One Nurse's Journey

Collaborative Clinical Research to Reduce Infections

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Hosted by Dr. Lynne Sehulster

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What Will We Talk About?

Discuss interdisciplinary collaboration.
Provide examples of collaborative clinical projects to reduce infections.
Identify what you will contribute to improved patient care.






2

Working Together Is Essential





3

What are the characteristics of interdisciplinarity?

4

A continuum of collaboration

Interactions may range from simple communication to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data, and organization of research and education

(OECD [1998] quoted in Morillo, Bordons, and Gomez [2003, p. 1237])

5

Outcome of the collaboration

- Solution to a discreet problem,
- A single or group of publications,
- Development of a new field and/or language
- The process of the interdisciplinary endeavor itself
- Synthesis between disciplines

6

Example of Varying Models

EPIDEMIOLOGY

- Numbers
- Scientific
- Quantitative
- Measures of Association
- Statistical Models
- Logical Positivism
- Study what you can measure

ANTHROPOLOGY

- Text
- Humanistic
- Qualitative
- Relationships
- Cultural Models
- Constructivism
- Study meaning

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Hence, we come to the table with differing perspectives, values, language and expectations

No wonder there is confusion!

8

It often starts as serendipity

- Study to assess impact of an ICU architectural change
- Isolation rooms not associated with reduced nosocomial acquisition of organisms or improved hand hygiene

"We conclude that many patient-staff interactions in an ICU are not followed by handwashing, and that the new unit design had no apparent effect upon the frequency of handwashing or over-all incidence of colonization and infection in the ICU."

- Preston, Larson, Stamm. Am J Med 1981;70 (3):641-645.

9

A Wake-Up Call

- Healthcare-associated infections are common. Are they preventable?
- Hand hygiene is supposed to be a primary prevention strategy, but
  - Not everyone believes in hand hygiene
  - Not everyone does it

- Larson, Killien. AJIC 1982; 10:93.

10

Phase 1: Descriptive/Correlational

What do we need to know?

What's on the hands of health care professionals?
What are hand hygiene practices of health care professionals?
(Exploratory, Descriptive)
What is evidence of a link between hands and infections?
(Correlational)

What skills are needed?

Clinical, microbiology, epidemiology

What skills do I have?

Clinical only. Get advanced degree, seek collaborators

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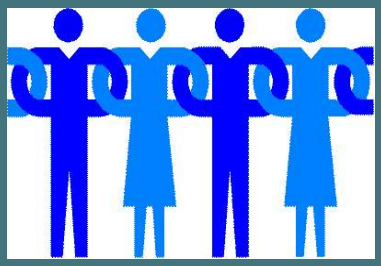
Collaborative team

- Surgeon
- Epidemiologist
- Nursing staff and administration
- Microbiologist
- Statistician
- Dermatologist



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Persistent Carriage

- ICU staff persistently carried on hands one or more of 22 species of gram-negative bacteria.
- 21%of 541 healthcare-associated infections over a 7-month period in the study institution were caused by species found on personnel hands.
- Larson, AJIC 1981; 9:112

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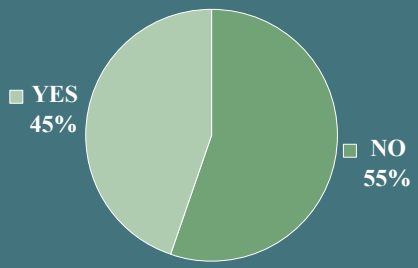
Handwashing After Contact With Infected Patient (n=372)



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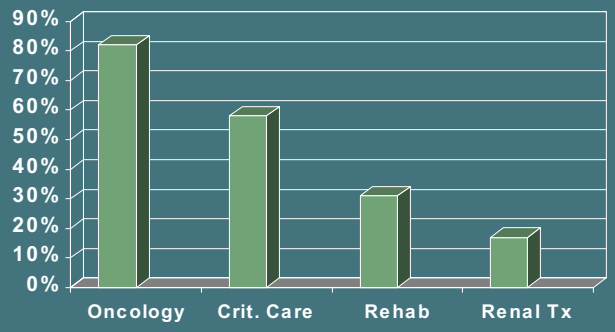
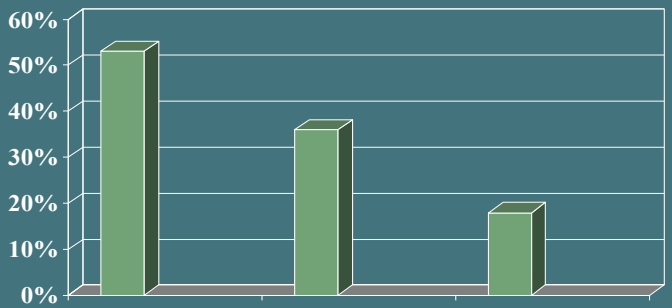
Handwashing After Contact with Isolated Patient (n=372)



