including touching equipment, handles, keyboards and surroundings contaminated with MRSA. Infection can also spread by droplets or dust in connection with treatment or care.

MRSA can survive for a long period of time in the surroundings, and MRSA can thus also be transferred by contact with other MRSA-contaminated surfaces (keyboards, mobile phones and the like).

11.1 Hand hygiene and personal protective equipment

Use of personal protective equipment in connection with the treatment and care of persons with MRSA is mentioned in hygiene documents available on the SSI website. It should be pointed out that:

- the patient must be informed about the importance of hand hygiene (hand disinfection) as well as be instructed and, if required, assisted in the performance of correct hand hygiene.
- visitors must be informed about the importance of hand hygiene (hand disinfection) as well as be instructed and, if required, assisted in the performance of correct hand hygiene.
- the use of personal protective equipment must be recommended to visitors involved in the care.
- everyone must perform hand disinfection when they leave a unit with a patient who has tested positive for MRSA.
- the use of personal protective equipment may be dispensed with if a person does not have physical contact with the patient, equipment or furniture etc. (in case of transport of a patient outside the unit, see hygiene documents).
- cleaning staff must use the same protective equipment as the nursing staff.

11.2 Hospitals

The basic principle is that a patient may be admitted to any hospital department. A patient with MRSA may not be denied hospitalisation or outpatient examination at a hospital (section 2.1).

Isolation means that the patient is admitted in a private unit. The patient should have a private toilet.

11.3 Examination for MRSA and isolation (Table 3)

All patients who are to be hospitalised or undergo same-day surgery must be asked about the 4 general high-risk situations. Furthermore, staff should be aware of any individual risk factors. Patients with a known risk situation are swabbed (see section 5.3) and, if required, isolated according to the table below.

In case of specific high-risk situations, a swab is taken and a decision is made on whether or not isolation is required.

Table 3: Swabbing for MRSA and isolation in connection with hospitalisation			
High-risk situation		Swabbing	Isolation
1. Has previously been diagnosed with MRSA	No negative MRSA tests	+	+
	Negative MRSA test 1 month after treatment as a minimum.	+	-
	MRSA-free*	+	-
2. Within the past 6 months, has been in contact with an MRSA-positive person	Lived together with or had other household-like contact ** with a person who is MRSA-positive	+	-
3. Within the past 6 months, has received treatment at a hospital or clinic abroad (outside the Nordic countries)	Admittance to hospital or clinic for longer than 24 hours within the last 7 days	+	+
	Admittance to hospital or clinic for longer than 24 hours more than 7 days ago	+	-
	Admittance to hospital or clinic for less than 24 hours, but has undergone invasive procedure, e.g. insertion of drain or catheters, dialysis, stitching of wounds (in this connection, injections, blood sampling or insertion of peripheral venous catheter are not considered invasive procedures)	+	-
	Admittance to a hospital or clinic for less than 24 hours without an invasive procedure	-	-
4. Within the past 6 months, has had direct or indirect contact	Has worked on a pig farm or otherwise had close contact with live pigs on a weekly or more frequent basis	+	+

with pig herd	Household member of person with contact to pig herd	+	-
<p>* Being MRSA-free implies that a person who has previously tested MRSA-positive has tested MRSA-negative at least 6 months after completing treatment.</p> <p>Persons who have previously been MRSA-positive are at an increased risk of becoming MRSA-positive again, so renewed testing may be considered despite a previous negative MRSA test.</p> <p>** Household-like contact means living in the same household or having had similar long-term close contact.</p>			

11.4 Treatment in hospitals outside the general department and in outpatient clinics

The fact that the patient is MRSA-positive may not postpone a relevant examination, treatment, rehabilitation etc. Staff must clean and disinfect equipment and contact points after use. If the treatment requires close physical contact, the staff must use disposable gloves and disposable coats. In case of treatment that does not involve physical contact, individual guidelines may be prepared for the staff in cooperation with the local infection hygiene unit.

The receiving department must be informed in advance, and the staff in therapeutic departments and outpatient clinics must observe the same rules as the general department.

The time spent in waiting rooms should be minimised.

11.5 Assisted living facilities

Residents may not be isolated because of MRSA and are free to participate in social activities and rehabilitation etc. (section 2.1). The staff must disinfect training equipment after use, using a suitable disinfectant. In case of close physical contact, disposable gloves and a disposable coat must be worn. Any wounds must be covered by a dry and tight-fitting dressing.

Residents with MRSA must be moved to a single room. As has been the case so far, however, spouses may continue to share a room. All treatments and care must be provided in the resident's room or in the clinic.

For staff who performs treatment and care of the resident, the same infection hygiene guidelines for hand hygiene and use of personal protective equipment applies as for staff in hospitals. Furthermore, the Guidance on workwear within the healthcare and nursing care sector applies (see references in Chapter 12).

In assisted living facilities and other residential institutions with persons who need care, it is important that the staff has received instruction in the infection hygiene guidelines, so that they avoid becoming carriers of or infecting others with MRSA. It should be emphasised that hand hygiene is the most important single factor in preventing the spread of infection.

