Day-to-Day Antimicrobial Stewardship:

Focusing on What Works and What You Have Resources For

Please Standby

We will begin promptly at 1 p.m. ET

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Antimicrobial Stewardship: Focus on What Works, What You Have Resources For

David Schwartz, MD
Stroger Hospital of Cook County
May 20, 2015

Nothing to disclose

Outline

- Focus on institutional antibiotic use
- Stewardship rationale
- Resources to/from stewardship
- Necessary procedural attributes
- Examples

The Primary Aim of Antimicrobial Stewardship Is…

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A. To conserve the fuel driving antimicrobial resistance and other unintended consequences of antimicrobial use

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B. To save money

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C. To improve patient care and outcomes

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A. To conserve the fuel driving antimicrobial resistance and other unintended consequences of antimicrobial use
B. To save money
C. To improve patient care and outcomes
D. All of the above

The Primary Aim of Antimicrobial Stewardship Is…

A. To conserve the fuel driving antimicrobial resistance and other unintended consequences of antimicrobial use
B. To save money
C. To improve patient care and outcomes
D. <u>All of the above</u>

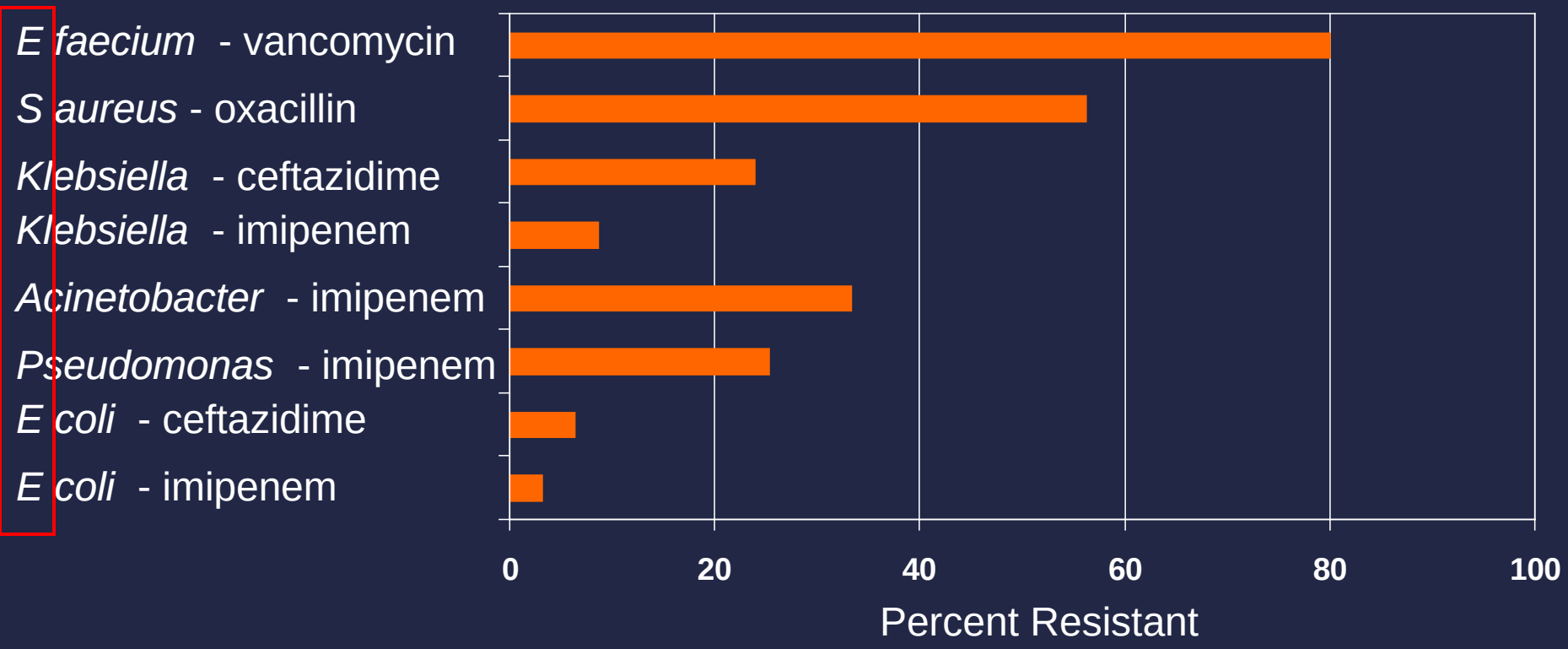
Ingredients Necessary for Changing Behavior