p<0.001

15

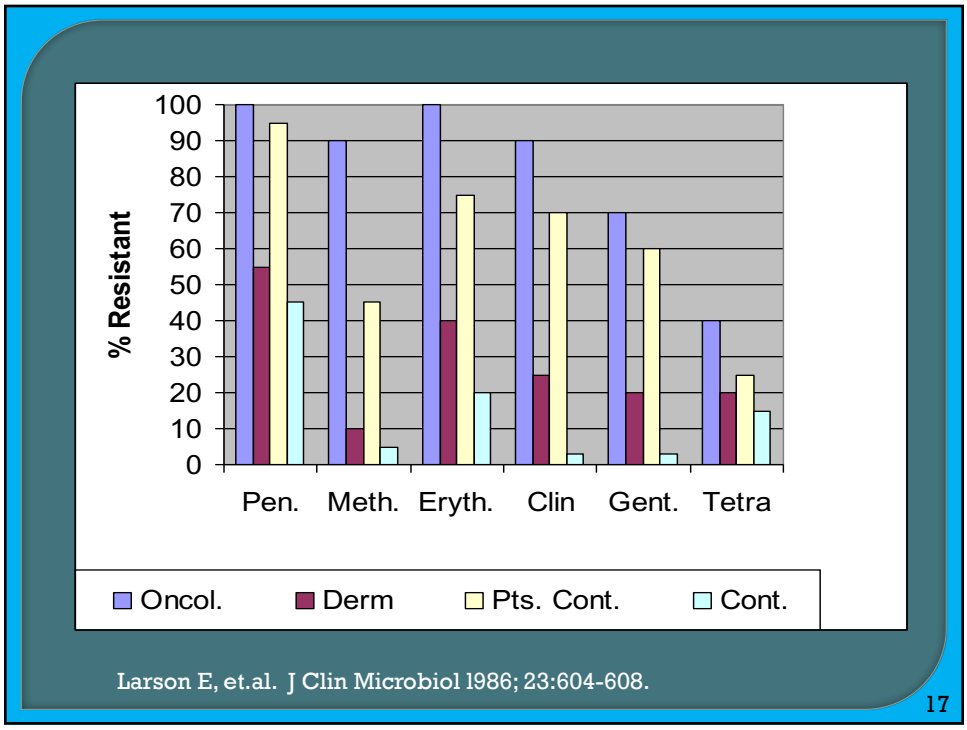
Handwashing by Discipline (n=372)



p<0.025

Larson. Compliance with isolation technique.
Am J Infec Contr 1983;11:221-225

16



Larson E, et.al. J Clin Microbiol 1986; 23:604-608.

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Differences by Discipline

- Physicians had higher counts than nurses
- Nurses had higher rates of antimicrobial-resistant flora than physicians
- Rank order of antimicrobial resistance:
  - Bone marrow transplant staff
  - Patients hospitalized 30+days
  - Dermatology staff
  - Normal controls

- Horn, Larson , McGinley, Leyden. Infec Control Hosp Epidemiol, 1988; 9:189-93.

18

Comprehensive Reviews

Larson E. A causal link between handwashing and risk of infection? Examination of the evidence. Infect Control Hosp Epidemiol 1988;9:28-36.

Aiello AE, Larson EL. What is evidence for a causal link between hygiene and infections? Lancet Infec Dis 2002; 2:103-110.

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Phase 2. Interventional

What do we need to know?

Does hand hygiene make a difference in infections?
How can we improve hand hygiene practice?

What additional skills are needed to address the question?

Change theory, behavioral sciences, clinical trials, systems theory

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Additional Team Members

- Psychologist
- Industrial Engineer
- Sociologist
- Infectious disease physician

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Intervention Comparison

Feb-June and Sept-Dec 98 (8 months)

- 477,680 handwashes recorded
- 382,887 handwashes recorded

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Intervention

- 109,732 patient days monitored
- 29 VRE, 54 MRSA infections

Comparison

- 236,989 patient days monitored
- 80 VRE, 55 MRSA infections

- Larson, Early, Cloonan, Sugrue, Parides. Behav Med 2000; 26:14-22.

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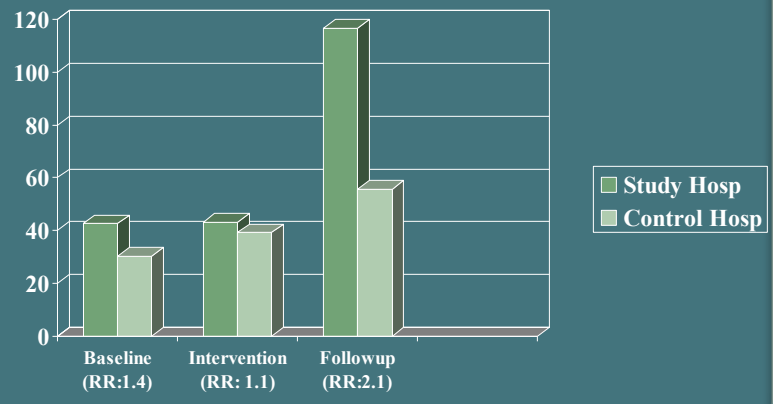
Mean handwashes/ patient care day



