

Hospital-based Public Health Epidemiologist Program: A Novel Approach to Public Health in NC

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Hospital-based Public Health Epidemiology Program: A Novel Approach to Public Health in NC

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Hospital-based Public Health Epidemiologist (PHE) Program

- CDC Cooperative Agreement *Public Health Preparedness and Response for Bioterrorism*
- Purpose:
 - upgrade state and local public health preparedness and response
 - bioterrorism
 - outbreaks of infectious disease
 - public health threats and emergencies

NC Threat Surveillance: New PH Capacity

Information Technology

The NC Public Health
Information Network

NC EDSS
NC HAN
NC DETECT (Syndromic Surveillance)

People

Public Health
Regional Surveillance
Teams

State and
Local Health
Departments

Hospital-based
Public Health
Epidemiologists

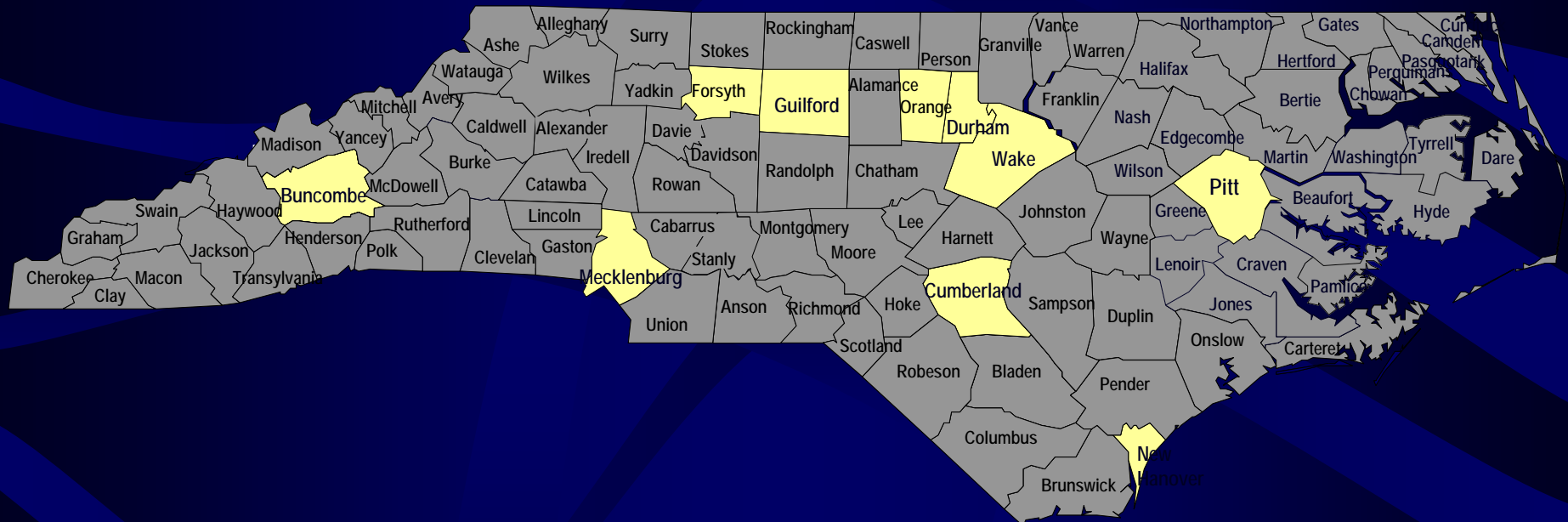
PHE Program Purpose

- Epidemiology and Surveillance Capacity
 - communicable disease reporting
 - epidemiologic training for healthcare professionals
 - improve public health surveillance
 - detect & characterize public health threats and emergencies
 - enhance relationships
 - infection control professionals
 - emergency department

PHE Hospital Selection

- ED Volume and Bed Size
- Hospital System or Network
- 11 Hospital Networks \approx 30% of NC ED Visits
- Geopolitical Considerations
 - Population and geography
 - Health systems with large referral bases

Hospital-based Public Health Epidemiologist Locations



PHE Personnel

- Program Director
- 11 Public Health Epidemiologists
 - RN – 7
 - MT – 3
 - MPH – 2
 - MS – 3
 - MBA – 1
 - MEd – 1

