IPAC BC EDUCATION DAY 2019

Hot Takes on Old Topics in Infection Prevention

On behalf of the VCH IPAC team:

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Medical Microbiologist, Medical Microbiology and Infection Prevention, VCH
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Department of Pathology and Laboratory Medicine, VCH, UBC
ACKNOWLEDGEMENTS

- IPAC BC & Amira, Jacquie – thank you for the invitation
- The super duper awesomeness bestest goodest incrediblest Infection Control Practitioners!!
- Our amazing technologists and the division of Medical Microbiology and Infection Prevention
- Crothall and our amazing EVS team
- FMO!!
- Allison Muniak and VCH Quality Patient Safety and Infection Control
- Liz, Marthe, Teresa, Jaime, Meghan and the K9 team
- Marthe, Rita, Juliana, Mary, Tamara, Gail, Eric for C. auris work
- Aleksandra Gara and the Information, Solutions and Analytics team
- Richard Dixon and CHAIR Canada
- Linda Hoang, Joanne Archer and PICNET
- UBC and VGH Hospital Foundation for supporting quality improvement and research

NOT TODAY EBOLA. NOT TODAY!!!!!
DISCLOSURE

Generic drug names will be used
No company sponsored trials will be mentioned
WHAT’S NEW IN 2018/19?

1. “See, aurs isn’t so bad, is it?”

2. “Influenz”ing patient outcomes

3. “Making a big C’difference”

4. “HAI, how you doing?”
See, aurs isn’t so bad, is it?
Candida auris
What's the big deal?
Candida Auris

A deadly, drug-resistant fungus is infecting patients in hospitals and nursing homes around the world. The fungus seems to have emerged in several locations at once, not from a single source.

Not just in acute care!
Candida typically not worked up in urine – should we change?
A Weekly Incidence of New *Candida auris* Detection

- **No exposure**
- **ICU exposure**
- **ward exposure**

70 pts (10 invasive); Mobile equipment can be point-sources for outbreaks!
C. auris and disinfectants – Quats don’t work

Quats are not effective vs C. auris

Cadnum, ICHE 2017
C. auris is as hardy as C. difficile vs UVC

In terms of environmental hardiness, Consider C. auris like C. difficile

Cadnum, ICHE 2018
Echinocandins are empiric drug of choice.

Ensure Micro can identify C. auris.

Early Recognition And treatment.

Seek help from experienced colleagues.

Understand how to clean and disinfect environment.

C AURIS CONTROL

CANDIDA AURIS

WHAT CAN WE DO?
And now for something completely different.

Monty Python
<table>
<thead>
<tr>
<th>Population based analysis</th>
<th>Exposed/unexposed group</th>
<th>Hazard ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any stress related disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life threatening infections</td>
<td>3292(2.9)/15 684(1.34)</td>
<td>1.58 (1.51 to 1.65)</td>
</tr>
<tr>
<td>Sepsis</td>
<td>2044(1.8)/96 24(0.82)</td>
<td>1.61 (1.52 to 1.70)</td>
</tr>
<tr>
<td>Endocarditis</td>
<td>158(0.14)/591(0.05)</td>
<td>1.89 (1.55 to 2.32)</td>
</tr>
<tr>
<td>Meningitis</td>
<td>181(0.16)/962(0.08)</td>
<td>1.70 (1.43 to 2.02)</td>
</tr>
<tr>
<td>Other CNS infections</td>
<td>429(0.38)/2531(0.22)</td>
<td>1.58 (1.41 to 1.76)</td>
</tr>
<tr>
<td>Death due to other infections</td>
<td>711(0.62)/2769(0.24)</td>
<td>1.64 (1.48 to 1.81)</td>
</tr>
<tr>
<td>Post-traumatic stress disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life threatening infections</td>
<td>244(3.04)/1041(1.26)</td>
<td>1.95 (1.66 to 2.28)</td>
</tr>
<tr>
<td>Sepsis</td>
<td>156(1.94)/631(0.76)</td>
<td>2.01 (1.65 to 2.45)</td>
</tr>
<tr>
<td>Endocarditis</td>
<td>15(0.19)/40(0.05)</td>
<td>2.90 (1.46 to 5.76)</td>
</tr>
<tr>
<td>Meningitis</td>
<td>17(0.21)/58(0.07)</td>
<td>2.80 (1.49 to 5.26)</td>
</tr>
<tr>
<td>Other CNS infections</td>
<td>34(0.42)/169(0.2)</td>
<td>1.88 (1.23 to 2.87)</td>
</tr>
<tr>
<td>Death due to other infections</td>
<td>45(0.55)/196(0.24)</td>
<td>1.99 (1.37 to 2.90)</td>
</tr>
</tbody>
</table>

