Debate ....

House believes contact precautions are essential for the management of patients with MDROs

Speaking FOR the motion ..... Prof. Eli Perencevich
University of Iowa

Speaking AGAINST the motion ..... Dr. Fidelma Fitzpatrick
Royal College of Surgeons in Ireland

www.webbertraining.com September 27, 2016
FOR: House believes contact precautions are essential for the management of patients with MDROs

Eli Perencevich, MD MS
Professor of Internal Medicine
University of Iowa, Carver College of Medicine
PI and Director, VA HSR&D Center for Comprehensive Access and Delivery Research & Evaluation
Controversies Blog: stopinfections.org
eli-perencevich@uiowa.edu
Twitter: @eliowa
Conflicts of Interest Statement

- No financial conflicts
- Section Editor for Guidelines, Position Papers, and Invited Reviews @ ICHE
- Federal Funding
  - VA HSR&D (COIN and CREATE)
  - CDC Prevention Epicenter
  - AHRQ
Contract Precautions Prevent Transmission

My Experience with Contact Precautions

Basics of How Contact Precautions Work

Review “Side Effects”
Hand Hygiene Completely Dead

- “Hand Hygiene Compliance: are we kidding ourselves?”¹
- Targets set at >90%, met by most facilities
- 2009-2014 Systematic Review²
  - Mean compliance before intervention 34%
  - After intervention 57%
- *If we can’t do hand hygiene, we need SOMETHING to prevent transmission*

Significant patient-to-patient spread occurring in ICUs

- Prospective cohort, 5 ICUs in 2 hospitals\(^1\)
  - Genetically linked 10 pathogens
  - 14.5% of infections could be pt-to-pt
- Prospective cohort, German ICU\(^2\)
  - PFGE for MRSA and PCR
  - 37.5% of nosocomial infections could be due to cross-transmission

2. Weist K ICHE March 2002
How CP are typically utilized

- Linked to active surveillance of MDRO patients
- Appears we are protecting HCW?
How might CP be better utilized?

- Strategies that isolate MDRO- patients protect them
## Benefits of Active Surveillance (VRE)

### Table 2.
Estimated number of incident vancomycin-resistant enterococci (VRE) acquisitions and absolute number and proportion of cases prevented in 1 year with 3 competing infection-control strategies, after 1000 model simulations.

<table>
<thead>
<tr>
<th>Infection control strategy</th>
<th>Average no. of incident VRE acquisitions</th>
<th>Estimated no. of incident cases of VRE colonization/infection prevented, compared with no surveillance strategy</th>
<th>Reduction of cases of VRE colonization/infection, compared with no surveillance strategy, %</th>
</tr>
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<tr>
<td>No surveillance</td>
<td>118</td>
<td>...</td>
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<td>5</td>
<td>4.2</td>
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<td><strong>Active surveillance</strong></td>
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**Note.** Each strategy is compared with a setting where no surveillance is in place.

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Benefits of Isolation for VRE

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<td>41.1</td>
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NOTE. Each strategy is compared with a setting where no surveillance is in place.

FOR MORE INFO...

You can’t study with Math Models

- The article by Perencevich et al. has potential for moving ... infection-control communities closer to a tipping point on the control of this important pathogen... It has this potential because the model seems to be logical and mathematically correct (and) provides valuable insight into the importance of variables such as the prevalence of culture positivity at ICU admission and the duration of ICU stay.” – Barry Farr, Clin Infect Dis 2003
Interventions Targeting Transmission

Key question: How many colonized become infected? 20:1 vs 10:1 vs 1:1

Uncolonized

Colonized, No infection

Infected

Outcomes (Mortality)

Bare Below Elbows, White Coats, Contact Precautions

LOS, comorbidity, colonization pressure

Severity of Illness, comorbidity, antibiotic exposure

Severity of illness, comorbidity, source control, antibiotics
Studies don’t include post-discharge infections

- Including 30-day post discharge incident MRSA infections tripled median incidence\(^1\)
  - From 12.2 to 35.7/10,000 at risk admissions, \(p<0.01\)
  - Limited by use of ICD-9 code for MRSA

- Prospective cohort of 281 MRSA carriers\(^2\)
  - 40% MRSA infections occurred during later hospitalizations, higher risk for recent carriers

- Prospective cohort of 209 new carriers\(^3\)
  - 49% of incident MRSA infections were post-discharge

**FOR MORE INFO...**

1. Avery et al. ICHE February 2012
2. Datta R, Huang SS CID 2008
Difficult to study contact precautions

- Need surveillance swabs on admission/discharge to measure benefits
  - Sensitivity/specificity/costs of surveillance tests
  - Typically look at only 1-2 organisms
  - Very hard to power/design good efficacy trials
    - More likely to be underpowered/negative studies

- RCTs can’t answer for all conditions
  - Organism prevalence, ICU length of stay
  - Need cohort studies and math models
Don’t wait for RCT

- Must consider other forms of epidemiological data when assessing benefits of contact precautions
- We will be waiting for years for well-powered RCTs
- Airline safety:
  - Tray tables up before take-off – RCT?
  - No sleeping in aisles of plane – RCT?
  - Parachutes
My Contact Precautions Decade

- July 2002, MICU
- Everyone on vacation, except...
- 5 patients with MDR-AB bacteremia in July
- 4 in August
- Control plan
- Shut MICU
- Press
- Ban artificial nails
What happened?

- Lawsuits
- Closed MICU 2002
- Closed SICU 2007 and 2009
- Closed several Shock Trauma ICUs
- Universal gown/glove in MICU and SICU¹
- Active surveillance on all transfers from OSH; isolated until cultures return
- Statewide AB surveillance (2010)

¹. Wright MO et al, Infect Control Hosp Epi
MDR-Acinetobacter baumannii 48 hour stratification

Red >48 hours
Research Questions

1. How important are contact precautions for MRSA, VRE, MDR A. *baumannii* or MDR *P. aeruginosa*?

2. How important is hand-hygiene after using contact precautions for MDR A. *baumannii*?

FOR MORE INFO...