PHE Personnel

Program Director

Jennifer MacFarquhar, NC DPH/NC SPICE

NC DPH GCDC Medical Director

Lana Deyneka

Hospital-based Public Health Epidemiologists

Tammy Bischoff, WFUBMC

Jim Butcher, CFVMC

Bill Cleve, PCMH

Kristi Clutts, CMC

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Joyce Frederick, VAHS

Pat Hilliard, MCHS

Marilee Johnson, WMHHS

Rachel Long, MSJ

Pam Moore, NHHN

Emily Sickbert-Bennett, UNC-CH

PHE Program Oversight

- Under direction of NC DPH GCDC
 - Surveillance Advisory Committee
- On-site direction from hospital epidemiologist, or appointee

Epidemiologist Responsibilities

- Active Surveillance
 - ED Syndromes
 - Hospital Admissions
 - Laboratory Tests
- Investigation
- Local Health Department Collaboration
- Public Health Outreach/Education to Clinicians
- Special Studies

Surveillance Goals

- *“...the continued watchfulness over the distribution and trends of incidence through the systematic collection, consolidation and evaluation of morbidity and mortality reports and other relevant data. Intrinsic in the concept is the regular dissemination of the basic data and interpretations to all who have contributed and to all others who need to know.”*

-Alexander Langmuir, 1962

Syndromic Surveillance

- Active & Automated
 - Botulinic Illness
 - Influenza-like Illness
 - Respiratory Illness
 - Gastrointestinal Illness
 - GI ALL
 - GI Severe
 - Neurological Illness
 - Fever/Rash Illness
 - Meningoencephalitis Illness

Expanded Surveillance

- Category A biological agents
- Communicable Diseases of Public Health Importance (e.g., Influenza)
- Community-Acquired Pneumonia
- SiCA-MRSA

Defining Syndromic Surveillance

- Syndromic Surveillance is ongoing, systematic collection, analysis, interpretation, and application of real-time indicators for diseases and outbreaks that allow for their detection before public health authorities would otherwise note them.*

Timeline

Syndrome

Release

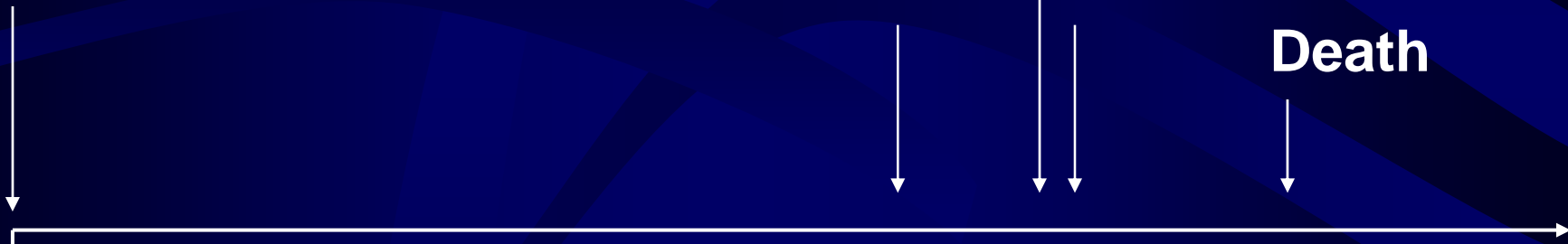
Symptoms

Hospital

Death

0

Time



Goals of Syndromic Surveillance

- Early detection of clusters
 - Syndromes (Gastroenteritis, Respiratory, Rash/Fever, Influenza like illness (ILI), Neurological (Meningitis/Encephalitis, Botulinic), Hemorrhagic)
 - Influenza
 - Foodborne epidemics
 - Chemical toxicities and poisonings
- Quick investigation

Syndrome Case Definitions

- Centers for Disease Control and Prevention Working Group on Syndrome Groups
 - ICD9, OR
 - Text-string data in chief complaint & triage notes
 - “Fever and rash” instead of “**Smallpox**”
 - “Influenza-like illness,” and “mediastinal widening on chest X-ray” instead of “**inhalational anthrax**”
 - Numeric data in vital signs

Surveillance Tools

- Automated
 - North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) - 9
 - Electronic Surveillance System for the Early Notification of Community-based Epidemics (DOD-ESSENCE) - 1
 - North Carolina Veterans Epidemiological Testbed (NC VET) - 1
- Manual
 - Review of ED logs - 1