Significantly higher chance for life-threatening infection
Influenz’ing patient outcomes
What are some updates from 2009?

- Recommended NAAT (nucleic acid amplification tests) over RIDT (viral antigen testing) due to NATs having superior performance.
- If suspecting flu, treat ASAP before lab confirmation (and independent of vaccination status, onset, duration of illness).
- Avoid steroids if possible unless there is a compelling reason; also avoid IVIG.

- What’s missing: NEW FLU DRUG, BALOXIVIR
Baloxavir Marboxil for Uncomplicated Influenza in Adults and Adolescents

Frederick G. Hayden, M.D., Norio Sugaya, M.D., Nobuo Hirotsu, M.D., Ph.D., Nelson Lee, M.D., Menno D. de Jong, M.D., Ph.D., Aeron C. Hurt, Ph.D., Tadashi Ishida, M.D., Ph.D., Hisakuni Sekino, M.D., Ph.D., Kota Yamada, M.D., Simon Portsmouth, M.D., Keiko Kawaguchi, M.Sc., Takao Shishido, Ph.D., Masatsugu Arai, M.Sc., Kenji Tsuchiya, M.Sc., Takeki Uehara, Ph.D., and Akira Watanabe, M.D., Ph.D., for the Baloxavir Marboxil Investigators Group*

Healthy patients, uncomplicated flu

**Baloxivir vs. Placebo, Oseltamivir**

Faster symptom relief vs placebo, similar to oseltamivir

GAP: What about complicated patients? E.g. most of ours...
Now FDA approved for high risk pts as of Oct 2019
The impact of incorporating early rapid influenza diagnosis on hospital occupancy and hospital acquired influenza

Lior Nesher MD$^{1,2}$, Gal Tsaban MD$^{1,2}$, Jacob Dreher MD PhD$^{2,3}$, Kenneth V.I. Rolston MD$^4$, Gal Ifergane MD$^{2,3}$, Yonat Shemer PhD$^{2,5}$, Abraham Borer MD$^{1,2,a}$ and Klaris Riesenber MD$^{1,2,a}$

1Internal Medicine Division, Infectious Disease Institute, Soroka Medical Center, Beer Sheba, Israel, 2Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer Sheba, Israel, 3Hospital Administration, Soroka University Medical Center, Beer Sheba, Israel, 4Department of Infectious Diseases, Infection Control, and Employee Health, University of Texas MD Anderson Cancer Center, Houston Texas, United States and 5Laboratory for Clinical Virology, Soroka Medical Center, Beer Sheba, Israel

In Hospital

2018 Rapid flu testing Vs. 2017 standard of care

Shorter hospital stays, lower occupancy rates

GAP: Cost implications? Complications?

Nesher, ICHE 2019
Rapid Flu testing + communication resulted in faster discharge rates

Significantly earlier discharge!
Rapid Flu testing + communication resulted in lower occupancy of medicine beds.

(Neuralgic) Green: last year's occupancy rate.
(Blue): Much lower occupancy rate!
N95 Respirators vs Medical Masks for Preventing Influenza Among Health Care Personnel
A Randomized Clinical Trial

Lewis J. Radonovich Jr, MD; Michael S. Simberkoff, MD; Mary T. Bessesen, MD; Alexandria C. Brown, PhD; Derek A. T. Cummings, PhD; Charlotte A. Gaydos, MD; Jenna G. Los, MLA; Amanda E. Krosche, BS; Cynthia L. Gibert, MD; Geoffrey J. Gorse, MD; Ann-Christine Nyquist, MD; Nicholas G. Reich, PhD; Maria C. Rodriguez-Barradas, MD; Connie Savor Price, MD; Trish M. Perl, MD; for the ResPECT Investigators
And now for something completely different.