Methods

- Cultured hands
  - before entry
  - gowns/gloves after exit
  - hands after gown/glove removal before hand hygiene
## Transmissibility and Protection

<table>
<thead>
<tr>
<th>Organism</th>
<th>HCW Room Entries</th>
<th>Hand + Before (%)</th>
<th>Gown and/or Glove + After %</th>
<th>Hands + After Removal</th>
<th>Effectiveness of PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. baumannii</em>¹</td>
<td>202</td>
<td>1.5%</td>
<td>38.7%</td>
<td>4.5%</td>
<td>88%</td>
</tr>
<tr>
<td><em>P. aeruginosa</em>¹</td>
<td>133</td>
<td>0%</td>
<td>8.2%</td>
<td>0.7%</td>
<td>90%</td>
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<tr>
<td>VRE²</td>
<td>94</td>
<td>0%</td>
<td>9%</td>
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<td>MRSA²</td>
<td>81</td>
<td>2%</td>
<td>19%</td>
<td>2.6%</td>
<td>85%</td>
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Effectiveness of Gloves

- 50 HCW contacts with VRE+ patients
- 44 with Hands negative for VRE prior to contact
  - 6 were VRE+ before enrollment and excluded
- 17 of 44 HCW (39%) acquired VRE on their gloves
- 12 of these 17 (71%) HCW hands were VRE negative

Thus, gloves reduce VRE transmission by ~70%

FOR MORE INFO...

More evidence for gloves

- Cultured patient, environment and 103 HCW hands/gloves before and after 131 observations
- 52% contaminated on gowns/gloves after touching environment
- 70% contaminated after touching patient/environment
- Hands contaminated 37% of time if no gloves
- Only 5% hand contamination if gloves worn
- **86% benefit of gloves**

FOR MORE INFO...

Hayden M et al. ICHE 2008 Feb;29(2):149-54
Transmission Matrix

How likely is a HCW to be contaminated after leaving room?

- Transmission data for MDR A. *baumannii*
- In relationship to compliance rates
- Assumption of independence of rates and 100% eradication with hand-hygiene
# A. baumannii: Transmission from Pt to HCW with Variable Compliance

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Transmission from Patient to HCW with 50% hand hygiene compliance

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Compliance with Gloves (patients on contact precautions)
What about 90% hand hygiene compliance?

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Contact Precautions Improve Hand Hygiene Compliance

- In long-term care, contact precautions associated with higher hand hygiene compliance\(^1\)
  - Before interaction RR 1.76 (0.71-4.33)
  - After interaction RR 2.68 (1.67-4.30)
- 4 acute care hospitals with 7,743 HCW visits\(^2\)
  - Entry compliance: 42.5% on CP vs 30.3%, \(p=0.14\)
  - Exit compliance 63.2% on CP vs 47.4%, \(p<0.001\)
- 38% hand hygiene after gloves vs 9.8% in ICUs\(^3\)

FOR MORE INFO...

1. Thompson BL et al. ICHE 1997
2. Morgan DM et al ICHE 2013
But what about this famous study?

56 wards in 15 hospitals
- England and Wales
- International Press
### Table 2. Rates of Compliance with Hand Hygiene When Gloves Were Worn and When Gloves Were Not Worn

<table>
<thead>
<tr>
<th>Type of moment</th>
<th>Proportion (%) of moments with hand hygiene compliance</th>
<th>RR (95% CI)</th>
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<tr>
<td></td>
<td>When gloves were worn</td>
<td>When gloves were not worn</td>
</tr>
<tr>
<td>All</td>
<td>415/1,002 (41.4)</td>
<td>1,344/2,686 (50.0)</td>
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<td>By location</td>
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<tr>
<td>Intensive therapy unit</td>
<td>246/514 (47.9)</td>
<td>488/896 (54.5)</td>
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<td>ACE/GM ward</td>
<td>169/488 (34.6)</td>
<td>856/1,790 (47.8)</td>
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<td>72/123 (58.5)</td>
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<td>Low-risk contact</td>
<td>203/518 (39.2)</td>
<td>1,272/2,563 (49.6)</td>
</tr>
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<td>By timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before contact</td>
<td>98/330 (29.7)</td>
<td>170/424 (40.1)</td>
</tr>
<tr>
<td>After contact</td>
<td>317/672 (47.2)</td>
<td>1,174/2,262 (51.9)</td>
</tr>
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**Note.** ACE/GM; acute care of the elderly and general medical; CI, confidence interval; RR, risk ratio.

Fulmer C. et al. ICHE 2011
Minimal change **AFTER** contact

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**Note.** ACE/GM; acute care of the elderly and general medical; CI, confidence interval; RR, risk ratio.

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For more info...

Fulmer C. et al. ICHE 2011
AND no need to perform hand hygiene before donning gloves

- Prospective randomized trial of 230 HCW entering ICU rooms
  - Directly don nonsterile gloves
  - Perform hand hygiene and then don nonsterile gloves

- No significant difference in colony counts of gloved hands between groups, p=0.52
  - Ratio of mean colony counts 0.86 (0.53-1.37)

Rock C. et al. AJIC, November 2013
But do they work?

- Medical ICU implemented universal contact precautions during Maryland’s Acinetobacter outbreak
- Quasi-experimental study, 6 months before/after
- Outcome: Acquisition of VRE and MRSA assessed with admission, weekly and discharge cultures
  - VRE acquisition declined, 21% to 9%, p=0.05
  - MRSA acquisition declined 14% to 10%, p=0.5

FOR MORE INFO...
Wright MO, et al. ICHE Feb 2004
BUGG

Original Investigation

Universal Glove and Gown Use and Acquisition of Antibiotic-Resistant Bacteria in the ICU
A Randomized Trial

Anthony D. Harris, MD, MPH; Lisa Pineles, MA; Beverly Belton, RN, MSN; J. Kristie Johnson, PhD; Michelle Shardell, PhD; Mark Loeb, MD, MSc; Robin Newhouse, RN, PhD; Louise Dembry, MD, MS, MBA; Barbara Braun, PhD; Eli N. Perencevich, MD, MS; Kendall K. Hall, MD, MS; Daniel J. Morgan, MD, MS; and the Benefits of Universal Glove and Gown (BUGG) Investigators

- Match-paired cluster-RCT, 9 months
- 20 medical and surgical ICUs, 20 US Hospitals
- Powered to detect 25% reduction in VRE or MRSA
- $5.7 million dollars

FOR MORE INFO...