- Compelling rationale
- Resources
- Procedures that:
  - Self-evidently promote improved patient care
  - Are feasible given limits of workflow and competence

Antimicrobial Stewardship Rationale

- Antimicrobial use is unnatural:
  - Disrupts normal physiologic function
  - Like other “restorative care” modalities:
    - Surgery
    - Cancer treatment
  - (Long-term intensive care: “beyond restorative” begets “beyond resistant”?)
- Antimicrobial exposure – breadth of spectrum, duration – should be limited to the extent possible

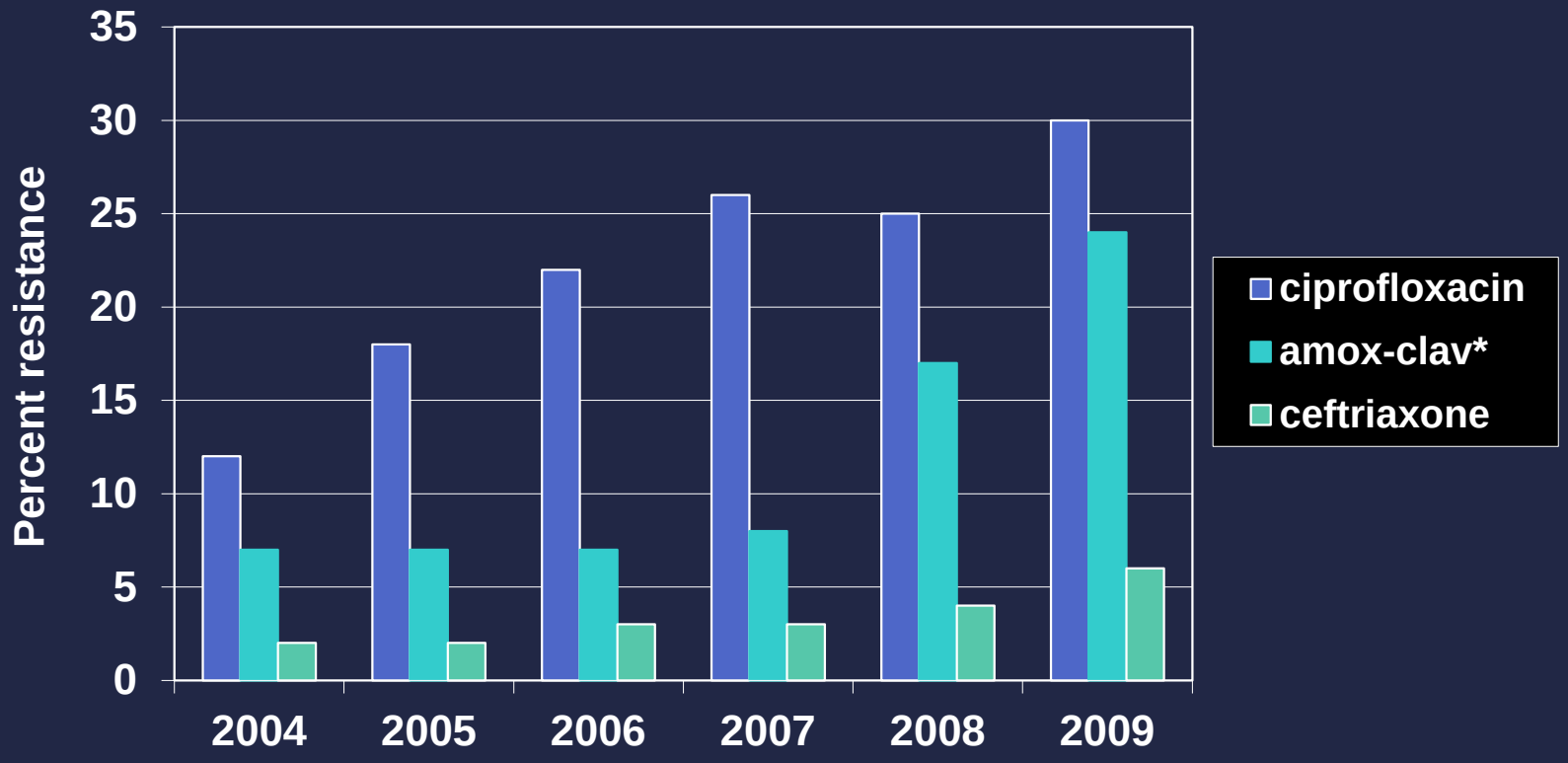
Antimicrobial Resistance Prevalence in Hospital-Acquired Infections*, NHSN-Reporting U.S Hospitals, 2006-7