Monty Python

Song, Crit Care Med 2019
Carthamus tinctorius, Paeonia lactiflora, Ligusticum chuanxiong, Angelica sinensis and Salvia miltiorrhiza are necessary for this.
What is, “XueBiJing”
TABLE 3. The Primary and Three Secondary Outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>XueBijing Recipients (n = 334)</th>
<th>Placebo Recipients (n = 341)</th>
<th>Between-Group Different (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumonia severity index improvement rate at day 8, n (%)</td>
<td>203 (60.8%)</td>
<td>158 (46.3%)</td>
<td>14.4% (6.9–21.8%)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Secondary outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28-d mortality, n (%)</td>
<td>53 (15.87)</td>
<td>84 (24.63)</td>
<td>8.8% (2.4–15.2%)</td>
<td>0.006</td>
</tr>
<tr>
<td>The time of mechanical ventilation, d, median (IQR)</td>
<td>11 (6, −)</td>
<td>16.5 (7, −)</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>Total duration of ICU stay, d, median (IQR)</td>
<td>12 (7, −)</td>
<td>16 (9, −)</td>
<td>0.004</td>
<td></td>
</tr>
</tbody>
</table>

Significantly improvement in pneumonia, mortality, ICU stay

Song, Crit Care Med 2019
Making a big *C’difference*
Asymptomatic Carriers Contribute to Nosocomial *Clostridium difficile* Infection: A Cohort Study of 4508 Patients

Thomas Blixt, Kim Oren Gradel, Christian Homann, Jakob Benedict Seidelin, Kristian Schønning, Anne Lester, Jette Houlin, Marie Stangerup, Magnus Gottlieb, and Jenny Dahl Knudsen

In hospital setting, screened all admitted patients for CDI

Rate of CDI in exposed vs unexposed patients

CDI in 2.6% unexposed patients and 4.6% in exposed

GAP: Can this training be replicated elsewhere?
Short Report

Detecting *Clostridioides (Clostridium)* difficile using canine teams: What does the nose know?

M.K. Charles\(^a\), Y. Wang\(^b\), T. Zurberg\(^c\), J. Kinna\(^c\), E. Bryce\(^{a,*}\)

\(^a\) Division of Medical Microbiology and Infection Prevention, Vancouver Coastal Health and University of British Columbia Faculty of Medicine, Vancouver, British Columbia, Canada
\(^b\) University of British Columbia Undergraduate Integrated Sciences Program, Vancouver, British Columbia, Canada
\(^c\) Quality and Patient Safety Department, Vancouver Coastal Health, Vancouver, British Columbia, Canada

In hospital setting

Two canine teams

Kappa agreement of 0.86 (excellent)

GAP: Can this training be replicated elsewhere?

Charles, Inf Prev Pract, 2019

Bryce, JHI, 2017
omg puppies!
Clostridium difficile

Clostridiodes difficile
Original Article

Oral vancomycin prophylaxis during systemic antibiotic exposure to prevent *Clostridioides difficile* infection relapses

Daniel A. Caroff MD, MPH\(^1\), John T. Menchaca BA\(^3\), Zilu Zhang MS\(^1\), Chanu Rhee MD, MPH\(^1\), Michael S. Calderwood MD, MPH\(^5\), David W. Kubiak PharmD\(^6\), Deborah S. Yokoe MD, MPH\(^7\) and Michael Klompas MD, MPH\(^1\)

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In hospital setting, patients with CDI history

When given abx, start PO VANCO prophylaxis vs NO vanco

No consistent benefit observed

GAP: Is there benefit with certain abx vs others?