Case Review

- NC DETECT line listing with triage notes
- Laboratory Results
- Physician Notes
- Admission Logs
- ED Logs

NC DETECT Line Listing

Syndrome Case Report

Data Source: ED
Syndrome: GI Severe

Date Range: From: 8/14/2006 To: 08/15/2006

County -All-
 Hospital -All-

Age Group: All Specify

Total ED Cases: 149

[Show Chart](#)

Excel
 ▼ Sorted Column

| Facility | Arrival Date and Time | County | Age | Sex | Disposition | Chief Complaint | Initial ED Temperature | Triage Notes | Diagnosis Code | MRN |
|------------|-----------------------|------------|-----|-----|---|-------------------------------|------------------------|--|----------------|--------------------------|
| Hospital A | 2006-08-14 | MOORE | 53 | F | Discharged to home or self-care (routine discharge) | FEVER,CHILLS,VOMITING,HBP,HBS | | | | Retrieve |
| Hospital B | 2006-08-14 | LEE | 5 | M | | VOMITING, FEVER | | | | Retrieve |
| Hospital C | 2006-08-14 | MONTGOMERY | 65 | M | Discharged to home or self-care (routine discharge) | Other | | Presenting complaint: Patient states: | | Retrieve |



Internet

Case Review

ED Visits

Median: 195

Range: 120-322

Cases Reviewed

Median: 44

Range: 0-49

Findings: Examples of Clusters

- Six pediatric patients with encephalitis
- Thirteen patients with encephalitis
- Cluster of *Clostridium difficile* colitis in residents of assisted living facility
- Three patients with hemoptysis and exposure to poultry

Findings: Examples of Individual Cases

- One patient with unreported pulmonary *Mycobacterium tuberculosis*
- CAP in a patient who handles rodents
- Suspected bubonic plague in livestock farmer

Additional Surveillance Findings

- Prompt notification and investigation of cases:
 - salmonellosis
 - shigellosis
 - campylobacteriosis
 - pertussis
 - babesiosis
 - Dengue fever
 - TB
 - RMSF
 - Erlichiosis
 - And many more!

siCA-MRSA Surveillance

- Only surveillance for CA-MRSA in NC
- PHE reviews MSRA reports, selects
 - normally sterile body sites
 - no established risk factors
- Enter data into Case Report Form (CRF)
 - CDC form used by emerging infections programs
- Fax CRF to NC DPH GCDC
- Data entry, further review and analysis

Case Report Form

Modified from 2/25/2004 version, CDC ABC

PHE Name, location: _____

Invasive Methicillin-resistant *Staphylococcus aureus* Active Bacterial Core Surveillance (ABCs) Case Report

Patient Name: _____ Phone: () _____
(Last, First, MI)

Address: _____ Chart Number: _____
(NUMBER, STREET, APT #) (STATE) (ZIP) (PLUS 4)

