Screening for MRSA at Multiple Body Sites in Nursing Home Residents

or, *is nasal screening enough?*
Thank you,

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Department of Internal Medicine
Division of Infectious Diseases
Intro to MRSA

MRSA in Nursing Homes

Is nasal-only screening enough?

Study Design

Results

Conclusions
The CDC estimates that 25-30% of the general population in the US is nasally colonized with MSSA, **but less than 2% are colonized with MRSA.**
In 2011, the STAR*ICU trial, a cluster-randomized trial, conducted in 18 US adult ICUs reported that **11% of the 5,512 patients admitted to medical or surgical ICUs** were nasally colonized with MRSA.

Nair et al. Infection Control and Hospital Epidemiology (ICHE), 2011.
In a prospective cohort study among 5,609 non-ICU patients admitted to the University of Maryland Hospitals with suspected infections and considered “high-risk” (self-report of hospital admission in the past 12 months or an active skin infection on admission), 11% were nasally colonized with MRSA.

Harris et al. AAC 2010.
Among Health-care workers?

A 2008 meta-analysis found that among 33,318 health care workers (HCWs), the average world-wide rate of MRSA colonization was 4.6%.

In a large, urban, tertiary care hospital in the US, a 2010 cross-sectional study, the rate of MRSA carriage among HCWs was 6.6%:

- Nurses: 10.5%
- Physicians: 3.8%
- Paramedics: 1.9%

Among Nursing Home residents?

In a cross-sectional study of 213 nursing home residents in 14 nursing homes in Southeastern Michigan, 26% were nasally colonized with MRSA.

Mody et al. CID 2008.
Among Nursing Home residents?

Prevalence of Nasal Colonization with MRSA

- US pop
- HCWs
- High-risk non-ICU
- ICU
- NHs

Percent Colonized (%)

Why so high?
Why so high?

CIPRO

AMOX/CLAV

TMP-STX
Route of transmission?
Intro to MRSA

MRSA in Nursing Homes

Is nasal-only screening enough?

Study Design

Results

Conclusions
Are nasal swabs sensitive enough?

A retrospective analysis of multi-anatomic MRSA screenings of 3,137 patients at a university hospital in Switzerland demonstrated that nasal swabs detected only 48% of MRSA-positive patients.

Study Design

Our study was a prospective cohort study in which samples were collected from the nares, skin of the axilla and groin (pooled), perianal skin (or stool), and when applicable, from wounds, insertion sites of invasive medical devices (e.g. tracheostomy sites, PEG, vascular catheters) at 0, 3, 6, 9, and 12 months from residents living in 6 skilled-nursing facilities (SNFs) in non-urban, South Central Wisconsin.
Study Design

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Methods

Specimens were enriched and then cultured on selective media for 48 hours. Catalase-positive, coagulase-positive, gram positive cocci were confirmed as MRSA using the Kirby Bauer disc diffusion method.
6 Skilled Nursing Facilities (SNFs) in Southcentral Wisconsin (non-urban)

851 RESIDENTS INVITED

449 ELIGIBLE SCREENED

MRSA (-)
  n = 352
  AT INITIAL SCREEN

MRSA (+)
  n = 97
  AT INITIAL SCREEN

25 DIED OR DC’D PRIOR

377 DECLINED PARTICIPATION
6 Skilled Nursing Facilities (SNFs) in Southcentral Wisconsin (non-urban)

449 ELIGIBLE SCREENED

MRSA (-)
n = 352
AT INITIAL SCREEN

MRSA (+)
n = 97
AT INITIAL SCREEN

22% MRSA (+)
6 Skilled Nursing Facilities (SNFs) in Southcentral Wisconsin (non-urban)

Prevalence of Colonization with MRSA

Percent Colonized (%)

US pop | HCWs | High-risk non-ICU | ICU | NHs | Wisc SNFs

6 Skilled Nursing Facilities (SNFs) in Southcentral Wisconsin (non-urban)

- **MRSA (-)**
  - n = 352
  - AT INITIAL SCREEN

- **MRSA (+)**
  - n = 97
  - AT INITIAL SCREEN

- **NEGATIVES**
  - n = 300

- **“CONVERTERS”**
  - n = 52

**TOTAL MRSA (+)**
- n = 149

149/449 = 33%
RESULTS

TOTAL MRSA (+)

n = 149
## RESULTS

**TOTAL MRSA (+)**  
\[ n = 149 \]

<table>
<thead>
<tr>
<th>Location</th>
<th>No. subjects colonized (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal</td>
<td>101 (68)</td>
</tr>
<tr>
<td>Axilla-Groin</td>
<td>66 (44)</td>
</tr>
<tr>
<td>Perianal/Stool</td>
<td>65 (44)</td>
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**IS NASAL SCREENING ENOUGH?**
# RESULTS