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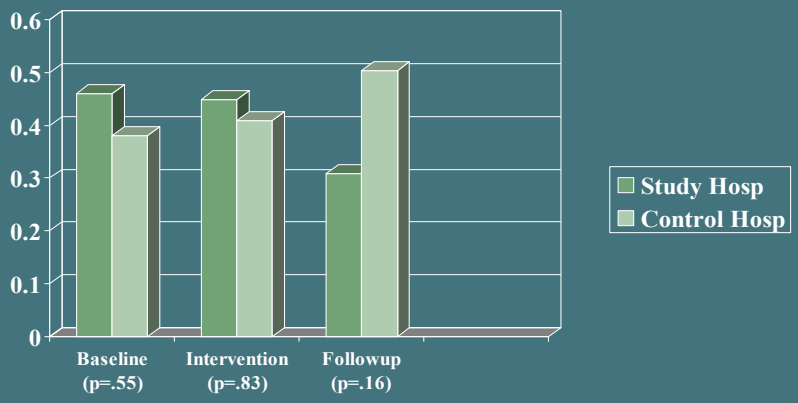
MRSA Rates/1000 Patient Days



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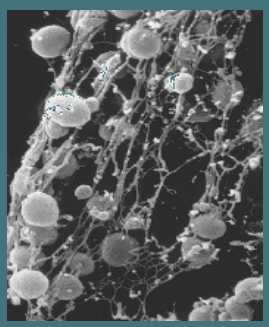
Change from Baseline : MRSA

- Intervention Hospital: 33% decrease
- Comparison Hospital: 31% increase
- p<0.0001



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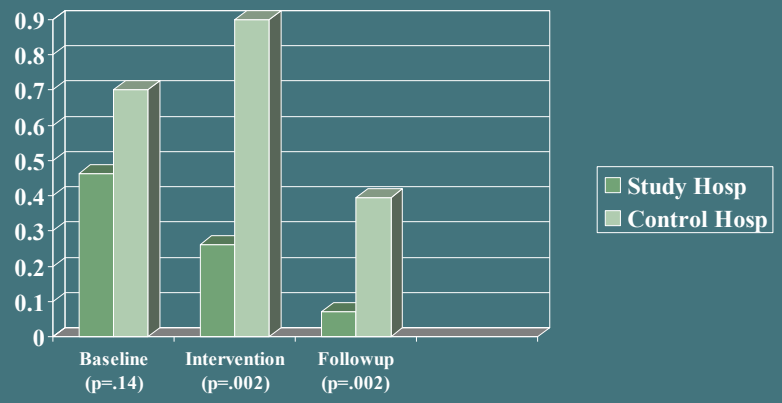
VRE Rates/1000 Patient Days



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Effect of Staff Hand Hygiene on Healthcare-Associated Infection in Neonates

- Arch Peds Adoles Med 2005; 159:377
- 1 R01 NR05197

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Nurse Staffing

- 3,155 neonates admitted
- Final sample 2,675 (< 48 hrs excluded)
- 374 neonates with infection
- 114 with more than one infection

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Healthcare-Associated infection
Low RN hours (HR 1.75)

Conjunct.
(longer)
High total nursing hours (HR 0.51)

LOS
(shorter)
High RN skill mix

BSI
Low total nursing hours (HR 2.56)
Low RN hours (HR 3.71)

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Summary

- New RN graduates acquired a shared clone of methicillin resistant staphylococci within 4-12 weeks
- Higher nurse staffing was associated with fewer infections and shorter length of stay among neonates in the NICU
- Cimiotti, Wu, Della-Latta, Nesin, Larson. Emergence of resistant staphylococci on the hands of new graduate nurses. Infec Contr Hosp Epidemiol 2004; 25:431-435.

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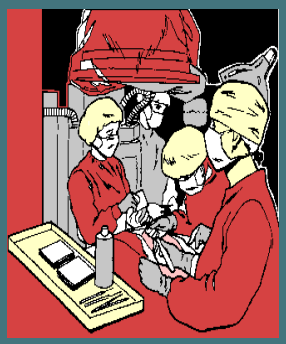
Sequential Trial: ALC or CHG

- Two products:
  - Detergent w/4%CHG
  - 61% ethyl ALC, 1% CHG, and emollients
- 20 OR staff used each product for 3 weeks sequentially

Larson, et al. AORN J 2001; 73:412



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Data Collection

Microbiological Assay

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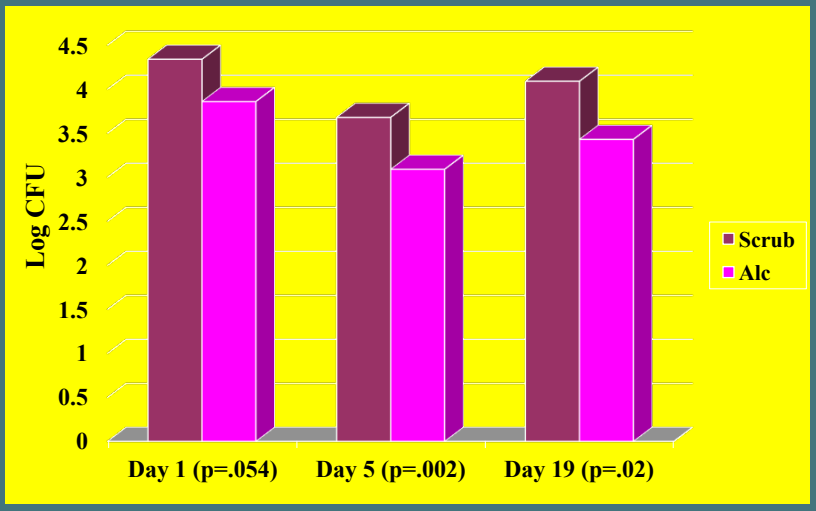
Post-Scrub Microbial Counts