| | | | | |
|---|--|--|---|--|
| 1. STATE: (Residence of Patient) | 2. COUNTY: (Residence of Patient) | 3. Provider: | Provider Telephone: | Lab Name, Telephone |
| 5. DATE OF BIRTH: / / | 6a. AGE: --- | 6b. Is age unit in day/mo/yr? <input type="checkbox"/> Day <input type="checkbox"/> Month <input type="checkbox"/> Year | 7a. SEX: <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Unknown | 7b. ETHNIC ORIGIN: <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Not Hispanic or Latino <input type="checkbox"/> Unknown |
| 8. WAS PATIENT HOSPITALIZED? <input type="checkbox"/> Yes <input type="checkbox"/> No | | Date of admission: / / | | Date of discharge: / / |
| 9. WAS AN INFECTION RELATED TO THE INITIAL CULTURE INCLUDED IN THE ADMISSION DIAGNOSIS? (Was MRSA infection the reason for hospital admission?) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | | | | |
| 11. PATIENT OUTCOME: <input type="checkbox"/> SURVIVED → Discharged to: <input type="checkbox"/> Home <input type="checkbox"/> Nursing Home <input type="checkbox"/> Rehabilitation Facility <input type="checkbox"/> Hospital <input type="checkbox"/> Prison/Jail <input type="checkbox"/> Unknown (Check one) <input type="checkbox"/> Other (specify): _____ <input type="checkbox"/> DIED → Date of Death: / / Was MRSA contributory or causal? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | | | | |
| 12. DATE OF INITIAL CULTURE: / / | | 14. Were cultures of the SAME sterile site(s) positive between 7 and 30 days after initial culture? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | | 16. NON-STERILE SITE(S) FROM WHICH MRSA WAS ISOLATED WITHIN 72 HOURS BEFORE OR AFTER INITIAL STERILE SITE CULTURE: (Check ALL that apply) <input type="checkbox"/> Sputum <input type="checkbox"/> Ear <input type="checkbox"/> Nasal <input type="checkbox"/> Rectal/Stool <input type="checkbox"/> Urine <input type="checkbox"/> Nasopharynx <input type="checkbox"/> Catheter/Device <input type="checkbox"/> Throat <input type="checkbox"/> Eye <input type="checkbox"/> Sinus <input type="checkbox"/> Skin <input type="checkbox"/> Other |
| 13. STERILE SITE(S) FROM WHICH MRSA WAS INITIALLY ISOLATED: (Check ALL that apply) <input type="checkbox"/> Blood <input type="checkbox"/> Peritoneal fluid <input type="checkbox"/> Bone <input type="checkbox"/> CSF <input type="checkbox"/> Pericardial fluid <input type="checkbox"/> Pleural fluid <input type="checkbox"/> Joint/Synovial fluid <input type="checkbox"/> Internal body site: (specify) _____ <input type="checkbox"/> Other sterile site: (specify) _____ | | 15. Were cultures of OTHER sterile site(s) positive within 30 days of initial culture? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown IF YES, list site(s): 1. _____ 2. _____ 3. _____ | | If SKIN, check culture type below: <input type="checkbox"/> Traumatic Wound <input type="checkbox"/> Pressure Ulcer <input type="checkbox"/> Surgical Incision <input type="checkbox"/> Not Specified <input type="checkbox"/> Other: (specify): _____ |
| 17. TYPES OF MRSA INFECTION ASSOCIATED WITH CULTURE(S): (Check ALL that apply) | | | | |
| Bacteremia | <input type="checkbox"/> Meningitis | Endocarditis | Septic Arthritis | |
| <input type="checkbox"/> Primary | <input type="checkbox"/> Peritonitis | <input type="checkbox"/> Native valve | <input type="checkbox"/> Native joint | <input type="checkbox"/> Cellulitis |
| <input type="checkbox"/> Secondary | <input type="checkbox"/> Pneumonia | <input type="checkbox"/> Prosthetic valve | <input type="checkbox"/> Prosthetic joint | <input type="checkbox"/> Traumatic wound |
| <input type="checkbox"/> Not specified | <input type="checkbox"/> Pericarditis | <input type="checkbox"/> Abscess (not skin) | <input type="checkbox"/> Bursitis | <input type="checkbox"/> Surgical incision |
| | <input type="checkbox"/> Osteomyelitis | <input type="checkbox"/> Surgical site (internal) | <input type="checkbox"/> Otitis media | <input type="checkbox"/> Pressure ulcer |

Revised 1/24/2005

Invasive Methicillin-resistant *Staphylococcus aureus* Active Bacterial Core Surveillance (ABCs) Case Report