To the extent possible, the resident must be instructed in the infection hygiene guidelines, particularly with focus on the importance of hand hygiene (hand wash and hand disinfection). If relevant, they must be assisted in the performance. If visitors are involved in the care, the use of personal protective equipment is recommended for them.

Before leaving the room, hand disinfection must be performed.

11.6 Home care and home nursing care

As a basis, citizens with MRSA may participate in social activities and rehabilitation etc. in the usual manner (section 2.1).

For staff who performs treatment and care of the resident, the same infection hygiene guidelines for hand hygiene and use of personal protective equipment applies as for staff in hospitals. Furthermore, the Guidance on workwear within the healthcare and nursing care sector applies (see references in Chapter 12).

The staff must be instructed in the infection hygiene guidelines, so that they avoid becoming carriers of or infecting others with MRSA. It should be emphasised that hand hygiene is the most important single factor in preventing the spread of infection.

The citizen must be instructed in the initiated hygiene measures, with special focus on the importance of hand hygiene (hand wash and hand disinfection), and must be instructed/assisted in applying the correct procedure. If visitors are involved in the care, the use of personal protective equipment is recommended for them.

11.7 The primary care sector in general

This means healthcare staff in clinics outside hospitals as well as general practitioners and other specialist doctors, dentists, physiotherapists, chiropractors, podiatrists etc. as well as public health nurses. Healthcare staff working in either assisted living facilities or home care, such as e.g. dental care for the elderly etc. is covered by the rules mentioned in sections 11.5 and 11.6.

Patients/citizens are generally healthier than hospital patients, residents in a nursing home or persons receiving care at home. Furthermore, such contact will generally be of a short duration. Often, healthcare staff will not know that a person is an MRSA carrier, unless the person has told them so. Spread is first and foremost prevented through careful compliance with the general infection hygiene guidelines.

Clinics should be designed and staff instructed so as for them to avoid becoming MRSA carriers or infecting others with MRSA.

If information is provided that the patient/citizen is an MRSA carrier, supplementary infection hygiene measures may be taken. It should be emphasised that hand hygiene is the most important single factor in preventing the spread of infection.

In case of antenatal classes, reference is made to section 5.2.8.

11.8 Transport etc.

Referring to material on infection hygiene guidelines prepared for the use of ambulance staff⁹, the following is emphasised:

- In connection with ordering an ambulance, air ambulance or the like, information should be provided that supplementary infection hygiene guidelines must be observed in connection with transfer or treatment, such guidelines i.a. prescribing the use of a disposable coat and disposable gloves. A coat is not required for ordinary transport on a stretcher.
- In connection with ordering other forms of transport (e.g. common patient transport and taxi), information must be provided that the patient has MRSA.

Patients with MRSA may use transport together with other patients, subject to the following precautions:

- Any wounds must be covered by a dry and tight-fitting dressing.
- The patient must wear clean clothes.
- The patient must perform hand disinfection prior to the transport.
- If the patient has an acute bronchial infection, the patient must be transported alone.

11.9 Schools, childcare institutions, family daycare, etc.

Generally speaking, healthy children may attend nursery, kindergarten etc. even though they are carrying MRSA. School-age children may attend school and participate in leisure activities if they only have one infected wound, providing it is being treated and is covered with a dry, tight-fitting dressing. The same applies to school staff, see the Danish Health Authority's Guidance on infectious diseases in children and adolescents, published in 2013.

Good and consistent hygiene practice in everyday life contributes to preventing the spread of MRSA. It is important that the conditions for observing good hand hygiene are fulfilled by both children and staff, and that the cleaning is of a sufficient standard. In addition, reference is made to the Danish Health Authority's publication on hygiene in childcare institutions (see Chapter 12).

At continuation schools and the like, students/pupils sharing a room are considered to be members of a household.

MRSA in special institutions for people with physical and mental disabilities may constitute a particular problem because MRSA spreads more easily in such environments, and these people often have contact with various hospital departments. In such cases, it is recommended to seek infection hygiene advice on initiatives that reduce the risk of the spread of MRSA. Furthermore, it might be appropriate to offer examination/treatment at the institution or part of the institution

⁹ Ambulance transport, hygiene precautions, see www.ssi.dk

comprising both children/clients and staff. Such examination/treatment is provided in collaboration between the department of clinical microbiology/infection hygiene unit and the Danish Patient Safety Authority in consultation with the municipal health service.

Group homes are considered to be households.

In institutions, the Danish Patient Safety Authority may implement special measures in collaboration with the department of clinical microbiology/infection hygiene unit if written information to this effect has been provided.

11.10 Separate hygiene documents

The general and the supplementary infection hygiene guidelines for hospitals, assisted living facilities and similar residential facilities, home care, home nursing and clinics as well as for public health nurses appear from the hygiene documents available via <http://www.ssi.dk/smitteberedskab/infektionshygiejne.aspx>.