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Moving into the Community

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Additional Team Members

- Sanitarian/health department
- Soap manufacturer
- Bilingual community health workers

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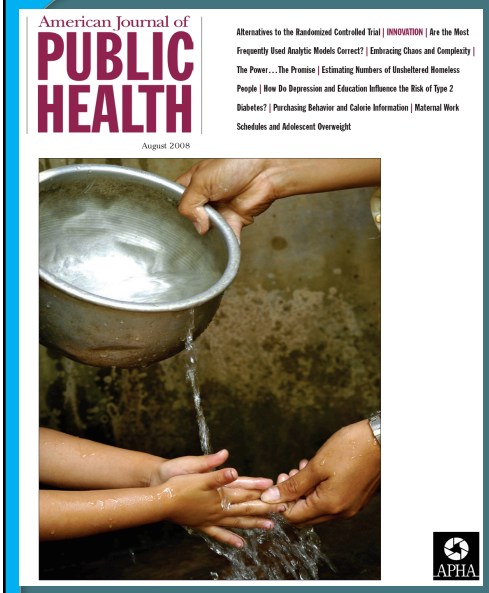

Hand hygiene in the community- is there a significant reduction in infectious illnesses?

- Meta-analysis of available studies

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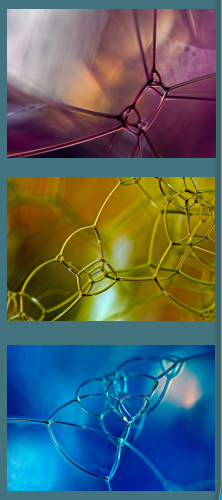
Pooled Efficacy of Hand Hygiene?

Overall, hand hygiene resulted in:

31% reduction in gastrointestinal illness (95% CI, 19% to 42%)

21% reduction in respiratory illness (95% CI, 5% to 34%)



Aiello, Coulborn, Perez, Larson. Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. *Am J Public Health* 2008; 98(8):1372-81

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Conclusions

- Antibacterial soaps showed no added benefit for reducing illnesses compared to plain soap
- Data on alcohol-based hand sanitizers were limited and weak

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Double-Blind, Randomized Clinical Trial of the Effect of Antibacterial Home Products on Infectious Disease Symptoms

- Larson E, Gomez Duarte C. Publ Health Nurs 2001; 18:116-127
- Larson E, et.al. Ann Intern Med 2004; 140:321-329.
- 1RO1NR05197

40

Participants (n=1,178) were....

- About 97% Hispanic
- About half born outside U.S.
- Living in multi-unit apartment buildings in upper Manhattan
- 99% female heads of households

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Rates of at least one symptom/ household month

	AB	*Non*	*Adj RR (95% CI)*
Runny nose	26.8	25.6	1.03 (.81-1.32)
Cough	23.2	23.6	.97 (.79-1.18)
Fever	10.2	11.9	.84 (.63-1.12)
Sore throat	10.0	10.3	.95 (.71-1.26)
Diarrhea	2.4	2.9	.90 (.54-1.50)
Vomiting	2.2	3.0	.77 (.47-1.27)
Skin/Eye	0.01	0.01	.46 (.18-1.21)

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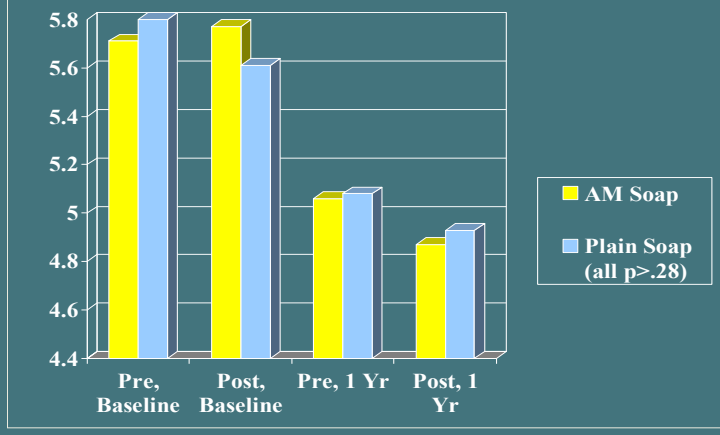
Log Counts: Baseline and After 1 Year