Harris AD, et al. JAMA 2013
BUGG Intervention

- 26,180 patient admissions
- 92,241 swabs collected, over 84% compliance
- Intervention ICUs
  - Glove compliance 86%, gown 85%
- Control ICUs (10.5% on contact precautions)
  - Glove compliance 84%, gown 81%
- Comparing 85% patients under CP vs 8.5%

FOR MORE INFO...
Harris AD, et al. JAMA 2013
MRSA and/or VRE

- MRSA and VRE -1.71 acquisitions per 1000 patient days (-6.15 to 2.73, p=0.57)
- VRE 0.89 acquisitions/1000 patient days, p=0.70
- MRSA reduced -2.98 acquisitions/1000 patient days, (-5.58 to -0.38, p=0.046)

- 40.2% reduction in MRSA in the intervention group vs 15% reduction in the control group

FOR MORE INFO...

Harris AD, et al. JAMA 2013
Other outcomes

- HCW visited one fewer time per hour
  - 4.28 vs 5.24, p=0.02
- Hand hygiene compliance on entry didn’t differ
- Hand hygiene on exit improved with CP
  - 78.3% vs 62.9%, p=0.02
- No change in CLABSI, CAUTI, VAP or mortality rates

Harris AD, et al. JAMA 2013
Other infection related outcomes?

- HCW visited one fewer time per hour
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- Hand hygiene compliance on entry didn’t differ
- **Hand hygiene on exit improved with CP**
  - 78.3% vs 62.9%, p=0.02
- No change in CLABSI, CAUTI, VAP or mortality rates

FOR MORE INFO...

Harris AD, et al. JAMA 2013
No difference in adverse events

- Random selection (N=90/ICU), chart review
- IHI Global trigger tool

<table>
<thead>
<tr>
<th>Adverse events</th>
<th>All</th>
<th>Preventable</th>
<th>Nonpreventable</th>
<th>Severe</th>
<th>Not severe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>266</td>
<td>134</td>
<td>132</td>
<td>163</td>
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</tr>
<tr>
<td></td>
<td>58.7 (45.8 to 75.2)</td>
<td>29.0 (20.0 to 42.1)</td>
<td>33.0 (24.3 to 45.0)</td>
<td>36.5 (25.2 to 52.8)</td>
<td>23.6 (15.7 to 35.5)</td>
</tr>
<tr>
<td></td>
<td>369</td>
<td>156</td>
<td>213</td>
<td>245</td>
<td>124</td>
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<td>4846</td>
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<td>4846</td>
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<tr>
<td></td>
<td>74.4 (57.9 to 95.6)</td>
<td>30.4 (21.7 to 42.7)</td>
<td>43.3 (31.0 to 60.4)</td>
<td>48.1 (35.7 to 64.6)</td>
<td>25.0 (18.9 to 33.2)</td>
</tr>
</tbody>
</table>

|                         | -15.7 (-40.7 to 9.2) | -1.4 (-19.4 to 16.6) | -1.4 (-13.1 to 10.3) |
|                         | .24                  | .88                    | .82                |

**FOR MORE INFO...**
Harris AD, et al. JAMA 2013
But what about the other bad side effects of contact precautions studies?

### General Cohort
- Precautions n=78
- Controls n=156

### Congestive Heart Failure Cohort
- Precautions n=72
- Controls n=144

#### Outcomes:
- **Length of Stay***: 31 vs. 12 days vs. 8 vs. 6 days
- **any Adverse Event***: 17% vs. 7% vs. 47% vs. 25%
- **Preventable AE***: 12% vs. 3% vs. 29% vs. 4%
- **Death**: 27% vs. 18% vs. 21% vs. 15%

FOR MORE INFO...
Stelfox et al. JAMA October 2003
But what about the other bad side effects of contact precautions studies?

<table>
<thead>
<tr>
<th>Differences in Adverse Events due to:</th>
<th>General Cohort</th>
<th>Congestive Heart Failure Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>any Adverse Event</td>
<td>17% vs. 7%</td>
<td>47% vs. 25%</td>
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<td>Preventable AE*</td>
<td>12% vs. 3%</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>falls</td>
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</tr>
<tr>
<td></td>
<td>pressure ulcers</td>
<td></td>
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<tr>
<td></td>
<td>fluid &amp; electrolyte disorders</td>
<td></td>
</tr>
</tbody>
</table>
But what about the other bad side effects of contact precautions studies?

<table>
<thead>
<tr>
<th>General Cohort</th>
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<tr>
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Stelfox et al. JAMA October 2003
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<thead>
<tr>
<th></th>
<th>General Cohort</th>
<th>Controls n=156</th>
<th>Congestive Heart Failure Cohort</th>
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<td>Precautions n</td>
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</table>

Study never adequately controlled for severity of illness

FOR MORE INFO...
Stelfox et al. JAMA October 2003
## Contact Precautions associated with reduced healthcare worker visits

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kirkland &amp; Weinstein 1999</td>
<td>Cohort</td>
<td>2.1 vs. 4.2 hourly contacts with HCWs</td>
</tr>
<tr>
<td>Saint et al 2003</td>
<td>Cohort</td>
<td>35% vs. 73% patients examined by attending physicians</td>
</tr>
<tr>
<td>Evans et al 2003</td>
<td>Matched cohort</td>
<td>5.3 vs. 10.9 contacts HCWs; 22% less contact time overall</td>
</tr>
<tr>
<td>Morgan et al 2013</td>
<td>Cohort</td>
<td>2.78 vs. 4.37 visits/hour; 17.7% less contact time; 23.6% fewer visitors</td>
</tr>
<tr>
<td>Harris et al 2013</td>
<td>Randomized controlled trial</td>
<td>4.28 vs. 5.24 visits/hour</td>
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</table>
Are reduced visits “independently” bad?