| | | | |
|---|--|---|--|
| 18. UNDERLYING CONDITIONS: (Check ALL that apply) | | (If none or chart unavailable, check appropriate box) <input type="checkbox"/> NONE <input type="checkbox"/> UNKNOWN | |
| <input type="checkbox"/> Current Smoker | <input type="checkbox"/> Heart Failure/CHF | <input type="checkbox"/> Diabetes | <input type="checkbox"/> Immunosuppressive Therapy |
| <input type="checkbox"/> Alcohol abuse | <input type="checkbox"/> Atherosclerotic Cardiovascular Disease | <input type="checkbox"/> Chronic Renal Insufficiency | <input type="checkbox"/> Influenza (within 10 days of initial culture) |
| <input type="checkbox"/> IV/DU | <input type="checkbox"/> CVA/Stroke (Not TIA) | <input type="checkbox"/> Chronic Liver Disease | Bite: <input type="checkbox"/> Spider <input type="checkbox"/> Insect <input type="checkbox"/> Other |
| <input type="checkbox"/> HIV | <input type="checkbox"/> Emphysema/COPD | <input type="checkbox"/> Rheumatoid Arthritis | <input type="checkbox"/> Abscess/Boil |
| <input type="checkbox"/> AIDS or CD4 count <200 | <input type="checkbox"/> Asthma | <input type="checkbox"/> Folliculitis | <input type="checkbox"/> Other dermatological Condition (specify): _____ |
| <input type="checkbox"/> Solid Organ Malignancy | <input type="checkbox"/> Systemic Lupus Erythematosus | <input type="checkbox"/> Eczema | |
| <input type="checkbox"/> Hematologic Malignancy | <input type="checkbox"/> Sickle Cell Anemia | <input type="checkbox"/> Psoriasis | <input type="checkbox"/> Other: (specify) _____ |
| 19. CLASSIFICATION – Healthcare-associated and Community-associated: (Check all that apply) | | | |
| <input type="checkbox"/> Previous documented MRSA infection or colonization | | <input type="checkbox"/> Residence in a long-term care facility within year before index culture date. | |
| IF YES: Month _____ Year _____ OR previous STATE ID: _____ | | IF YES: <input type="checkbox"/> Nursing Home <input type="checkbox"/> Rehabilitation facility <input type="checkbox"/> Other: (specify) _____ | |
| <input type="checkbox"/> Culture collected > 48 hours after hospital admission | | <input type="checkbox"/> Resident at time of culture: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | |
| <input type="checkbox"/> Hospitalized within year before index culture date. | | <input type="checkbox"/> Invasive device or catheter in place at time of admission/evaluation? | |
| <input type="checkbox"/> Surgery within year before index culture date. | | IF YES, (Check ALL that apply): | |
| <input type="checkbox"/> Dialysis within year before index culture date. (Hemodialysis or Peritoneal dialysis) | | <input type="checkbox"/> Urinary <input type="checkbox"/> Gastrointestinal <input type="checkbox"/> Other: _____ | |
| | | <input type="checkbox"/> Respiratory <input type="checkbox"/> Central Vascular | |
| 20. SUSCEPTIBILITY RESULTS: [S=Sensitive (1), I=Intermediate (2), R=Resistant (3), U=Unknown/Not Reported (9)] | | | |
| Ciprofloxacin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | Oxacillin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | 21a. OXACILLIN ZONE SIZE: _____ mm <input type="checkbox"/> Not Reported | |
| Clindamycin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | Penicillin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | 21b. OXACILLIN MIC: _____ µg/ml <input type="checkbox"/> Not Reported | |
| Daptomycin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | Quinupristin/Dalfopristin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | 22. WAS CULTURE POLYMICROBIAL? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | |
| Doxycycline: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | Rifampin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | IF YES, List other bacterial species isolated: 1. _____ 2. _____ | |
| Erythromycin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | Tetracycline: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | | |
| Gatifloxacin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | Trimethoprim-sulfamethoxazole: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | | |
| Gentamicin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | Vancomycin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | | |
| Levofloxacin: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | Other: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U | | |
| Linezolid: <input type="checkbox"/> S <input type="checkbox"/> I <input type="checkbox"/> R <input type="checkbox"/> U (specify) _____ | | | |
| 23. WAS PATIENT RECEIVING ANTIBIOTICS AT TIME OF CULTURE? <input type="checkbox"/> Yes <input type="checkbox"/> No | | 24. WAS PATIENT PRESCRIBED ANTIBIOTICS AT THE TIME OF CULTURE? (Was antibiotic treatment initiated or changed?) <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| IF YES, please list: (Use codes in Appendix 1) 1. _____ 2. _____ 3. _____ | | IF YES, please list: (Use codes in Appendix 1) 1. _____ 2. _____ 3. _____ | |
| 9 Unknown _____ 4. _____ | | 9 Unknown _____ 4. _____ | |
| 25. Was case first identified through audit? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | 26. CRF status: <input type="checkbox"/> Complete <input type="checkbox"/> Incomplete <input type="checkbox"/> Edited & Correct <input type="checkbox"/> Chart unavailable after 3 requests | 27. Does this case have recurrent MRSA disease? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | 28. Date reported to EIP site: / / |
| 29. Initials: _____ | | | |
| 30. COMMENTS: _____ _____ _____ | | | |

Revised 1/24/2005

siCA-MRSA Findings

- siCA-MRSA baseline documented
- Noted:
 - Demographics
 - Geographics
 - Type/Site of Infection
 - Underlying Conditions
 - Antibigram Information
 - Outcomes