*Central-line-associated bloodstream infections, catheter-associated urinary tract infections, ventilator-associated pneumonia only

Infect Control Hosp Epidemiol 2008;29:996-1011

Prevalence of Antibiotic Resistance Among Community-Onset Isolates of *E coli*, Stroger Hospital



* Percent intermediate or resistant

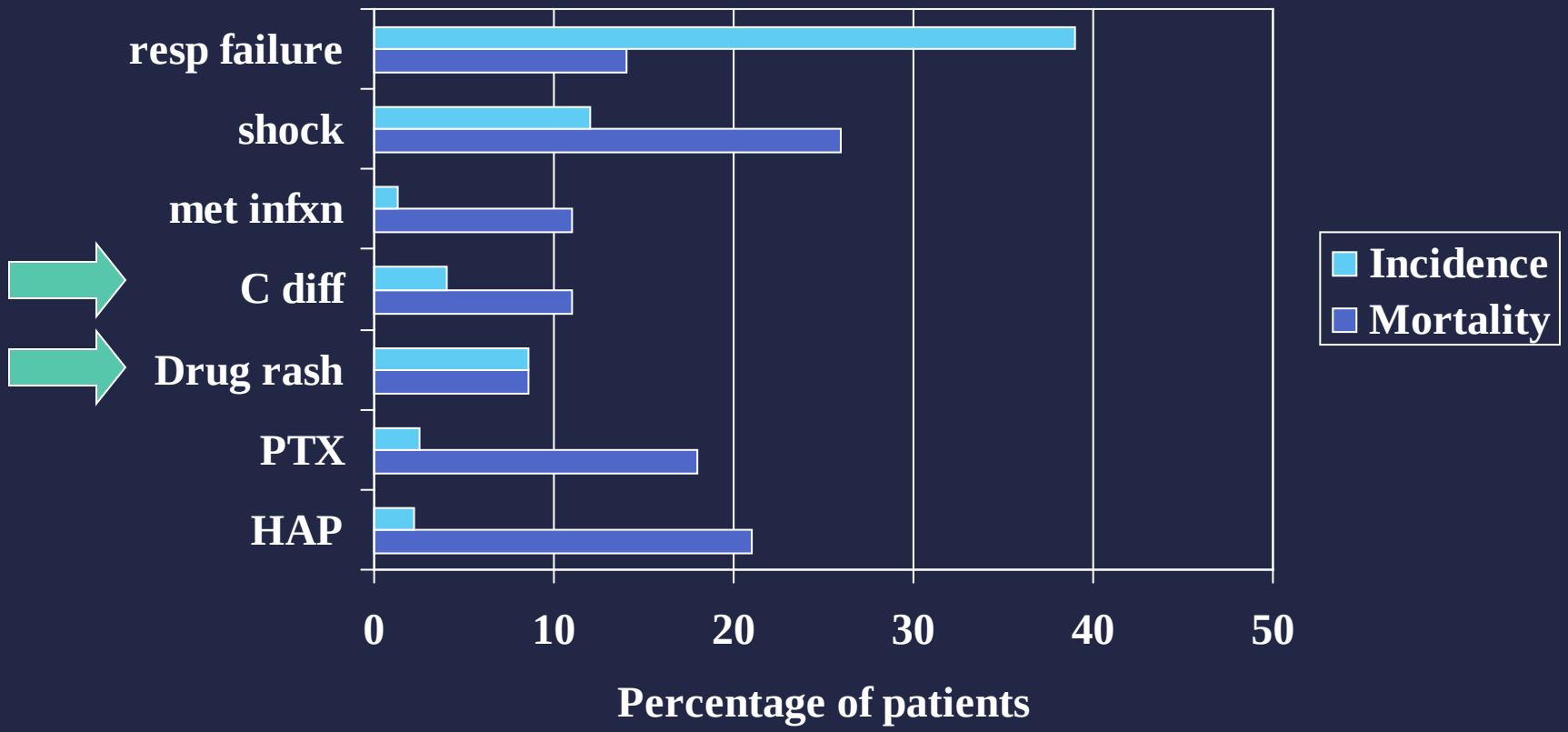
Schwartz DN, unpublished data

Antibiotic Use Begets Resistance in the Population and the Person

- Adjusted hazard ratios for development of specific resistance pattern after prior use:
  - Fluoroquinolones: 4.0
  - 3rd-generation cephalosporins: 3.5
  - Ampicillin-sulbactam: 2.3
  - Imipenem: 5.7

Harbarth et al. Clin Infect Dis 2001;33:1462-8

Complications Among 1339 Inpatients with CAP



Arch Intern Med 1999;159:970-81

Antibiotic-Associated Adverse Drug Reactions

- "Allergic" reactions:
  - IgE-mediated