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Caroff, ICHE, 2019
No consistent benefit observed.
A Randomized, Placebo-controlled Trial of Fidaxomicin for Prophylaxis of Clostridium difficile–associated Diarrhea in Adults Undergoing Hematopoietic Stem Cell Transplantation

Kathleen M. Mullane,1 Drew J. Winston,2 Ajay Nooka,3 Michele I. Morris,4 Patrick Stiff,5 Michael J. Dugan,6 Henry Holland,7 Kevin Gregg,8 Javier A. Adachi,9 Steven A. Pergam,10 Barbara D. Alexander,11 Erik R. Dubberke,12 Natalya Broyde,13 Sherwood L. Gorbach,14 and Pamela S. Sears13

In hospital setting, LBMT patients

FQ + Fidaxomicin vs placebo

Benefit observed in fidaxomicin arm for lab confirmed CDI

GAP: What about other antibiotics other than FQ?
Association of Duration and Type of Surgical Prophylaxis With Antimicrobial-Associated Adverse Events

Westyn Branch-Elliman, MD, MMSc; William O'Brien, MS; Judith Srymish, MD; Kamal Itani, MD; Christina Wyatt, MD; Kalpana Gupta, MD, MPH

Cardiac, ortho, colorectal, vascular surgical patients

ABX prophylaxis <24h, 24-48h, 48-72h, >72h

Increasing duration associated with AKI, CDI, time dependent

Opportunity Let’s keep on collaborating with ASP!
HAI, how you doing?
Changes in Prevalence of Health Care–Associated Infections in U.S. Hospitals


Magill, NEJM 2018
SSI and UTIs were significantly lower in repeat point prevalence study 2011 vs 2015

### Table 4. Percentages of All Surveyed Patients with Specific Types of Health Care–Associated Infection, 2011 vs. 2015 Survey.

<table>
<thead>
<tr>
<th>Type of Infection</th>
<th>2011 Survey</th>
<th>2015 Survey</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Patients with Infection</td>
<td>No. of Infections</td>
<td>Percentage of Patients with Infection (95% CI)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>110</td>
<td>110</td>
<td>0.98 (0.81–1.20)</td>
</tr>
<tr>
<td>Ventilator-associated pneumonia</td>
<td>43</td>
<td>43</td>
<td>0.38 (0.28–0.51)</td>
</tr>
<tr>
<td>Other pneumonia</td>
<td>67</td>
<td>67</td>
<td>0.59 (0.47–0.75)</td>
</tr>
<tr>
<td>Gastrointestinal infection</td>
<td>86</td>
<td>86</td>
<td>0.76 (0.62–0.94)</td>
</tr>
<tr>
<td><em>Clostridium difficile</em> infection‡</td>
<td>61</td>
<td>61</td>
<td>0.54 (0.42–0.69)</td>
</tr>
<tr>
<td>Other gastrointestinal infection</td>
<td>25</td>
<td>25</td>
<td>0.22 (0.15–0.33)</td>
</tr>
<tr>
<td><strong>Surgical-site infection</strong></td>
<td>109</td>
<td>110</td>
<td>0.97 (0.80–1.20)</td>
</tr>
<tr>
<td>Deep incisional or organ-space infection</td>
<td>77</td>
<td>77</td>
<td>0.68 (0.55–0.85)</td>
</tr>
<tr>
<td>Superficial incisional infection</td>
<td>33</td>
<td>33</td>
<td>0.29 (0.21–0.41)</td>
</tr>
<tr>
<td>Bloodstream infection</td>
<td>50</td>
<td>50</td>
<td>0.44 (0.34–0.58)</td>
</tr>
<tr>
<td>Central catheter–associated bloodstream infection</td>
<td>42</td>
<td>42</td>
<td>0.37 (0.27–0.50)</td>
</tr>
<tr>
<td>Other primary bloodstream infection</td>
<td>8</td>
<td>8</td>
<td>0.07 (0.03–0.14)</td>
</tr>
<tr>
<td><strong>Urinary tract infection</strong></td>
<td>65</td>
<td>68</td>
<td>0.88 (0.45–0.73)</td>
</tr>
<tr>
<td>Catheter-associated urinary tract infection</td>
<td>29</td>
<td>29</td>
<td>0.29 (0.29–0.52)</td>
</tr>
<tr>
<td>Other urinary tract infection</td>
<td>16</td>
<td>16</td>
<td>0.12 (0.12–0.29)</td>
</tr>
<tr>
<td><strong>Any infection</strong></td>
<td>504</td>
<td>494</td>
<td>4.0 (3.7–4.4)</td>
</tr>
</tbody>
</table>

SSI, UTI drove the overall decrease in HAI’s

Magill, NEJM 2018
Decolonization to Reduce Postdischarge Infection Risk among MRSA Carriers


- Multicenter, randomized, post-discharge
- Education vs education+ decolonization
- Decol group 6.3% infection vs 9.2% in control
- Gap: What are the cost / resistance implications?