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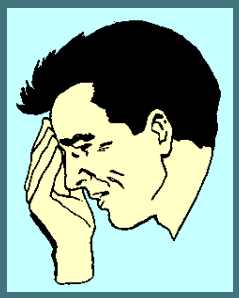
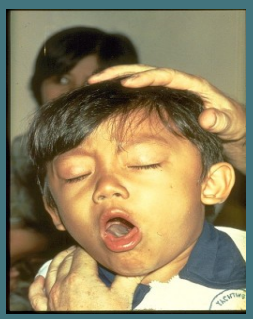
Reducing Influenza

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Stopping URIs and Flu in the Family: The Stuffy Trial

CDC U01/CI000442

Larson EL, Ferng Y, Wong-McLoughlin J, Wang S, Haber M, Morse SS. Impact of non-pharmaceutical interventions on URIs and influenza in crowded, urban households. Public Health Rep 2010; 125:178-191.

Columbia University School of Nursing | CDC | Columbia University Mailman School of Public Health

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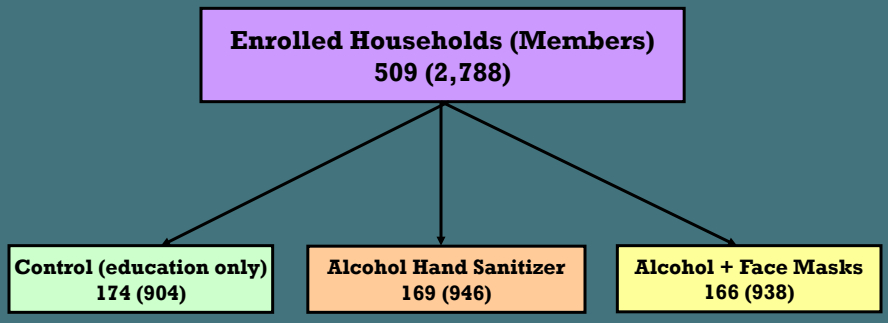
Enrolled Households



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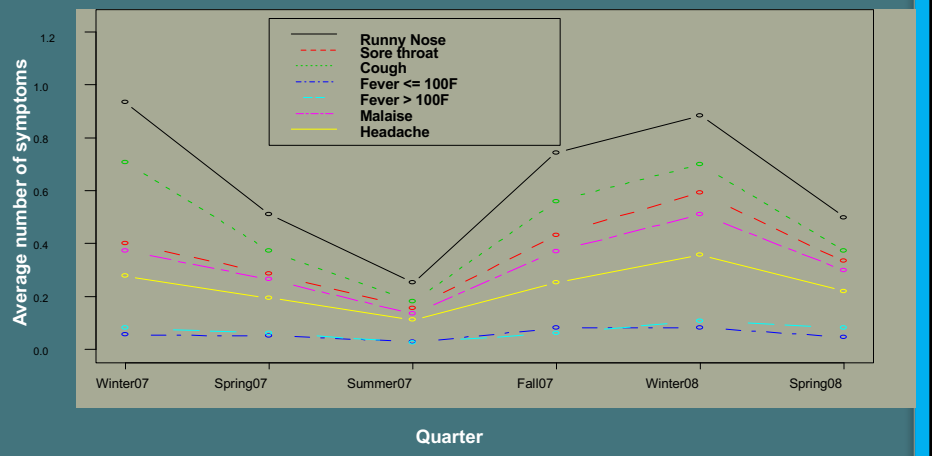
Average Number of Symptoms/Individual/Quarter



- **Households with at least one symptom reported: 83.3% (424/509)**

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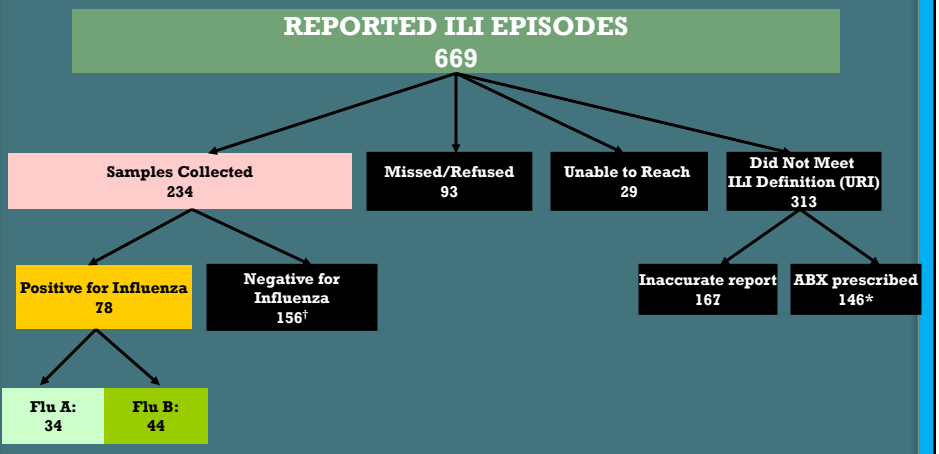
Influenza-like Illness (ILI)



†Among the 156 negatives for influenza, there were seven RSV, one paraflu type 1, three paraflu type 2, five paraflu type 3, eleven enterovirus, ten rhinovirus, six adenovirus and five human metapneumo-virus.