  - Fever, rash, hepatitis, nephritis, pneumonitis, etc.
- Dyspepsia, diarrhea
- Pill esophagitis
- Seizures, neuropathy
- Stevens-Johnson, TEN
- Bone marrow dyscrasias

Resources for/from Antimicrobial Stewardship

- Resources needed:
  - Multidisciplinary staff:
    - MD/RN/PharmD
    - IT/IC/microbiology
  - Authority
    - Provider respect
    - Administrative support
  - Niche within QA infra-structure
  - Capacity for multimodal interventions
  - Process, outcome data

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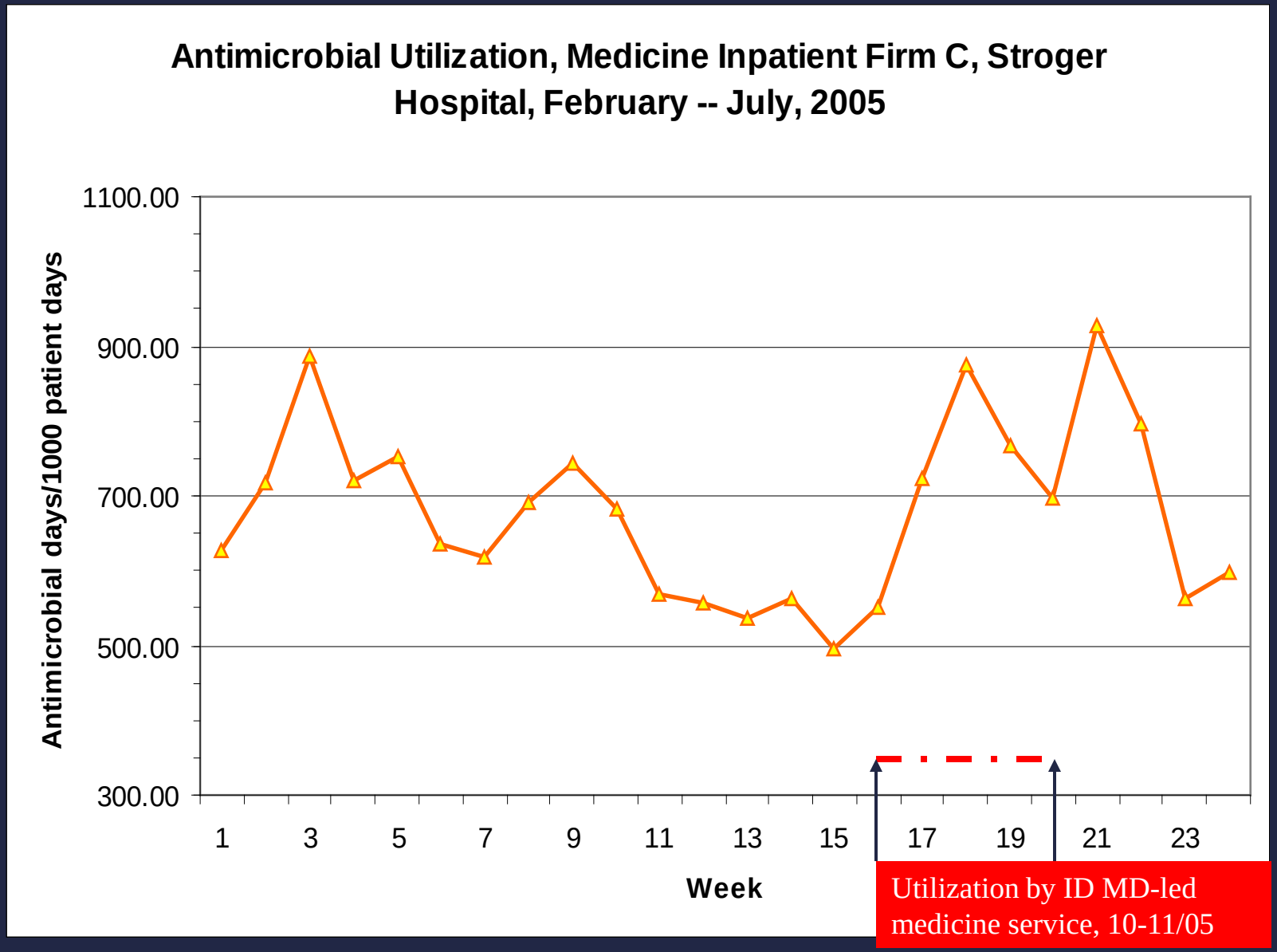
  - Capacity for multimodal interventions
  - Process, outcome data
- Expected return:
  - Reduced medication acquisition costs
    - Big-ticket items
    - In aggregate
  - Reduced ancillary costs
    - Lab testing
    - Diapers
  - Better informed, more harmonious staff
  - Improved outcomes(?)