- Independently = bad for patients without causing other problems
- If no adverse events in RCT then reduced visits could be good for patients (or at least not bad)
- Fewer visits = fewer opportunities to transmit infections
- Fewer visits = fewer disruptions
  - Detsky and Krumholz, reducing trauma of hospitalization (post-hospital syndrome)

FOR MORE INFO...
Detsky AS and Krumholz HM, JAMA June 2014
<table>
<thead>
<tr>
<th>Setting</th>
<th>Design</th>
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<tbody>
<tr>
<td>Kennedy &amp; Hamilton 1997</td>
<td>Spinal Cord rehab unit</td>
<td>16 cases/16 controls 85% believed CP limited rehab, More Anger 12.3 vs. 16.5 depression scores (NS)</td>
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<tr>
<td>Gammon 1998</td>
<td>Wards, 3 hospitals</td>
<td>20 cases/20 controls 30% higher depression and anxiety scores</td>
</tr>
<tr>
<td>Tarzi et al 2001</td>
<td>Rehab unit</td>
<td>20 cases/20 controls 33% vs. 77% depression 8.6 vs. 15 anxiety scores</td>
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<tr>
<td>Wassenberg et al. 2010</td>
<td>Tertiary Hospital</td>
<td>42 cases/84 controls Small, nonsignificant difference in depression/anxiety at admission</td>
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<tr>
<td>Day et al. 2011</td>
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# Psychology of Isolation

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</table>

**Cross-sectional studies. Studies have not controlled for baseline characteristics and underlying disease severity**

**Isolated patients are sicker independent of contact precautions exposure**
Patients on contact precautions are not more likely to develop depression or anxiety

- Prospective cohort of medical/surgical patients
  - Matched on hospital ward and month
- 148 exposed (contact precautions) vs 148 controls
- Enrolled on admission
  - 36-item questionnaire
  - Medical/Psychiatric history
  - Hospital Anxiety and Depression Scale (HADS)
  - Visual analog mood scales (VAMS)

Day HR et al. ICHE March 2013
Stable Depression Symptoms with CP

![Graph showing stable depression symptoms with CP over three days with different patient groups.](image-url)
Stable Anxiety Symptoms with CP

**Graph Description:**
- **HADS-A** scale ranging from 0 to 10.
- **Days:** Day 1 (n=296), Day 3 (n=296), Day 7 (n=56).
- **Lines:**
  - Blue line: Patients on Contact Precautions.
  - Black dashed line: Patients not on Contact Precautions.

**Key Points:**
- The blue line shows a slight increase in symptoms from Day 1 to Day 3, followed by a decrease on Day 7.
- The black dashed line shows a steady decrease in symptoms from Day 1 to Day 7.
- The graph indicates stability in anxiety symptoms for patients on contact precautions compared to those not on contact precautions.
## Contact Precautions Associated with Fewer Adverse Events

<table>
<thead>
<tr>
<th>Type of Adverse Event</th>
<th>R(_r)R (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Noninfectious adverse events(^a)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients on contact precautions vs. not on contact precautions</td>
<td>0.70 (0.51–0.95)</td>
<td>.02</td>
</tr>
<tr>
<td>Prior hospitalization in previous 30 days</td>
<td>1.22 (0.87–1.70)</td>
<td>.25</td>
</tr>
<tr>
<td>Charlson comorbidity score ≥2</td>
<td>1.04 (0.75–1.45)</td>
<td>.80</td>
</tr>
<tr>
<td>Male gender</td>
<td>0.73 (0.54–0.99)</td>
<td>.05</td>
</tr>
<tr>
<td><strong>Preventable noninfectious adverse events(^a)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients on contact precautions vs not on contact precautions</td>
<td>0.85 (0.59–1.24)</td>
<td>.41</td>
</tr>
<tr>
<td>Male gender</td>
<td>0.67 (0.46–0.98)</td>
<td>.04</td>
</tr>
<tr>
<td>Charlson comorbidity score ≥2</td>
<td>0.89 (0.60–1.33)</td>
<td>.57</td>
</tr>
</tbody>
</table>

\(^a\) Adjusted for hospital type, age, gender, race, education, insurance, and prior hospitalization in previous 30 days.
USE CONTACT PRECAUTIONS – NO FEAR

- Hand hygiene compliance remains poor
  - Contact Precautions 80-100% effective in reducing hand contamination
- Contact Precautions often bundled with active surveillance, but are effective alone
  - Data strongest for MRSA (also VRE, Acinetobacter)
- Side-effects greatly overblown
- Longer, less frequent HCW visits could be beneficial
Acknowledgements

- Anthony Harris
- Daniel Morgan
- Hannah Day
- J Kristie Johnson
- Jon Furuno
- Marin Schweizer
- Daniel Diekema
- Kent Sepkowitz
- Graeme Forrest
- Heather Reisinger
- Margaret Graham
- Michelle Shardell
- Lisa Pineles
- Kerri Thom
- Peter Kim
- Mary Claire Roghmann
Thank you
Thank you – Questions?

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- Contact Precautions often bundled with active surveillance, but are effective alone
  - Data strongest for MRSA (also VRE, Acinetobacter)
- Side-effects greatly overblown
- Longer, less frequent HCW visits could be beneficial

QUESTIONS? @eliowa eli-perencevich@uiowa.edu stopinfections.org
“This house believes that contact precautions are essential for the management of patients with MDROs”

Dr. Fidelma Fitzpatrick,
Senior Lecturer, Royal College of Surgeons in Ireland,
Consultant Microbiologist, Beaumont Hospital,
Dublin, Ireland
@ffitzP
THE TREE, as seen by...