*46.6% were diagnosed to have a bacterial infection and prescribed an antibiotic

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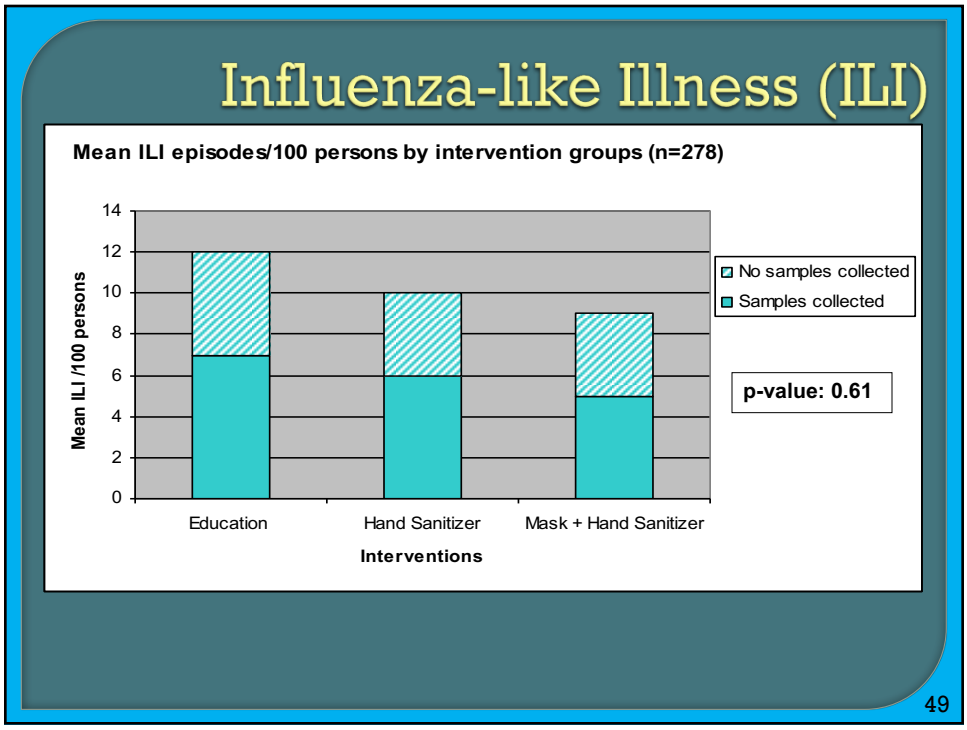
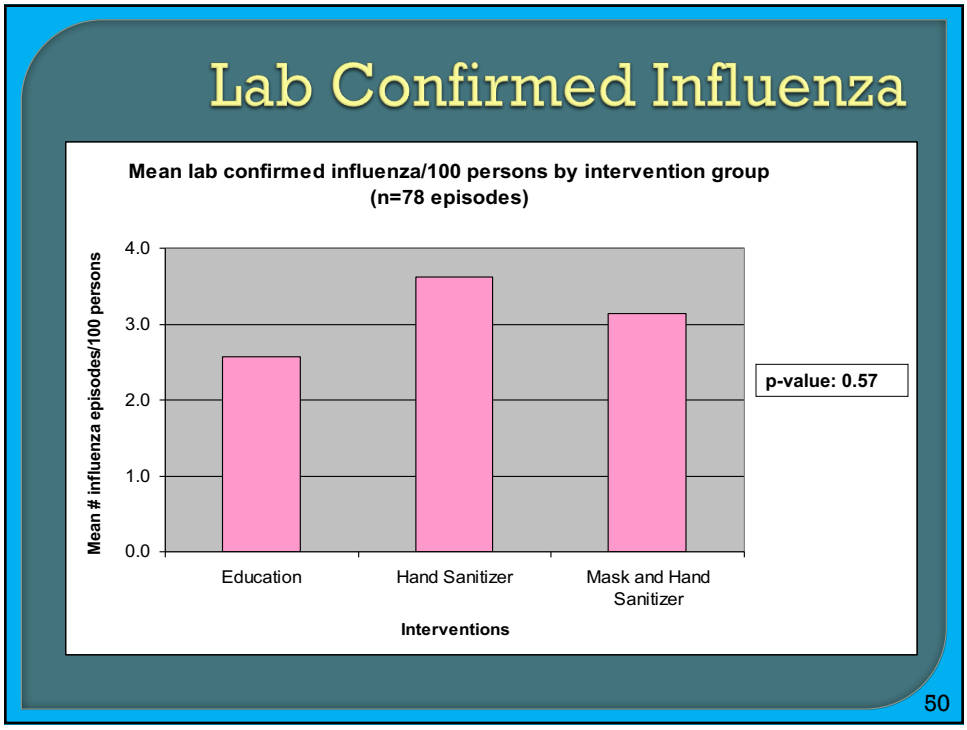

Influenza-like Illness (ILI)
Mean ILI episodes/100 persons by intervention groups (n=278)
Mean ILI /100 persons
14
12
10
8
6
4
2
0
Education
Hand Sanitizer
Mask + Hand Sanitizer
Interventions
No samples collected
Samples collected
p-value: 0.61
49