Hota B, et al. SHEA 2006, abstract 317; Schwartz DN, unpublished.

Real-Time Expert-Level Antimicrobial Use Oversight

- By whom?
  - ID physician
  - ID pharmacist
  - Stewardship-trained pharmacist or other*
- How applied?
  - Participating in rounds
  - Via review of patient records
- Of which patients?
  - Assigned wards or services
  - Those identified by active surveillance (drug, syndrome, culture results)

Antimicrobial Stewardship Procedures Must Be…

- Clearly (and repeatedly) communicated
- Easy for providers to access and understand
- Within provider and staff competence
- Minimally intrusive on established workflows
- More informative/persuasive than coercive
- Self-evidently promote improved patient care

Antibiotic Use Is Easy, Right?

- 40 syndromes, 40 drugs (antibacterials)
- Multiple bugs and resistance phenotypes for each
- Variation by institution, over time
- “When will it get through to you ID guys that we need you to explain how we should treat common infections? Is that so hard to understand?”

Are Doctors Teachable?

- Controversy highlights contradictions in current healthcare systems
- Need for redundancy:
  - Multimodal presentations of relevant evidence
  - “Marketing” approaches, “culture change”
  - Stewardship staff: frequent contact, high visibility and street cred

Might he be infected?
I'll give VANC &
ZOSYN!

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God, were the Phillies awful – AGAIN?!!

Might he be infected? I'll give VANC & ZOSYN!

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I wonder what's on TV tonight?

Might he be infected? I'll give VANC & ZOSYN!

