Epidemiology & Infection Prevention

Max Habicht
Infection Prevention Partner

PRISMA HEALTH®

Objectives

- Introduction
- History of Infection Prevention
- Current state of Infection Prevention
- My experience at ASPH
  - Potential summer projects
- Q&A
- Outbreak Activity (time-permitting)

No financial disclosures

About me

2x Graduate of UofSC

- 2016 – BA in Public Health
- 2019 – MPH in Epidemiology
  - Practicum – childhood lead exposure impacts

First Job - South Carolina Department of Health and Environmental Control (DHEC aka DPH)

- 2020-2024 - Epidemiologist 1&2
  - HAI Program

Current Job – Prisma Health Richland

- 2024-present – Infection Prevention Partner

Brief IP History

- 1946 – The Communicable Disease Center (CDC) founded w/ primary tasks of field investigation, training and control of communicable disease + encouragement of formal infection control programs
- 1951 – The Joint Commission (TJC) is founded
- 1965 – CDC initiates the Comprehensive Hospital Infection Project (CHIP)
- 1970 – CDC establishes the National Nosocomial Infections Surveillance (NNIS) System
- 1972 – First professional society, the Association for Professionals in Infection Control (APIC) created
- 1974 – CDC begins national study known as the Study on Efficacy of Nosocomial Infection Control (SENIC)
- 1976 – TJC established the first accreditation standards for IP
- 1980 – First education standards for IP are created
- 1991 – US Department of Health and Human Serviced establishes the Hospital Infection Control Practices Advisory Committee (HICPAC)
- 1999 – Institute of Medicine publishes report, *To Err is Human*, revealing thousands of patients are injured or die each year because of HAIs
- 2002 – States begin to mandate health-care facilities report HAIs to public
- 2005-06 – Two research projects are published highlighting central line-associated infections (CLABSI)
- 2010 = Congress incorporated HAI prevention into the Value Based Purchasing program of the ACA
- 2013 – CDC publishes *Antibiotic Resistance Threats in the United States*
- 2019 – SARS-CoV-2 Pandemic begins

Source: Brief Modern-Era History of Infection Prevention | Colorado Hospital Association

Early HAI/IPC Perspectives

- Ignaz Semmelweis, 1846
  - Childbed fever – noticed increased mortality in newborns
  - Medical students working with cadavers in the morgue were assisting in the birthing clinic
- Florence Nightingale, 1854
  - During the Crimean war, demonstrated that hygiene is important for outcomes of wounded soldiers
  - Clean linen, scrubbed floors, etc.
- Joseph Lister
  - Demonstrated that limb amputation infection was much more likely w/o hand hygiene and antisepsis treatment prior to surgery

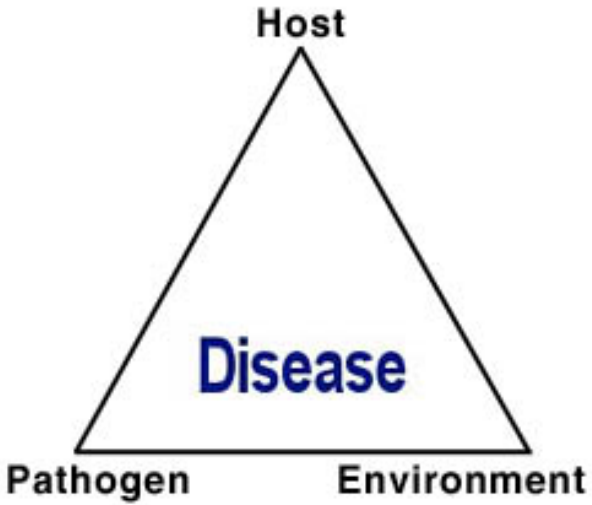
What is the role of the IP?