Lab Confirmed Influenza
Mean lab confirmed influenza/100 persons by intervention group
(n=78 episodes)
Mean # influenza episodes/100 persons
4.0
3.0
2.0
1.0
0.0
Education
Hand Sanitizer
Mask and Hand Sanitizer
Interventions
p-value: 0.57
50

Secondary Cases of Flu/ILI/URI

INTERVENTION GROUP	Relative Risk (95% Confidence Limits)	P VALUE
Education Group	Ref	
Hand Sanitizer Group	1.01 (.85, 1.21)	p-value: 0.02*
Hand Sanitizer + Mask Group	0.82 (.7, .97)	

*Regression controlling for gender, age group, whether or not born in the U.S., number of hours/week spent outside of the home, whether or not he/she had a chronic respiratory illness such as asthma, and influenza vaccination status, household crowding

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Conclusions

- No significant difference between intervention groups in terms of numbers of URI or flu, but secondary attack rates lower in mask group
- Increased knowledge and attitude scores and vaccination rates in all households
- Low compliance with mask wearing
- Need for improved rapid influenza tests

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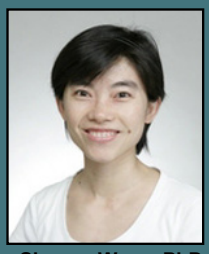
Team Members

Left to right: Maria Alvarez-Cid, Maria Jose Gonzales, Jennifer Wong-McLoughlin, Elaine Larson, Angela Barrett, Yu-hui Ferng

Stephen S. Morse, PhD



Shuang Wang, PhD

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Next…Pediatric Longterm Care

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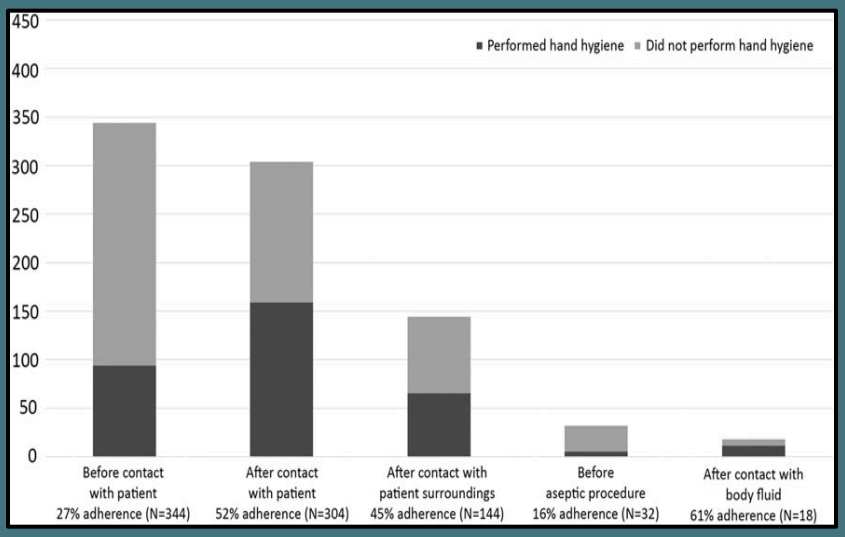
Staff Observations



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Qualitative Work Needed!

- Despite a multifaceted intervention in three pediatric longterm care hospitals, hand hygiene practices were unchanged
- We wanted to understand why

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Staff Interviews

Themes	Subthemes	
Hand Hygiene Products	• Perceptions/preferences • Availability/access	
Knowledge, Attitudes, Perceptions, Beliefs	• Internal/external motivation • "Us" vs. "Them" • Applicability of '5 Moments'	
Barriers to IP practice	• Patient characteristics • Access to/timeliness of data • Workflow/setting • Low priority	
Suggested Improvements	• Fun • Firm	• Feedback • Fine

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Family Interviews

Themes	Subthemes
Everyone Follows the Rules	• Staff is competent • Visitors are vigilant
Infections are Inevitable	• Germs are everywhere • Children are susceptible

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- Larson EL, et al. Behavioral interventions to reduce infections in pediatric longterm care facilities: The Keep It Clean for Kids Trial. Behav Med 2017; Mar 3:1-10.
- Saiman L, et al. Incidence, risks, and types of infections in pediatric long-term care facilities. JAMA Pediatr 2017; 171:872-878.
- Loyland B, et al. Staff knowledge, awareness, perceptions and beliefs about infection prevention in pediatric long-term care facilities. Nurs Res 2016; 65:132-141.
- Wilmont S, et al. Family experiences and perspectives on infection prevention in pediatric long-term care. Rehab Nurs J 2017, Jun 19.

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Phase 3: Impact on Clinical Practice and Policy

What do we need to know?

How can standards for testing products and performing hand hygiene be changed?

What additional skills are needed to address the question?