- the planner...
- the parks department...
- the publisher...
- the highways department...
- the developer...
- the landscape architect
WHAT ARE CONTACT PRECAUTIONS?
Standard Precautions *plus something else*

- **Containment**
  - Patients: Single room – cohort
  - Staff
- **Dedicated** equipment and supplies
- **PPE**
  - **What?**
    - Gloves
    - Apron
    - Long sleeved gown
    - Mask (???)
  - When to put on?
    - Before entering or red zone
  - Who?
    - Staff
    - Visitors?
Approx 15% hospitalised patients under contact precautions at any one time

28.5% ICU / 19% ward MRSA/VRE alone
HOW DO WE USUALLY DECIDE WHO GETS THEM?
• Active screening
  – All
  – ‘high risk’ (whatever that is)
• Positive clinical cultures
• Previous MDRO
  – Forever
  – If not decolonised
• All of the above
WHY DO WE DO IT?
AIMING TO PREVENT HAI

- **Exogenous**
  - Equipment
  - Environment

- **Endogenous**

- **Sterile Site**

- Other patients

- Staff
  - Hands
  - Clothes
WHAT IS THE EVIDENCE BASE?
OUTBREAKS

- July 1991-Jan 1992
- Contact precautions (CP) vs. none in NICU
- Mask + gown + gloves + isolation + staff screening
- Rate of MRSA transmission/d
- CP 0.009 vs. none 0.140
- Discussion – older papers with failure of CP
Endemic MDRO

No study of Contact Precautions (CP) vs. none!

1. ICU:
   Universal gown/glove vs. CP MRSA/VRE
   - Decrease MRSA transmission (not VRE)

2. ICU + wards:
   CP - no CP (+ daily chlorhex + HH + bare below elbows)
   - No change MRSA/VRE device infection

3. ICU + wards:
   MRSA bundle (included CP)

<table>
<thead>
<tr>
<th></th>
<th>ICU</th>
<th>Non ICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA transmission</td>
<td>Down 17%</td>
<td>Down 21%</td>
</tr>
<tr>
<td>HCA MRSA infection</td>
<td>Down 62%</td>
<td>Down 45%</td>
</tr>
<tr>
<td>HCA VRE infection</td>
<td>Down to zero</td>
<td>Down 73%</td>
</tr>
</tbody>
</table>

### Endemic MDRO

No study reported.

1. **ICU:**
   - Decreased
   - No change

2. **ICU + HCA:**
   - CP - no CP
   - No change

3. **ICU + HCA:**
   - MRSA burden

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Domains</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Interventions</td>
<td>MRSA-specific interventions</td>
<td>Active surveillance screening</td>
</tr>
<tr>
<td>Horizontal Interventions</td>
<td>Expansion of local human resources</td>
<td>MPC position</td>
</tr>
<tr>
<td>Cultural transformation</td>
<td>“Positive deviance“ approach</td>
<td></td>
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<tr>
<td>Educational resources</td>
<td>Training resources for MPCs</td>
<td></td>
</tr>
<tr>
<td>Leadership involvement</td>
<td>Clarification of leadership responsibility</td>
<td></td>
</tr>
</tbody>
</table>

ICU (n=18)

Intervention
- MRSA/VRE screening
- Universal gloves till negative screen
- CP if positive
- Training after randomisation

Control
- Did the screens but did not tell staff the results
- Existing procedures to ID MRSA/VRE and CP if +
- Everybody else standard precautions

No difference in colonisation/infection with MRSA or VRE
ICU-level incidence of MRSA not associated with % ICU patient days on CPs
Interventions to reduce colonisation and transmission of antimicrobial-resistant bacteria in intensive care units: an interrupted time series study and cluster randomised trial

13 EU ITUs

1. Baseline

2. Universal CHG + Hand hygiene improvement
   Reduced acquisition of MDRO – principally MRSA.

3. Screening (conventional/rapid)+ contact precautions
   No incremental effect on acquisition.
Reconsidering Contact Precautions for Endemic Methicillin-Resistant *Staphylococcus aureus* and Vancomycin-Resistant *Enterococcus*

Mainly ICUs

CP rarely analysed separately from other interventions

<table>
<thead>
<tr>
<th>Lead author</th>
<th>Trial design</th>
<th>Setting</th>
<th>Gowns</th>
<th>Gloves</th>
<th>Surveillance culturing</th>
<th>HH</th>
<th>Universal decolonization</th>
<th>Targeted decolonization</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigg et al⁹</td>
<td>RCT</td>
<td>SNFs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td></td>
<td></td>
<td>UG use was equivalent to CP in SNFs that did not limit patient activities</td>
</tr>
<tr>
<td>Lucet et al¹⁴</td>
<td>Before-after</td>
<td>ICU's</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>Surveillance cultures to guide CP led to a decrease in MRSA acquisition rates</td>
</tr>
<tr>
<td>Huang et al¹⁵</td>
<td>Quasi-experimental</td>
<td>ICU's</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Surveillance cultures to guide CP decreased MRSA acquisition rates and BSI rates</td>
</tr>
<tr>
<td>Robishek et al²⁰</td>
<td>Before-after</td>
<td>Hospital-wide</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>Some decrease in BSI rates observed hospital-wide</td>
</tr>
<tr>
<td>Harborth et al⁸</td>
<td>Cross-over quasi-experimental</td>
<td>Surgical patients</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Surveillance cultures to guide CP and targeted decolonization did not reduce nosocomial MRSA infection rates with endemic MRSA prevalence</td>
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<tr>
<td>Bearman et al¹⁴</td>
<td>Before-after</td>
<td>ICU's</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>UG use was equivalent to CP for prevention of MRSA acquisition</td>
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<td>Huskins et al¹⁶</td>
<td>RCT</td>
<td>ICU's</td>
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<td>✓</td>
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<td>✓</td>
<td>Surveillance cultures to guide CP vs standard CP alone resulted in equivalent MRSA acquisition or infection rates</td>
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<tr>
<td>Jain et al¹⁷</td>
<td>Before-after</td>
<td>Hospital-wide</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>Bundle of surveillance cultures to guide CP, HH, and institutional culture change was associated with a decrease in MRSA colonization and infection rates</td>
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<td>Derde et al³⁰</td>
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<td>✓</td>
<td>No impact of surveillance cultures to guide CP</td>
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<td>✓</td>
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<table>
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<tr>
<th>Lead author</th>
<th>Trial design</th>
<th>Setting</th>
<th>Gowns</th>
<th>Gloves</th>
<th>Surveillance cultures</th>
<th>HH</th>
<th>Universal decolonization</th>
<th>Targeted decolonization</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearman et al$^{16}$</td>
<td>Before-after</td>
<td>MICU</td>
<td>Before</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>No</td>
<td>No</td>
<td>No difference in VRE acquisition risk between CP and UG use</td>
</tr>
<tr>
<td>Bearman et al$^{24}$</td>
<td>Before-after</td>
<td>SICU</td>
<td>Before</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>No</td>
<td>No</td>
<td>No difference in VRE acquisition risk between CP and UG use</td>
</tr>
<tr>
<td>Huskins et al$^{12}$</td>
<td>RCT of 18 ICUs</td>
<td>ICU</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>No</td>
<td>No</td>
<td>No impact of surveillance culturing and isolation for MDROs</td>
</tr>
<tr>
<td>Harris et al$^{16}$</td>
<td>RCT of 20 ICUs</td>
<td>ICU</td>
<td>√</td>
<td>√</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Universal CP use had no effect on VRE acquisition but was associated with less MRSA acquisition</td>
</tr>
<tr>
<td>Derde et al$^{11}$</td>
<td>Before-after</td>
<td>ICU</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>No</td>
<td>No</td>
<td>No impact of surveillance culturing and isolation for MDROs</td>
</tr>
</tbody>
</table>
OTHER FACTORS RARELY TAKEN INTO ACCOUNT