Huang, NEJM 2019
Post discharge Education + decolonization significantly reduced MRSA infections
Original Investigation

Burden of Invasive *Staphylococcus aureus* Infections in Hospitalized Infants

Jessica E. Ericson, MD; Victor O. Popoola, MBBS, MPH, ScM; P. Brian Smith, MD, MPH, MHS; Daniel K. Benjamin, PhD; Vance G. Fowler, MD, MHS; Daniel K. Benjamin Jr, MD, PhD; Reese H. Clark, MD; Aaron M. Milstone, MD, MHS

Multicenter, Retrospective cohort study, 348 NICU’s, 3888 pts

**invasive infections with MSSA vs MRSA**

**mortality similar, but MSSA 3:1 more common than MRSA**

opportunity: should we aim to prevent MSSA along with MRSA?

Ericson, *JAMA pediatrics, 2015*
Mortality similar in MRSA and MSSA invasive infection; MSSA more common = more deaths

Ericson, JAMA pediatrics, 2015
The importance of adjusting for enterococcus species when assessing the burden of vancomycin resistance: a cohort study including over 1000 cases of enterococcal bloodstream infections

Tobias Siegfried Kramer, Cornelius Remschmidt, Sven Werner, Michael Behnke, Frank Schwab, Guido Werner, Petra Gastmeier, and Rasmus Leistner

- Multicenter, Retrospective cohort study, 1160 cases BSI
- E. faecalis vs E. faecium; VR or VS
- E. faecium independent risk factor for mortality
- Vanco resistance did not increase mortality risk, but increased costs

Kramer, Antimicrob Res and Inf Cont, 2018
Mortality difference driven by species, not resistance

E. faecalis

E. faecium VSE

E. faecium VRE

Kramer, Antimicrob Res and Inf Cont, 2018
Investigation of a Cluster of Sphingomonas koreensis Infections

Ryan C. Johnson, Ph.D., Clay Deming, M.S., Sean Conlan, Ph.D., Caroline J. Zellmer, B.S., Angela V. Michelin, M.P.H., ShihQueen Lee-Lin, M.S., Pamela J. Thomas, Ph.D., Morgan Park, Ph.D., Rebecca A. Weingarten, Ph.D., John Less, P.E., C.H.F.M., John P. Dekker, M.D., Ph.D., Karen M. Frank, M.D., Ph.D., Kimberlee A. Musser, Ph.D., John R. McQuiston, Ph.D., Dave K. Henry, M.D., Anna F. Lau, Ph.D., Tim K. Currey, M.D., and Didier S. Raoult, Ph.D.

WGS study S. koreensis isolates 2006-16 at NIH

12 patients infected, including 8 bacteremias

IPAC + EPI + MICRO + WGS + CLINICIAN + FMO teamwork needed

Opportunity: horizontal IPAC ; plumbing important

Johnson, NEJM 2019
Prolonged *Sphingomonas* outbreak at the NIH

Johnson, NEJM 2019
longitudinal cohort study

estimated # of clusters needed to observe 10, 30, 50% decreases

Very large data sets needed for definitive guidance

Opportunity: fewer, but larger, higher quality studies!
With smaller predicted effect sizes, the number of clusters needed dramatically increases.
**SUMMARY**

- **C. auris**
  - Emerging pathogen causing outbreaks, difficult to eradicate

- **FLU**
  - New guidelines
  - New drug
  - Baloxivir
  - Rapid NAATs
  - Masking

- **CDI**
  - Asymptomatic carriage and risks
  - Abx Prophylaxis
  - K9 detection

- **HAI**
  - HAI reduction drivers
  - Post-discharge
  - MRSA decol
  - ‘other’ GNRs

- **OTHERS**
  - PTSD, Stress and severe infections
  - XueBiJing
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• UBC and VGH Hospital Foundation for supporting quality improvement and research

NOT TODAY EBOLA.
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THANK YOU FOR YOUR ATTENTION
The determinants of Health are often not medical

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Claire Martin / Oculi / Redux Pictures