Risk Factors

- Host
- Pathogen/Agent
- Environment

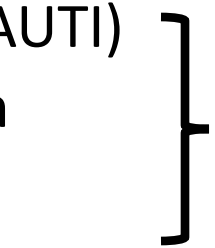
Examples

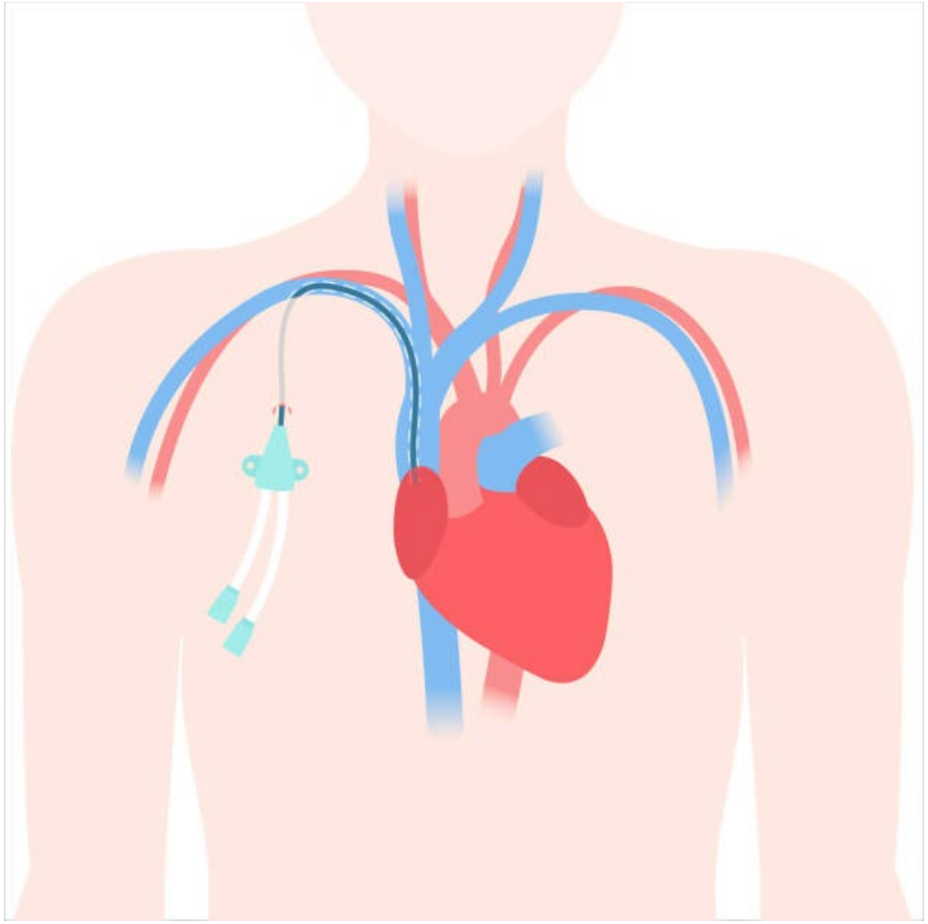
- HIV
- Smoking-related disease



Reportable HAIs

- Catheter-associated Urinary Tract Infection (CAUTI)
- Central Line-associated Blood Stream Infection (CLABSI)
- Ventilator-Associated Events (VAE)
- Surgical Site Infections (SSI)
- *Clostridioides difficile* Infection (CDI)
- Methicillin Resistant *Staphylococcus aureus* (MRSA)