- Sensitivity of screening (including staff technique)
- Endogenous MDRO
- Patients not screened = reservoir
- Other sources of transmission
  - Staff
  - Environment
  - Equipment....not everything can be dedicated
  - Outside healthcare – Food / water / agriculture etc
WHAT HAPPENS IF WE DON’T USE THEM?
The Impact of Discontinuing Contact Precautions for VRE and MRSA on Device-Associated Infections

‘In the setting of a strong horizontal infection prevention platform, discontinuation of contact precautions had no impact on device-associated hospital-acquired infection rates’

ICHE 2015 36(8) 978-980

Figure 1: MRSA and VRE device-associated infections before and after discontinuation of contact precautions. Parentheses indicate rate per 1,000 device days. The Y-axis represents the number of device-associated infections.
Before: CP (contact precautions)

After: No CP for MRSA/VRE unless draining wounds

plus

- Chlorhexidine bathing for most patients (except NICU etc)

- 2 hospitals

No increase MRSA/VRE clinical culture rates

- $643,776/yr saved (no gowns / plus CHG)

- Nursing time on PPE before = 45,277 hrs/year (estim $4.6 million).
• Before: Active VRE screen + strict CP (contact precautions) but no reductions
• Molecular = sporadic VRE acq
• After: No CP

• 1 year before + levoF proph

**Figure 1.** Rates of vancomycin-resistant Enterococcus faecium (VRE) bacteremia.

Nursing hours per patient/day 13.99 to 12.86 (NS)
Prospective Validation of Cessation of Contact Precautions for Extended-Spectrum β-Lactamase–Producing *Escherichia coli*¹

- Transmission in 2/133 (1.5%) - Stopped CP
- 4.8% transmission
  - 4/151 – 2.6% (University Hospital)
  - 7/80 – 8.8% (Long term centre)

Other Swiss studies
- Hospitals: 2.8% transmission with contact precautions
- Long term care: 6.5% transmission

1. CID 2012;55:1505-11
2. EID June 2016; 22(6); 1094-1097
3. CID 2012; 55:967-75
5. CMI 2012: 18 F497-505
WHAT DO THE EXPERTS (US) DO AND BELIEVE?
Reconsidering Contact Precautions for Endemic Methicillin-Resistant Staphylococcus aureus and Vancomycin-Resistant Enterococcus

<table>
<thead>
<tr>
<th>Institution (number of hospitals)</th>
<th>MRSA</th>
<th>VRE</th>
<th>C. difficile</th>
<th>MDR-GNR</th>
<th>Year foregoing CP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospitals that practice enhanced focus on hand hygiene compliance and HAI prevention bundles (horizontal interventions)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virginia Commonwealth University MC</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2013</td>
</tr>
<tr>
<td>University of Massachusetts (2 hospital campuses)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2010</td>
</tr>
<tr>
<td>Detroit MC (7 hospitals)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Prior to 2003</td>
</tr>
<tr>
<td>Tufts-New England MC</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2010</td>
</tr>
<tr>
<td>St. Johns MC, Santa Monica, CA</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2002</td>
</tr>
<tr>
<td>University of Rochester MC</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2014</td>
</tr>
<tr>
<td>Baylor St. Luke's MC</td>
<td>No⁴</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2005</td>
</tr>
<tr>
<td>UCLA (2 hospitals)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2013</td>
</tr>
<tr>
<td>University of Nebraska MC</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>2015</td>
</tr>
<tr>
<td>San Francisco General Hospital</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Prior to 2002</td>
</tr>
<tr>
<td>University of San Francisco MC</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Prior to 2002</td>
</tr>
<tr>
<td>Alta Bates MC, Oakland, CA</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2014</td>
</tr>
<tr>
<td>University of Cincinnati MC</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Prior to 2002</td>
</tr>
<tr>
<td>Oakwood Hospital System, MI (4 hospitals)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Prior to 2013</td>
</tr>
<tr>
<td><strong>Hospitals that use gowns and gloves for syndromic indications only (diarrhea, draining wounds)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baystate Hospitals (multiple hospitals)</td>
<td>No</td>
<td>No</td>
<td>Yes³</td>
<td>Yes</td>
<td>2003</td>
</tr>
<tr>
<td>Dartmouth MC⁵</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Prior to 2003</td>
</tr>
<tr>
<td>**Hospitals that use decolonization of patients identified to have S. aureus (including MRSA)**⁶</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleveland Clinic (10 hospitals)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Prior to 2003</td>
</tr>
</tbody>
</table>
Routine Use of Contact Precautions for Methicillin-Resistant *Staphylococcus aureus* and Vancomycin-Resistant Enterococcus: Which Way Is the Pendulum Swinging?