Political process, rules and regulations of regulatory and professional organizations, grantsmanship (from the grantor's perspective)

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Additional Team Members

- CDC, WHO
- FDA, EPA
- Economists
- News media (through University Public Affairs and professional organizations)
- Professional organization leadership
- Lobbying groups
- The Joint Commission, CMS

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Practice Guidelines Are Not Enough

- Site visits at 40 US NNIS hospitals to assess impact of CDC Hand Hygiene Guideline
- 89.8% of 1359 ICU staff members were familiar with the Guideline
- Alcohol products readily available in all hospitals
- Hand hygiene rates remained low (mean, 56.6%)
- Catheter-associated bloodstream infection rates significantly lower in hospitals with higher rates of hand hygiene ($p<.001$)

• Larson, et al. AJIC 2007; 35:666 (1 RO1 NR008242)

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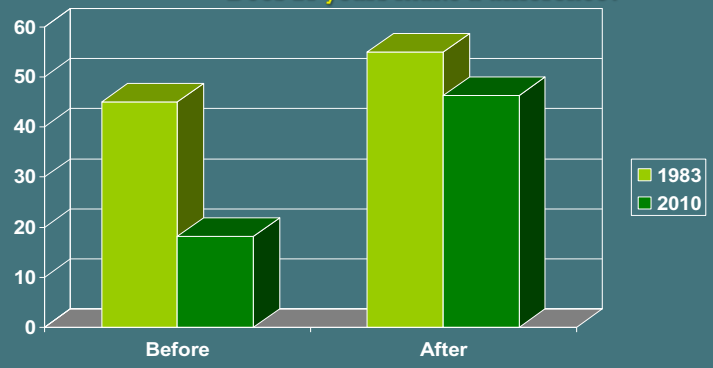
Staff Hand Hygiene For Contact with Isolated Patients (n=1,001):

Does 27 years make a difference?



Larson, AJIC 1983; 11:221. Clock, AJIC 2010; 38:105

U50 CD300860-21 (TS-1431)

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Mean Additional Costs

	Healthcare-Associated	Community-Associated
Charges	$18,990	$32,400
Length of stay	2.2 days	4.2 days
Deaths	4%	3%

5R01NR10822

Neidell MJ, Cohen B, Furuya Y, Hill J, Jeon CY, Glied S, Larson EL. Costs of healthcare- and community-associated infections with antimicrobial-resistant versus antimicrobial-susceptible organisms. J Clin Infect Dis 2012; 55:807-815

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Impact on Clinical Practice and Policy

- Standard setting for evidence-based practice
- Professional organizations, CDC, WHO, Joint Commission, CMS
- Testing and product regulation
- FDA, EPA
- National research agenda
- NIH, other funders, IOM Report
- Public practice
- Media

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So, where are we? What next? Where do you fit in?

- Behavioral and systems interventions—make it easier to do the right thing and difficult to do it wrong (electronic monitoring of practice, sanitizers, align incentives)
- More flexible and efficient research methods: comparative effectiveness research, practice-based evidence, modeling and simulation

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Common Elements for Success

- Clearly articulated purpose
- Strong leadership
- Contributions by all partners
- Funding
- Work products
- Minimal waste of time and resources

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A Final Challenge

Evaluate (formative and summative) the outcomes of your collaboration!!

Is the research collaborative effective and cost effective?

Are results sustainable?

How can it be more effective?

Qual Saf Health Care 2002; 11:345-351

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Centuries of scientific observation and of prophets wise have shown us what we know defines what we know not, and there is where our future lies.

Hall. J Infect Dis 2013:207: 1028.

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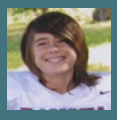
Here's Why We Do It

Simon

Stella



Carlos

Bryce in the ICU

Nils

Evelyn, Nathan

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Sincerest Gratitude

To a legion of colleagues and collaborators

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www.webbertraining.com/schedulep1.php

March 7, 2019	GOING BEYOND THE 5 MOMENTS Speaker: **Prof. Colin D. Furness**, University of Toronto
March 21, 2019	INFLUENZA AND VIRAL PNEUMONIA Speaker: **Prof. Rodrigo Cavallazzi**, University of Louisville
March 26, 2019	*(European Teleclass)* TAMING THE BUGS: CONTAMINATION AND INNOVATIVE APPROACHES TO STETHOSCOPE DISINFECTION Speaker: **Dr. Aamer Ikram**, National Institute of Health, Islamabad, Pakistan
April 3, 2019	*(South Pacific Teleclass)* HEALTHCARE ASSOCIATED INFECTION SURVEILLANCE IN THE ERA OF ELECTRONIC HEALTH DATA Speaker: **Prof. Phil Russo**, Deakin University, Australia
April 9, 2019	*(FREE Teleclass - Europe)* MODERN TOOLS FOR MODERN TOOLS FOR BACTERIAL IDENTIFICATION AND ANTIBIOTIC SUSCEPTIBILITY TESTING Speaker: **Prof. Vincent Cattoir**, Université de Caen Basse-Normandie, France
April 25, 2019	INFECTION CONTROL ISSUES IN HEALTHCARE CONSTRUCTION, PART 1 - RENOVATION Speaker: **Andrew Streifel**, University of Minnesota

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