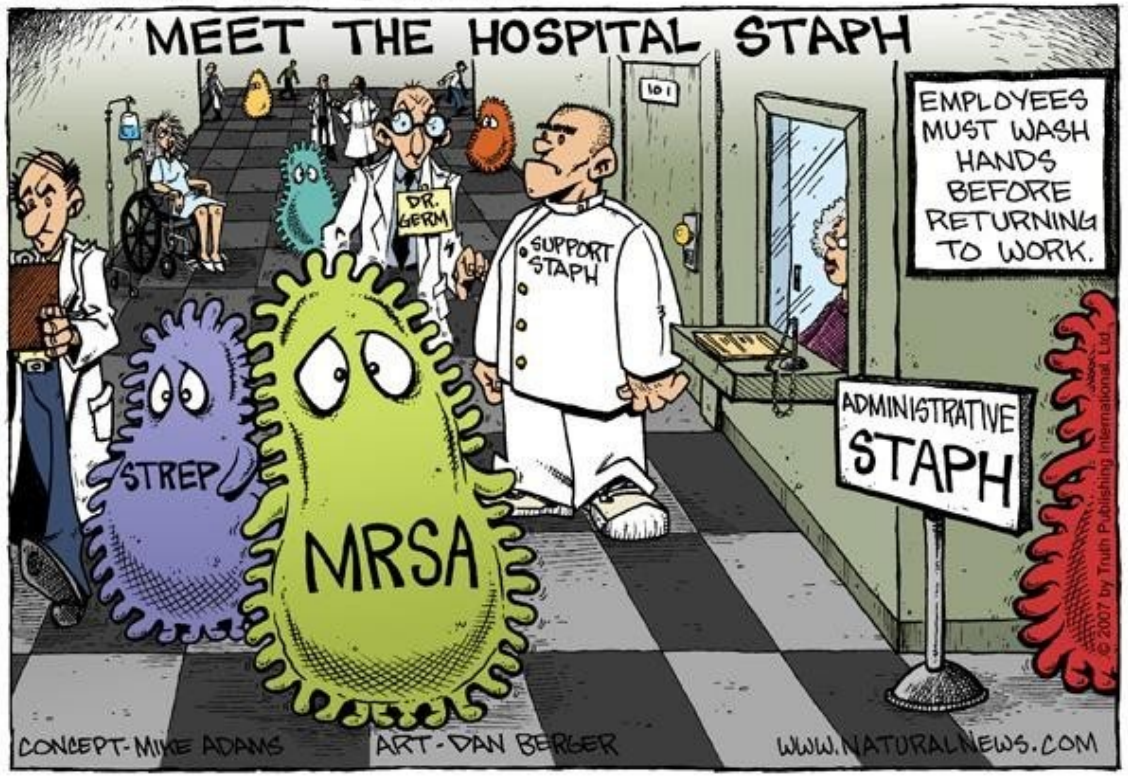
Today's Data

According to data from CDC in 2015…

- 1 in 31 patients will acquire an HAI
- 3% of hospitalized patients had one or more HAI
- 75,000 hospital patients with HAIs died during hospitalization
- $28.4 billion/annually in excess healthcare costs

IP Job Functions

- Surveillance
- Direct Patient Observation (rounding)
- Construction/Renovation
- Policy Creation/Maintenance
- Data/Statistics
- Place/Remove isolation precautions
- Special Projects
- Outbreak Investigation
- Emergency Preparedness
- Product Evaluation
- Staff Training & Education
- Coordinate w/ local & state public health


COUNTERTHINK
MEET THE HOSPITAL STAPH
EMPLOYEES MUST WASH HANDS BEFORE RETURNING TO WORK.
DR. GERM
SUPPORT STAPH
ADMINISTRATIVE STAPH
STREP
MRSA
© 2007 by Truth Publishing International Ltd.
CONCEPT-MIKE ADAMS
ART-DAN BERGER
WWW.NATURALNEWS.COM

Who is the IP?

"40% of the IP workforce will be eligible for retirement within 10 years"

Broad background of experience

- RNs
- MPHs (me)
- Respiratory Therapists
- Pharm D
- Microbiologist

Marketable Skills

- Ability to learn new skills
- Flexible
- Large knowledge base
- Public speaking ability
- Passionate
- Germ-aware *NOT* germaphobe

Infection Prevention Resources

- Association for Professionals in Infection Control and Epidemiology (APIC)
  - APIC Palmetto
- Society for Healthcare Epidemiology of America (SHEA)
- Infection Control Today
- American Journal of Infection Control (AJIC)

Arnold School Experience

- Curriculum was slightly different
  - Epidemiology
  - Biostatistics
  - ENHS
  - HPEB
- Allowed students to really focus on specific interests
- Practical Public Health applications
- Epidemiology experience

Potential Projects

Blood Culture Contamination Project

Problem: High BCC contamination rate - > 3%

Goal: Reduce BCC across Prisma System

1) Identify leading causes of variation in the collection process
2) Standardize products/processes

Potential Projects Cont.