- **Triggers for Contact Precautions**
  - clinical culture (97% MRSA, 98% VRE)
  - active surveillance (87% MRSA, 65% VRE),
  - preexisting HER alert (91% MRSA, 85% VRE),
  - suspicion of infection (36% MRSA, 20% VRE)

- **Duration of isolation**
  - Indefinite (18% MRSA, 31% VRE),
  - Until negative (69% MRSA, 54% VRE),
  - 1 year after + (17% MRSA, 13% VRE),
  - Specific inpatient encounters (7% MRSA, 8% VRE)
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  - Until negative (69% MRSA, 54% VRE),
  - 1 year after + (17% MRSA, 13% VRE),
  - Specific inpatient encounters (7% MRSA, 8% VRE)
ARE THERE ANY DOWNSIDES TO CONTACT PRECAUTIONS?

- Do physicians spend less time with patients in contact isolation?: a time-motion study of internal medicine interns. JAMA Intern Med 2014;174:814-5.
- Safety of patients isolated for infection control. JAMA 2003;290:1899-905.
- Depression, anxiety, and moods of hospitalized patients under contact precautions. ICHE 2013;34:251-8.
Taking Off the Gloves: Toward a Less Dogmatic Approach to the Use of Contact Isolation

Kathryn B. Kirkland

- Public health intervention to interrupt transmission

- Intended benefits not for the isolated patient but for other patients who may be at risk of acquiring infection if isolation is not imposed.

- Infringes on the personal rights of the individual in the name of protection of the public health
PROBLEMS WITH CONTACT PRECAUTIONS?

• Patient:
  – Restricts free movement
  – Psychological
    • Loneliness – 23% fewer visitors
    • Stigma /depression (?) / anxiety (?)
    • X2 likely to perceive issues with their care
  – Receives different levels of care from staff????
    • Reduced frequency of staff visits (36-50% less)
    • Less contact time (17-22% less)
    • Less likely to have vital signs recorded (51 vs 31%)
    • More likely to have no MD note (26 vs 13%)
    • More adverse events??
  – Delays in discharge
  – Patient satisfaction? More likely to complain

• Other Patients:
  – Admission delays
Delays in accessing radiology in patients under contact precautions because of colonization with vancomycin-resistant enterococci

- Median time for CT
  9.8 hrs vs. 18.9 hrs (Contact Precautions)

MRSA status = predicted a longer ED stay
Universal Glove and Gown Use and Acquisition of Antibiotic-Resistant Bacteria in the ICU A Randomized Trial

Anthony D. Harris, MD, MPH; Lisa Pineles, MA; Beverly Belton, RN, MSN; J. Kristie Johnson, PhD; Michelle Shardell, PhD; Mark Loeb, MD, MSc; Robin Newhouse, RN, PhD; Louise Dembry, MD, MS, MBA; Barbara Braun, PhD; Eli N. Perencevich, MD, MS; Kendall K. Hall, MD, MS; Daniel J. Morgan, MD, MS; and the Benefits of Universal Glove and Gown (BUGG) Investigators

- **Universal gown and gloves Vs CP if MRSA/VRE +**

- Fewer staff visits
- No difference in adverse events
- Better hand hygiene on exit
- No contact precautions for MRSA/VRE patients

- No significant differences before and after
  - Falls and pressure ulcers among MRSA/VRE patients
  - MRSA or VRE hospital-acquired transmission.
COSTS

- Mean cost associated with MRSA/VRE isolation $400–$2000 per positive-patient per day

- PPE / isolation room
- Screening: + follow up + repeat testing -laboratory / ward/ IPCT
- Hidden costs - time: Patient flow / IPCT managing isolation rather than more strategic issues / ward
- Unfactored costs: delayed discharge / postponed surgeries.
  - patients on CPs stay longer while awaiting transfer: mean 10.9 vs. 4.3 days

- Who pays??
CONTACT PRECAUTIONS
- WE ARE NOT GREAT AT COMPLIANCE
ETHICAL PRINCIPLES TO CONSIDER?

- Do we have justifiable goals and evidence for the effectiveness of contact precautions?
- Benefits vs. Harm
- Have we considered less harmful alternatives
ISSUES OF FAIRNESS

- Why not use universally rather than variably to subsets of patients that you have just happened to ID as MDRO?
- Only isolating a subset of colonised patients =
  - unfairly subjects some patients to the risk of potential harm associated with contact precautions
  - unfairly deprives others from the transmission of MDRO
- Screening for select bugs will miss others that can equally be as pathogenic (e.g., MSSA)
I think your argument is specious.

I think your tie is ugly.
<table>
<thead>
<tr>
<th>Vertical / Bug specific</th>
<th>Horizontal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target <strong>specific</strong> pathogens</td>
<td></td>
</tr>
<tr>
<td>Active surveillance</td>
<td></td>
</tr>
</tbody>
</table>
| Followed by measures to prevent transmission from colonised/infected patients to others.  
  - contact precautions,  
  - decolonisation |            |
<p>| Narrow – specific pathogen |            |
| High resource utilization |            |
| ? promotes exceptionalism (some organisms are more important than others) |            |
| Short term              |            |</p>
<table>
<thead>
<tr>
<th>Vertical / Bug specific</th>
<th>Horizontal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target <strong>specific</strong> pathogens</td>
<td>Many pathogens</td>
</tr>
<tr>
<td>Active surveillance</td>
<td>• Antimicrobial stewardship</td>
</tr>
</tbody>
</table>
| Followed by measures to prevent transmission from colonised/infected patients to others.  
  - contact precautions,  
  - decolonisation | • Standard precautions – hand hygiene / environmental cleaning |
| | • Device Infection Prevention |
| | • Universal decolonization |
| | • Chlorhexidine bathing / SDD |
| | • Universal use of gloves or gloves and gowns |
| Narrow – specific pathogen | Broad – all pathogens |
| High resource utilization | Lower resource utilization |
| ? promotes exceptionalism (some organisms are more important than others) | utilitarian |
| Short term | Longer term |
# The Knock on Effects of MRSA Prevention... With Horizontal Measures?

