Community associated Methicillin Resistant Staphlococcus aureus (MRSA)

Claire Farrugia - Infection Control Nurse Mater Dei Hospital
Methicillin sensitive Staphylococcus aureus MSSA

- Gram positive cocci
- Common commensal, 30% have it in nose and skin
- *S. aureus* can survive from hours to weeks, or even months, on dry environmental surfaces
- *S. aureus* survives on pets and livestock
- *S. aureus* is not always pathogenic, it is a common cause of skin infections
- Most often the cause of surgical site infections
MSSA - Mode of transmission

- New strains are acquired by direct contact
  - E.g. from hands of HCWs.
- Spread of *Staphylococci*

Diagram:
- Anterior Nares → Hands → Skin → Squames → Air
MRSA

- First described in 1961
- Resistant to all current β-lactam antibiotics
  - Penicillins, monobactams, cephalosporins & carbapenems
- Traditionally associated with hospital settings
- Associated with blood stream, respiratory tract and urinary infections
- Risk factors for colonisation and infection
  - Recent or prolonged hospitalisation
  - Nursing home admission
  - Recent antimicrobial therapy
  - Chronic disease
  - Contact with a colonised individual
Background – How common is MRSA?

Figure 3.23. *Staphylococcus aureus*. Percentage (%) of invasive isolates resistant to meticillin (MRSA), by country, EU/EEA countries, 2013

- ≤ 1%
- 1% to ≤ 5%
- 5% to ≤ 10%
- 10% to ≤ 25%
- 25% to ≤ 50%
- > 50%
- No data reported or less than 10 isolates
- Not included

ECDC (2014) EARS-Net 2013
Defining community acquired MRSA

- CA-MRSA first found in early 1990s
- Severity was unusual & hosts were healthy
- More implicated in skin and soft tissue infections
  - Linked to Panton-Valentine Leukocidin (PVL) gene
  - PVL absent in local endemic MRSA strain
- Different microbiological, epidemiological and molecular characteristics
- No single definition to distinguish CA-MRSA from HA-MRSA
  - Absence of healthcare associated factors rather than microbiological or molecular criteria
Table 1. Examples of Definitions Used for Community-Associated Methicillin-Resistant Staphylococcus aureus (CA-MRSA)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Patient Population</th>
<th>Resistance Phenotype</th>
<th>Genotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centers for Disease Control and</td>
<td>Diagnosis of MRSA in the outpatient setting or by positive culture within 48 hours of hospital admission. No history of MRSA infection or colonization. No history in the past year of: (1) Hospitalization (2) Admission to a nursing home, skilled nursing facility, or hospice (3) Dialysis (4) Surgery No permanent indwelling catheters or medical devices that pass through the skin into the body</td>
<td>Not defined</td>
<td>Not defined</td>
</tr>
<tr>
<td>Prevention [9]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herold et al. [3]</td>
<td>Isolate from a specimen obtained within 72 hours of hospital admission. No identified risks including: (1) Hospitalization (2) Previous hospitalization or antimicrobial therapy within past 6 months (3) History of endotracheal intubation, underlying chronic disorder, presence of an indwelling venous or urinary catheter, a history of any surgical procedure (4) Notation in the medical record of a household contact with an identified risk factor</td>
<td>Not defined</td>
<td>Not defined</td>
</tr>
<tr>
<td>Vandenesch et al. [5]</td>
<td>Positive culture within 48 hours after hospital admission. No risk factors for nosocomial acquisition, including no hospitalizations or nursing home residence in the year before admission</td>
<td>Generally susceptible to most of antibiotics tested apart from β-lactams</td>
<td>Novel smaller variant of SCCmecV for example: SCCmecIV, lukSF-PV gene locus positive</td>
</tr>
<tr>
<td>O’Brien et al. [10]</td>
<td>Isolates from people who have had little or no contact with health care facilities or workers</td>
<td>Non multiresistant: Strains resistant to ≤ 3 of the following non-β-lactams: GEN, ERY, TET, TMP, RIF, FA, CIP, MUP</td>
<td>SCCmecIV Multiple clones described based on MLST</td>
</tr>
</tbody>
</table>

**NOTE:** CIP, ciprofloxacin; ERY, erythromycin; FA, fusidic acid; GEN, gentamicin; MLST, multi-locus sequence type; MUP, mupirocin; RIF, rifampin; TET, tetracycline; TMP, trimethoprim.
Trends in oxacillin susceptibility in community strains of *Staphylococcus aureus*
Prevalence of community carriage of MRSA in Malta