Drivers:

1) Differing processes between campuses/systems (upstate versus midlands)
2) Different products in place for collection

Methods:

1) Direct observations across 5 different campuses
2) Development of new procedural/product checklists
3) Policy Update

Potential Projects: NV-HAP

Non-Ventilator Hospital-Associated Pneumonia

Goal: Reduce NV-HAP incidence across Prisma Health

Methods:

Results:

Conclusions

- IP needs more people w/ different experience
- Versatile job w/ lots of chances to learn new skills
- Plenty of opportunity to work as team and individually
  - Unique responsibilities
- Fun to confuse your friends/family

Questions?

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Thank You!

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HAI Outbreak Exercise

Backstory and Evidence

- 1950s – *Staphylococcus aureus* outbreaks and the baby boom
- S. aureus can cause skin infections, mastitis, pneumonia, and sepsis
- Very infectious to depressed immune systems

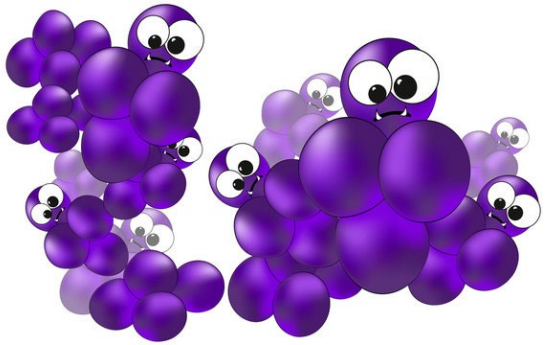
Crowded nurseries

+

Understaffing

=

PROBLEMS



Staph aureus continued

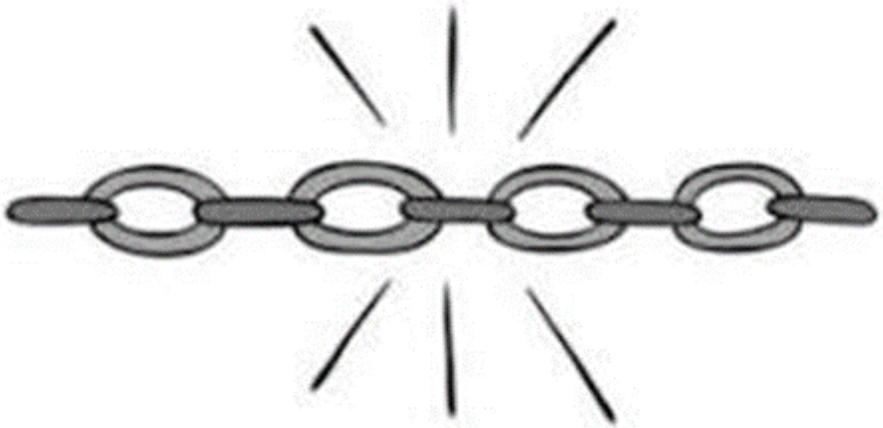
- Many researchers involved in trying to determine the source of outbreaks
- Began with observation/data collection
- Goal to identify source and **break chain of transmission**

Hypothesis = Hospital

Theory #1

- Theory of transmission by direct contact via healthcare workers
- Baby is primary infection
- Led to new policies
  - Removing colonized staff
  - PPE use
  - Not sharing equipment
  - Moving towards disposable equipment
- Mother was secondary infection
  - Via contact during breastfeeding

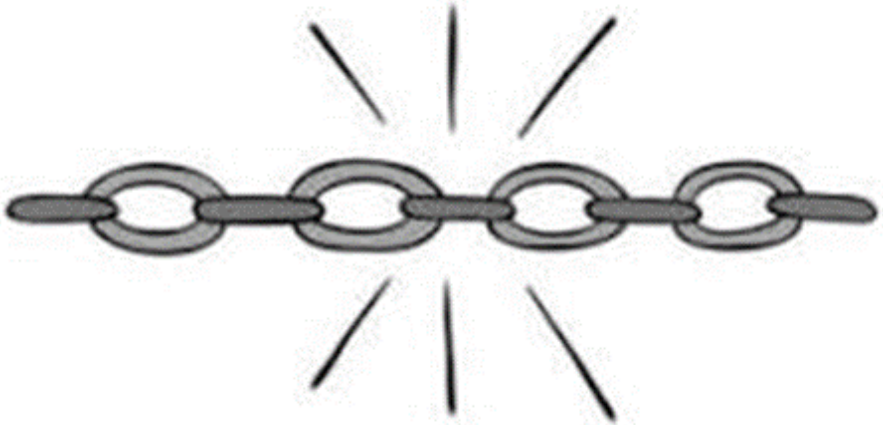
OUTBREAKS CONTINUE



Theory #2

- Theory of transmission via fomites
- Fomite – inanimate objects that include skin cells, hair and particles of clothing and bedding
- Blankets, pillows, stuffed animals, toys
- Impacted housekeeping practices and food handling policies