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Domains</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Interventions</td>
<td>MRSA-specific interventions</td>
<td>Active surveillance screening</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contact precaution</td>
</tr>
<tr>
<td>Horizontal Interventions</td>
<td>Expansion of local human resources</td>
<td>MPC position</td>
</tr>
<tr>
<td>Cultural transformation</td>
<td>&quot;Positive deviance&quot; approach</td>
<td>Emphasis on hand hygiene</td>
</tr>
<tr>
<td>Educational resources</td>
<td>Training resources for MPCs</td>
<td>Patient education materials</td>
</tr>
<tr>
<td>Leadership involvement</td>
<td>Clarification of leadership responsibility</td>
<td></td>
</tr>
</tbody>
</table>
WHY DO WE NEED TO RECONSIDER?

- Confusion and lack of evidence in endemic situation for additional benefit of Contact Precautions (CP)
  - What do we actually mean by CP?
  - Lots of studies in ICU
  - No studies of CP versus none
  - Those that abandon them to date mainly US
- Possible harm associate with them
- Active screening and implementation of contact precautions costs money and time (ward / lab / IPCT / patient flow)
- What about the patients we don’t screen?
VERTICAL APPROACHES AND MDRO

- CPE / other new or unusual MDRO
- Outbreaks
ENDEMIC MDRO

- When and where CP may provide additional benefits over standard precautions?
  - How?
  - Who and where?
    - All
    - High risk ??........what is this exactly anymore??
    - Contacts?
    - Long term care
    - OPD
    - Etc etc etc

Irl: only 55% MDR K. pneumoniae isolated in 24 hours of ID

- What do our patients want?
- What can we afford??
  - Screen everybody for all bugs?
  - Concentrate on doing the basics right?
BUG OR PERSON CENTERED CARE???
HORIZONTAL + VERTICAL APPROACHES
NOT MUTUALLY EXCLUSIVE
CONTEXT MATTERS

- Isolation ‘fatigue’
- One size does not fit all
- CP as part of standard precautions (eg, with drainage that can’t be contained, use CP).

- Decision re CP not simple (hence variation in what we actually do in practice)
  - Institutional (MDRO epidemiology /infrastructure / staffing / culture)
  - Patient population
  - Regulatory
  - Scientific (eg evidence re colonisation duration)
Horizontal infection prevention measures and a risk-managed approach to vancomycin-resistant enterococci: An evaluation
• No change VRE BSI.
• # VRE isolation = 32 to 6 beds/day (100% occupancy)
• Significant reductions CDI / MRSA rates

• Cost savings

• Value added features
  • 566 bed days for CDI isolation saved / less repairs and better turn around time etc
A USEFUL FRAMEWORK?

Table 1. Locally variable factors that may influence the likelihood of benefit of contact isolation.

<table>
<thead>
<tr>
<th>Local factor</th>
<th>Lower likelihood of benefit</th>
<th>Higher likelihood of benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand-hygiene compliance by health care workers</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Epidemiology of health care-associated infections</td>
<td>Low endemic rates</td>
<td>Epidemic or uncontrolled rates</td>
</tr>
<tr>
<td>Organism of concern</td>
<td>All or easily treatable</td>
<td>Selected or difficult to treat</td>
</tr>
<tr>
<td>Prevalence of organism</td>
<td>Common</td>
<td>Rare</td>
</tr>
<tr>
<td>Clinical features of source patient</td>
<td>Asymptomatic</td>
<td>Open wound, diarrhea, or uncontained secretions</td>
</tr>
<tr>
<td>Clinical features of patients at risk of infection</td>
<td>Healthy</td>
<td>Vulnerable to infection because of age, immune status, or other risks</td>
</tr>
<tr>
<td>Physical environment</td>
<td>Clean, spacious, single rooms</td>
<td>Crowded, dirty wards</td>
</tr>
<tr>
<td>Available resources</td>
<td>Limited</td>
<td>Plentiful</td>
</tr>
</tbody>
</table>
FOR YOUR CONTEXT THINGS TO CONSIDER

- **Resources**
  - Infrastructure
  - Ward and infection control staffing
  - Laboratory capability
- **Outbreak or endemic or unusual/rare MDRO**
- **MDROs are not all the same**
  - Epidemiological reservoir
  - Potential to cause outbreaks
  - Environmental survival
  - Evidence to support contact precautions in the endemic setting
- **Your transmission rates**
- **The patient!**
  - Benefits vs. potential harm
ACKNOWLEDGEMENTS

- Ms. Sheila Donlon, Beaumont Hospital, Dublin.
- Ms. Catherine Lee, RCSI Library Beaumont Hospital, Dublin
- Dr. Sarah Tschudin Sutter, Basel, Switzerland.
- Mr. Martin Kiernan, Visiting Clinical Fellow, University of West London
September 28  (Free Teleclass – Broadcast live from the annual conference of the Infection Prevention Society – www.ips.uk.net)
USING SCIENCE TO GUIDE HAND HYGIENE SURVEILLANCE AND IMPROVEMENT
Prof. Eli Perencevich, University of Iowa

September 29  ADHERENCE ENGINEERING TO REDUCE CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTIONS
Prof. Frank Drews, University of Utah

October 13  UPDATE ON STRATEGIES FOR CLEANING AND DISINFECTION OF ENVIRONMENTAL SURFACES IN HEALTHCARE
Prof. John Boyce, J.M. Boyce Consulting
Sponsored by Sealed Air Diversey Care (www.sealedair.com)

October 19  (South Pacific Teleclass)
TECHNOLOGY FOR MONITORING HAND HYGIENE IN THE 21ST CENTURY – WHY ARE WE USING IT?

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