The precautions in hospitals are the most restrictive, but it is pointed out that proper implementation and observance of the rules, also outside hospitals, are regarded as a very important prerequisite for the successful implementation of the overall effort.

The guidelines are divided into the following subjects:

- patient placement etc.
- hand hygiene.
- protective equipment in general.
- gloves.
- workwear, plastic aprons and disposable coat.
- surgical mask, goggles, face shield.
- patients' secretions.
- laboratory tests, handling.
- equipment/utensils.
- waste.
- clothing and linen.
- cleaning, removal of waste.
- examination and treatment outside the general department, assisted living facility and similar institutions or home (patient transportation).

12 References

(Danish titles in brackets)

Ambulance transport, hygiene precautions, see
<http://www.ssi.dk/smitteberedskab/infektionshygiejne.aspx>.
(Ambulancetransport, hygiejniske forholdsregler)

Act to Consolidate the Danish Act on measures against infectious and other communicable diseases (the Danish Epidemics Act), Consolidated Act No. 814 of 27 August 2009.
(Bekendtgørelse af lov om foranstaltninger mod smitsomme og andre overførbare sygdomme (Epidemiloven), LBK nr. 814 af 27. august 2009)

Executive Order on doctors' and dentists' duty to notify occupational diseases to the Danish Working Environment Authority and Labour Market Insurance, Executive Order No. 605 of 27 May 2010.
(Bekendtgørelse om lægers og tandlægers pligt til at anmelde erhvervssygdomme til Arbejdstilsynet og Arbejdsskadestyrelsen, BEK nr. 605 af 27. maj 2010)

Executive Order on doctors' notification of cases of Methicillin resistant *Staphylococcus aureus* (MRSA) found in people, Executive Order No. 1002 of 6 October 2006.
(Bekendtgørelse om lægers anmeldelse af tilfælde af Methicillinresistent Staphylococcus aureus (MRSA) påvist hos personer, BEK nr. 1002 af den 6. oktober 2006)

Hygiene in childcare institutions. Recommendations on prevention and health promotion for children within hygiene, environment and safety, 4th edition, the Danish Health Authority 2013.
(Hygiejne i daginstitutioner. Anbefalinger om forebyggelse og sundhedsfremme for børn inden for hygiejne, miljø og sikkerhed 4. udgave, Sundhedsstyrelsen 2013)

The national infection hygiene guidelines for the treatment of patients with infectious diseases, including isolation, 4th edition, SSI, Central Unit for Infection Hygiene 2011.
(Nationale infektionshygiejniske retningslinjer om behandling af patienter med smitsomme sygdomme, herunder isolation, 4. udgave, Statens Serum Institut, Central Enhed for Infektionshygiejne 2011)

Preventive measures to be taken by the regions – a guide to Section 119(3) of the Danish Health Act. The Danish Health Authority 2009.
(Regionernes forebyggelsesopgaver – en vejledning til sundhedslovens § 119, stk. 3. Sundhedsstyrelsen 2009)

Infectious diseases in children and adolescents. Guidance on preventive measures in childcare institutions, schools etc. the Danish Health Authority 2013.
(Smitsomme sygdomme hos børn og unge. Vejledning om forebyggelse i daginstitutioner, skoler m.v., Sundhedsstyrelsen 2013)

The Danish Health Act, Part 9 Professional secrecy, disclosure and collection of health information etc., Consolidation Act No. 202 of 14/11/2014.
(Sundhedsloven, Kapitel 9 Tavshedspligt, videregivelse og indhentning af helbredsoplysninger m.v., LBK nr. 202 af 14/11/2014)

Guidance on workwear within the healthcare and nursing care sector, the Danish Health Authority 2011.

(Vejledning om arbejdsdragt i sundheds- og plejesektor, Sundhedsstyrelsen 2011)

The general and supplementary infection hygiene guidelines for MRSA appear from the SSI website <http://www.ssi.dk/smitteberedskab/infektionshygiejne.aspx>.

13 The working group

The working group that has provided advice to the Danish Health Authority in connection with this guidance consists of the following:

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The Danish Health Authority's secretariat

Bolette Søborg, Senior Consultant

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Stine Jacobsen, academic staff

14 Appendix

On the Danish Health Authority's website, www.sundhedsstyrelsen.dk:

- personal MRSA card
- information about treatment of MRSA carriers
- information about LA-MRSA (MRSA 398)
- Tables:
 - 1a and 1b: the 4 general high-risk situations and the special high-risk situations
 - 2: times for control after treatment
 - 3: swabbing and isolation in connection with hospitalisation
- exemption of 20 November 2006 (Danish Ministry of Employment)

On the SSI website

Here general guidelines on infection hygiene and supplementary infection guidelines for MRSA infection are available aimed at hospitals, assisted living facilities and similar institutions, home care and home nursing care, clinics outside hospitals as well as public health nurses:

<http://www.ssi.dk/Smitteberedskab/Infektionshygiejne.aspx>.

Further information is also available on the Danish Veterinary and Food Administration's website and the Danish Working Environment Authority's website.