OUTBREAKS CONTINUE

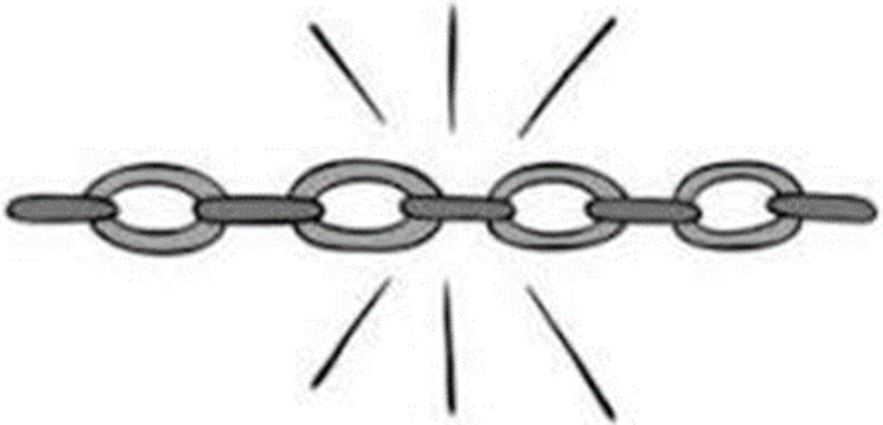


~50% of newborn infants infected

Theory #3

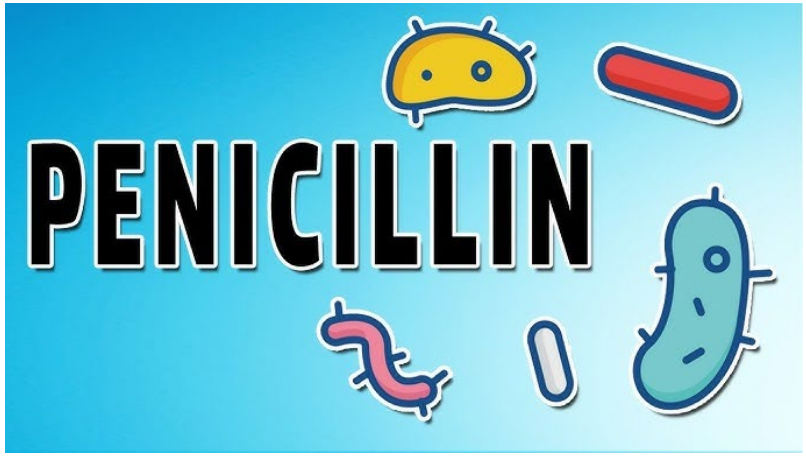
- Theory of airborne transmission
- Evidence showed *S. aureus* present in respiratory tract
- Cultures from nose, throat and skin of all infants + air samples in outbreak nurseries
- Phage typing and antibiotic-sensitivity testing “fingerprinted” the organism

OUTBREAKS CONTINUE



Conclusion

- Antibiotic resistance was key driver to outbreak



Penicillin Facts

- Discovered by Alexander Fleming in 1928
- Made available as an injectable in 1941
- Penicillin-resistant S. aureus first noted by William M.M Kirby in 1944
- Post WWII, resistance estimated ~10%
- By 1948 resistance increased to 59%!!!
- Community strains remained sensitive to penicillin
- With known penicillin resistance, researchers turned towards non-pharmacologic IP methods

Laboratory Evidence

- Lab data confirmed presence of airborne transmission
- Strain 80/81 typed and identified in 65% of all hospitals worldwide
- Resistant to penicillin in > 90% of cases