PHE Program Impact

- Hospital liaison with public health
 - Point of Contact for hospital personnel re community-acquired infection
 - Education of clinicians on public health issues
 - Communicable diseases, influenza, respiratory hygiene
 - Assistance with disease reporting
 - Assistance with investigations

PHE Program Impact

- Service to local & state health departments
 - Alert LHDs to infections & diseases of public health significance
 - Assistance with investigations
 - Patient information
 - Laboratory results
 - Questionnaire administration
 - Case finding

PHE Program Impact

- Facilitating implementation of NCHESS within respective facilities
- Facilitate automated laboratory reporting (communicable diseases, category A agents)
- Facilitate BT/Infectious Disease facility response plans
- Participate in study of sensitivity of North Carolina communicable disease reporting

PHE Program Impact

- PHEs routinely investigate
 - 125 syndromic surveillance aberrations per month
- PHEs have identified
 - Hundreds of reportable diseases
 - >100 clusters
- PHEs have performed
 - >300 educational sessions (medical facility, public health, community) including TV, radio, and newspaper reports

PHE Program Impact

- PHEs have collaborated with LHD, SHD & CDC to investigate:
 - *Bartonella quintana*
 - Group B Streptococcus
 - Invasive Group A Streptococcus
 - *Mycobacterium abscessus*
 - *E. coli* O157:H7
 - *Enterobacter sakazakii*
 - Kawasaki Disease
 - *Serratia marcescens*
 - siCA-MRSA
 - Guillain-Barre cases following Menactra
 - *Legionella*
 - Mumps
 - Community-associated *Clostridium difficile*
 - Katrina evacuee
 - Chemical plant explosion
 - Middle school pepper spray event

PHE Program Impact

- *Serratia marcescens* multistate nosocomial outbreak
 - Hospital pharmacies alerted of widened MgSO₄ recall
 - 15 months of lab records reviewed
 - 28 possible cases within 5 healthcare facilities
- **Case report forms completed and clinical isolates sent to CDC**
- 3 cases confirmed by PFGE match to multistate outbreak strain

PHE Program Impact

- Late-onset Neonatal Group B Strep
 - County X
 - 9 cases (4 confirmed, 5 probable)
 - Not reportable condition
 - Hospital-based PHE
 - Reported cluster to LHD
 - Assisted with chart reviews and observation of procedures
 - Facilitated communication between PH and hospital
 - Facilitated obtaining isolates

PHE Program Impact

- Invasive Group A Strep
 - County Y
 - 9 cases (2 additional suspect)
 - 4 deaths
 - 1 postpartum
 - Hospital-based PHE
 - Reported cases to LHD
 - Did f/u chart investigation
 - Produced line list and EpiCurve for LHD
 - Ensured isolates held in laboratory
 - Facilitated involvement of Regional PH Surveillance Team

PHE Program Impact

- *E. coli* O157:H7 Outbreak (2004)
 - Active surveillance/Case Finding
 - Syndromic Surveillance GI syndrome and Lab results
 - Submitted daily line lists to GCDC and LHD of possible cases
 - PH Liaison within hospital
 - Increased ED and pediatrician awareness
 - Diagnosis and case finding
 - Disseminating State Epi's treatment recommendations
 - Identified and resolved laboratory issues

PHE Program Impact

- *E. coli* O157:H7 Outbreak
 - PH Liaison within hospital (continued)
 - Obtained environmental samples from patients
 - Administered questionnaires for hospitalized patients
 - Carried out After-Action Review in one Hospital
 - PHE Coordinator provided surge capacity for PHCC

PHE Program Impact

- *Mycobacterium abscessus*
 - County Z
 - 2 Cases with h/o cosmetic surgery in Santo Domingo, DR
 - Hospital-based PHE
 - Reported cases to LHD & SHD → CDC
 - Did f/u chart investigation
 - Facilitated CDC interview/questionnaire completion
 - Ensured isolates held in laboratory
 - Nation-wide surveillance for additional cases
 - 12 confirmed cases
 - MMWR 53 (23); 509 6/18/04

Summary

This novel program has proven beneficial and strengthened communication among clinicians, laboratories, and public health.

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- PHEs

- Tammy Bischoff
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- Sharon Evans
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- Lana Deyneka
- Jeffrey Engel

THANK YOU.



<http://go.to/funpic>

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