- Study period Aug 2010 to March 2011
- 329 healthy individuals
  - Nasal swabs were collected
  - Completed brief questionnaire about risk factors commonly associated with MRSA carriage and infection.
- Prevalence of MRSA nasal colonization was found to be 8.81% (95% CI 5.75–11.87%)
  - Much higher than that found in other studies carried out in several countries 1% - 5%.
- 82.8% of strains were resistant to fusidic-acid

Scerri et al, Journal of Epidemiology and Global Health 2013
Table 1  Results for chi-square test for association between MRSA carriage and different demographics.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>MRSA carriage</th>
<th>Degrees of freedom</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>9 (7.6%)</td>
<td>109 (92.4%)</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>20 (9.5%)</td>
<td>191 (90.5%)</td>
<td></td>
</tr>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16–40</td>
<td>11 (14.7%)</td>
<td>64 (85.3%)</td>
<td>3</td>
</tr>
<tr>
<td>41–55</td>
<td>6 (8.0%)</td>
<td>69 (92.0%)</td>
<td></td>
</tr>
<tr>
<td>56–65</td>
<td>8 (8.3%)</td>
<td>88 (91.7%)</td>
<td></td>
</tr>
<tr>
<td>&gt; 65</td>
<td>4 (4.8%)</td>
<td>79 (95.2%)</td>
<td></td>
</tr>
</tbody>
</table>
Table 2  Organization of risk factors in the questionnaire and results for chi-square test for association between MRSA carriage and different risk factor categories. For the association between carriage and having any risk factor, the result of the Fisher's exact test is shown in brackets as one of the cells had an expected count of less than 5.

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Categories</th>
<th>MRSA carriage</th>
<th>X² value</th>
<th>D.F.</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gym membership</td>
<td>Having a community associated risk factor</td>
<td>Yes 13 (11.3%)</td>
<td>102 (88.7%)</td>
<td>1.364</td>
<td>1</td>
</tr>
<tr>
<td>Attendance at a day care center</td>
<td></td>
<td>No 16 (7.5%)</td>
<td>198 (92.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharing of personal items</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthcare workers</td>
<td>Having relatives with healthcare contacts</td>
<td>Yes 16 (10.5%)</td>
<td>137 (89.5%)</td>
<td>0.960</td>
<td>1</td>
</tr>
<tr>
<td>Elderly relatives living in nursing homes</td>
<td></td>
<td>No 13 (7.4%)</td>
<td>163 (92.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic relatives making frequent hospital visits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic disease</td>
<td>Having a medical history associated with MRSA</td>
<td>Yes 12 (7.1%)</td>
<td>158 (92.9%)</td>
<td>1.349</td>
<td>1</td>
</tr>
<tr>
<td>History of skin infection with boils/abscesses</td>
<td></td>
<td>No 17 (10.7%)</td>
<td>142 (89.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic skin disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotic consumption</td>
<td>Exposure to risk factors in past year</td>
<td>Yes 20 (7.6%)</td>
<td>242 (92.4%)</td>
<td>2.233</td>
<td>1</td>
</tr>
<tr>
<td>Surgery</td>
<td></td>
<td>No 9 (13.4%)</td>
<td>58 (86.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to hospitalized patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All of the above</td>
<td>Having any risk factor</td>
<td>Yes 26 (8.3%)</td>
<td>288 (91.7%)</td>
<td>2.446</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No 3 (20.0%)</td>
<td>12 (80.0%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Implications of these findings

- The presence of such a significant reservoir of MRSA in Maltese community:
  - Increases the burden already faced by the local healthcare system to control the MRSA epidemic.

- When health individuals colonized with MRSA are admitted to healthcare facility, they may represent a risk for
  - endogenous infection
  - transmission to hospitalized patients
  - leading to longer hospital stays and increased healthcare costs.

Scerri et al, Journal of Epidemiology and Global Health 2013
Screening on Admission to MDH

<table>
<thead>
<tr>
<th>Month</th>
<th>Count</th>
<th>Negative</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>April</td>
<td>2046</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>May</td>
<td>2138</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>June</td>
<td>2007</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>July</td>
<td>2075</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>August</td>
<td>2221</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>September</td>
<td>2269</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>October</td>
<td>2265</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>All</td>
<td>15021</td>
<td>90%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Question

How to manage community associated MRSA?