**TOTAL MRSA (+)**

$n = 149$

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<tr>
<td>Nasal + Axilla-Groin</td>
<td>127 (85)</td>
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</tbody>
</table>
## RESULTS

**TOTAL MRSA (+)**  
\[ n = 149 \]

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<td>65 (44)</td>
</tr>
<tr>
<td>Nasal + Perianal/Stool</td>
<td>131 (88)</td>
</tr>
</tbody>
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# RESULTS

TOTAL MRSA (+)  
\[ n = 149 \]

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<tr>
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<td>66 (44)</td>
</tr>
<tr>
<td><strong>Perianal/Stool</strong></td>
<td>65 (44)</td>
</tr>
<tr>
<td><strong>Axilla-Groin + Perianal/Stool</strong></td>
<td>93 (62)</td>
</tr>
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# RESULTS

**TOTAL MRSA (+)**  
\[ n = 149 \]

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</tr>
<tr>
<td>Perianal/Stool</td>
<td>65 (44)</td>
</tr>
<tr>
<td>Nose + Ax-Groin + Perianal</td>
<td>142 (95)</td>
</tr>
</tbody>
</table>
RESULTS

TOTAL MRSA (+)
n = 149

What’s left?

Nose + Ax-Groin + Perianal 142 (95)
<table>
<thead>
<tr>
<th>Subject</th>
<th>Wound</th>
<th>Urine (Foley)</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>
# RESULTS

<table>
<thead>
<tr>
<th>Combinations of sites</th>
<th>Sensitivity (%)</th>
<th>Confidence Interval (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nose</td>
<td>68</td>
<td>(0.60-0.75)</td>
</tr>
<tr>
<td>Nose + Ax-Groin</td>
<td>85</td>
<td>(0.79-0.91)</td>
</tr>
<tr>
<td>Nose + Rectal</td>
<td>88</td>
<td>(0.83-0.93)</td>
</tr>
<tr>
<td>Ax-Groin + Rectal</td>
<td>62</td>
<td>(0.54-0.70)</td>
</tr>
<tr>
<td>Nose + Ax-Groin + Rectal</td>
<td>95</td>
<td>(0.92-0.99)</td>
</tr>
<tr>
<td>Nose + Ax-Groin + Rectal + Wound</td>
<td>99</td>
<td>(0.97-1.0)</td>
</tr>
<tr>
<td>Nose + Ax-Groin + Rectal + Wound + Others</td>
<td>100</td>
<td>(1.0-1.0)</td>
</tr>
</tbody>
</table>
## RESULTS

### Sensitivity for MRSA

<table>
<thead>
<tr>
<th></th>
<th>Nose</th>
<th>AG</th>
<th>R</th>
<th>N+AG</th>
<th>N+R</th>
<th>AG+R</th>
<th>N,AG,R</th>
<th>N,AG,R, W</th>
<th>N,AG,R, W,O</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>68</td>
<td>44</td>
<td>44</td>
<td>85</td>
<td>88</td>
<td>62</td>
<td>95</td>
<td>99</td>
<td>100</td>
</tr>
</tbody>
</table>
- MRSA colonization in nursing homes is high.
- Nasal screening alone does not detect a high enough proportion of those colonized.
- Adding an axillary/groin swab or a rectal increases sensitivity to an acceptable level (85-88%).
Albrich WC, Harbarth S. *Health-care workers: source, vector, or victim of MRSA?*. Lancet Inf Dis 2008;8:289-301.


References


Senn L, Basset P, Nahimana I, Zanetti G, Blanc DS. *Which anatomical sites should be sampled for screening of methicillin-resistant Staphylococcus aureus carriage by culture or by rapid PCR test?* Clin Micro and Inf 2011;18:E31-E33.
FUTURE DIRECTIONS

- Persistence as a risk factor for invasive infection

- What are predictors of persistence?

- Is there a pattern of body site colonization that predisposes to persistence?

- Do devices or wounds predict persistence?

- Does multi-anatomic site colonization predict persistence?
Incidence of Infections

A recently publicized article in JAMA (2010) from CDC data indicated that in the years 2005-2008, the rates of invasive MRSA infections were decreasing.

However, an article in ICHE published this month, found that the number of MRSA infections in academic hospitals were actually increasing during the period from 2003 to 2008 (actual number of MRSA infections documented at hospital discharge was ~2%). The CDC study did not include skin and soft tissue infections.

CDC.gov, 2012; Kallen et al. JAMA 2010; David et al. ICHE 2012.