OR

How to manage MRSA in the community?
MRSA in primary care

- Complex and different to managing patients in MRSA in hospital setting
  - Patients have to manage their environment themselves
  - HCWs have little influence on the environment in which patients live
- Patients need to adhere to environmental factors to prevent spread and recolonisation
- Colonisation and infection
Patient understanding of MRSA

- Patients reported that:
  - They are unaware of ways to stop spread of MRSA
  - Instructions on application of treatment were not detailed
    
    “*used a towel to dry himself after applying the treatment, rather than washing it off*”

- Anxiety patients experience when diagnosed

- Looking clean is not clean enough
  - Changing bedding, clothing and towelling every day
  - Wiping surfaces

- When patients feel unwell, are frail or have comorbidities, their ability to comply might be compromised

Robinson et al, BJN 2014
5 Cs in MRSA transmission - CDC

- Crowding,
- Frequent skin-to-skin Contact,
- Compromised skin integrity,
- Contaminated items and surfaces,
- Lack of Cleanliness
Preventing MRSA transmission and infection

- Provide accurate information to patients and public
  - Identifying risk

- Advise patients to:
  - Clean hands often, especially before and after changing wound dressing or bandage
  - Household members should clean their hands often as well
  - Keep any wounds clean and change bandages as instructed until healed
  - Avoid sharing personal items – e.g. towels and razors
  - Don’t share ointments
  - Keep taking any antibiotics as prescribed
  - Wash and dry clothes and bed linens in the highest temperatures recommended on the labels
  - Tell health professionals that you have MRSA.
Info for patients/clients & families

**When should your health care provider/carer clean their hands?**

There are 5 Moments when hand hygiene should be performed by your healthcare provider/carer:

**Moment 1. When arriving to attend your care**
- At home
  - After your healthcare worker has entered your house
- In a clinic
  - On entering the treatment room
- Anywhere
  - Before starting any care
  - Before giving oral medications

**Moment 2. Before attending to your care**
- Immediately before touching your wounds or giving intravenous medications
- Immediately before touching any device you may have like a catheter or IV line

**Moment 3. After attending your care**
- After touching your wounds or giving your medications
- Immediately after touching any device you may have like a catheter or IV line
- After they have disposed of used/dirty equipment or rubbish
- After collecting any specimens

**Moment 4. When your care is finished**
- When they leave your home, room or building you are in

**Moment 5. After touching the surroundings but not the patient**
- After touching any furniture or equipment but not touching you
- After touching any pets
Suspected or confirmed MRSA

- Main mode of transmission – **Contact**

**Direct contact**
- Hand hygiene
- Gloves for any patient contact
- Apron
- Hand hygiene after removing apron & gloves

**Indirect contact**
- Environmental disinfection – high touch surfaces, couches
WHO material adapted (AUS)
Contact precautions

- Any equipment used should be cleaned and disinfected before reuse
  - e.g. stethoscope, sphygmomanometer, thermometer, wheelchair, ambulance.

- Instruments used for dressing changes should not be used for other patients

- Known cases – Time spent in Waiting Area should be kept to minimum

- If patient is referred to other HCWs, these should be informed of MRSA status
Cutaneous abscesses caused by MRSA
Outpatient† management of skin and soft tissue infections in the era of community-associated MRSA‡

<table>
<thead>
<tr>
<th>Patient presents with signs/symptoms of skin infection:</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Redness</td>
</tr>
<tr>
<td>■ Swelling</td>
</tr>
<tr>
<td>■ Warmth</td>
</tr>
<tr>
<td>■ Pain/tenderness</td>
</tr>
<tr>
<td>■ Complaint of “spider bite”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is the lesion purulent (i.e., are any of the following signs present)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Fluctuance—palpable fluid-filled cavity, movable, compressible</td>
</tr>
<tr>
<td>■ Yellow or white center</td>
</tr>
<tr>
<td>■ Central point or “head”</td>
</tr>
<tr>
<td>■ Draining pus</td>
</tr>
<tr>
<td>■ Possible to aspirate pus with needle and syringe</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Possible cellulitis without abscess:</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Provide antimicrobial therapy with coverage for <em>Streptococcus</em> spp. and/or other suspected pathogens</td>
</tr>
<tr>
<td>■ Maintain close follow-up</td>
</tr>
<tr>
<td>■ Consider adding coverage for MRSA (if not provided initially), if patient does not respond</td>
</tr>
</tbody>
</table>

† For severe infections requiring inpatient management, consider consulting an infectious disease specialist.
‡ Visit [www.cdc.gov/mrsa](http://www.cdc.gov/mrsa) for more information.

If systemic symptoms, severe local symptoms, immunosuppression, or failure to respond to I&D, consider antimicrobial therapy with coverage for MRSA in addition to I&D. (See below for options)

1. Drain the lesion
2. Send wound drainage for culture and susceptibility testing
3. Advise patient on wound care and hygiene
4. Discuss follow-up plan with patient

Abbreviations:
I&D—incision and drainage
MRSA—methicillin-resistant *S. aureus*
SSTI—skin and soft tissue infection
Antibiotic treatment guidelines for community care

https://ehealth.gov.mt
Use social media

facebook

Infection prevention and control Malta

twitter

@ClaireFarrugia7
Acknowledgements

Ms Elizabeth Scicluna Epidemiologist ICU MDH
Thank You