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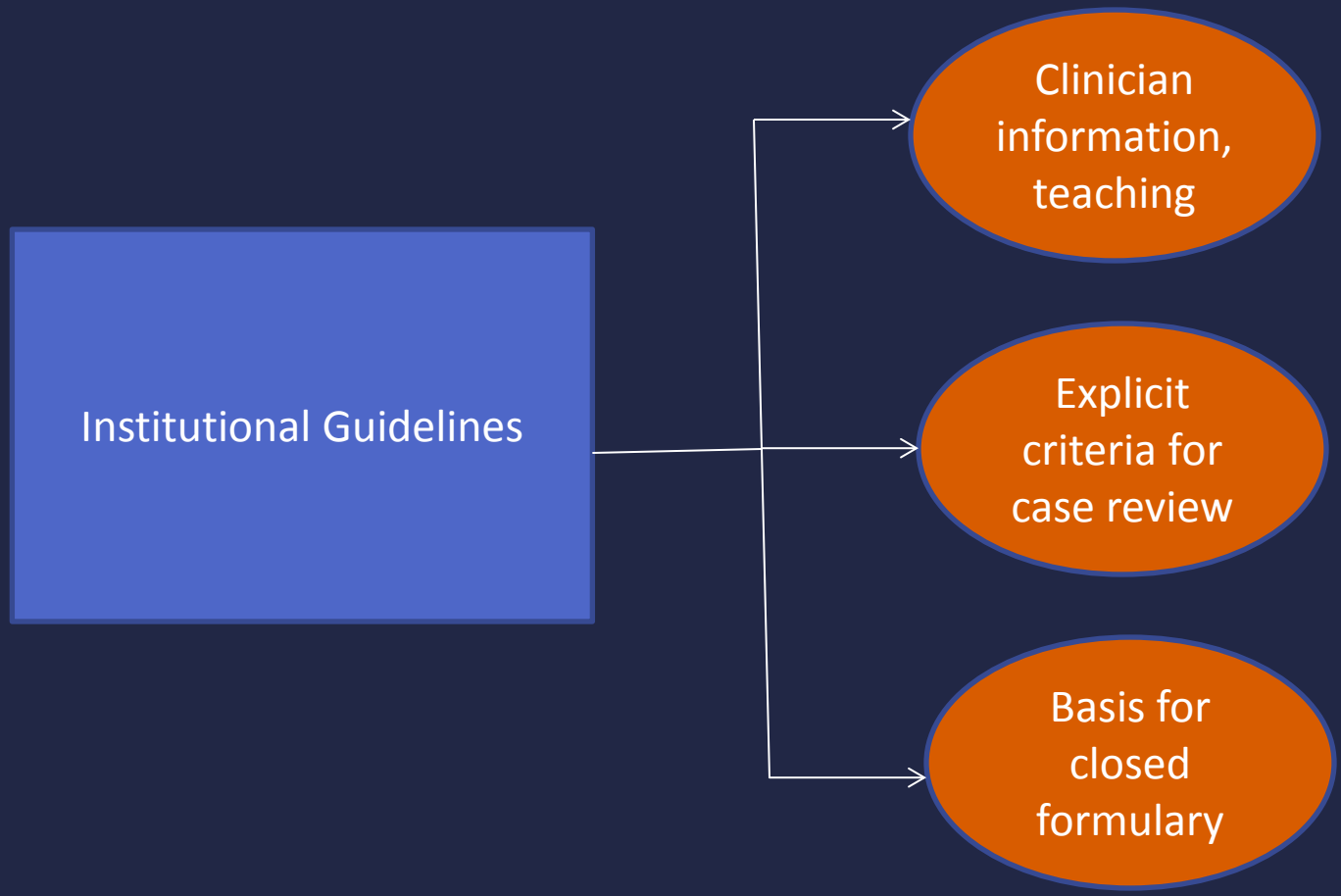
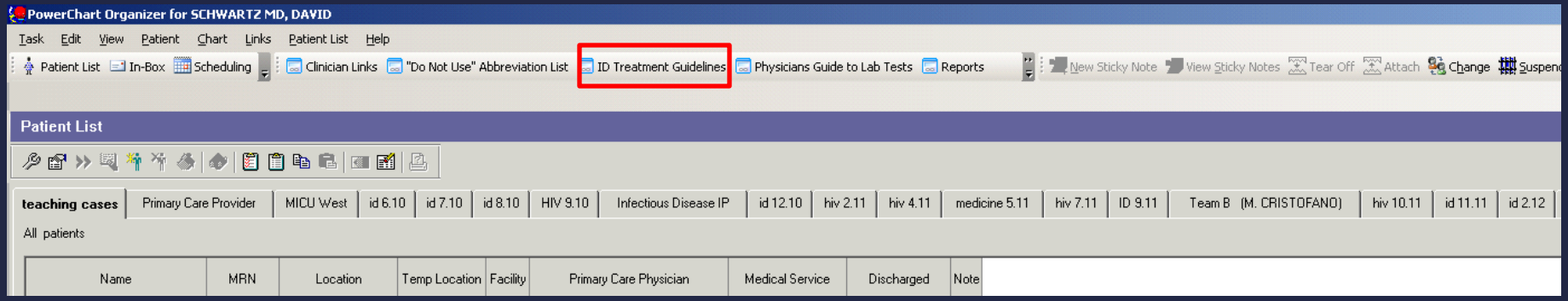
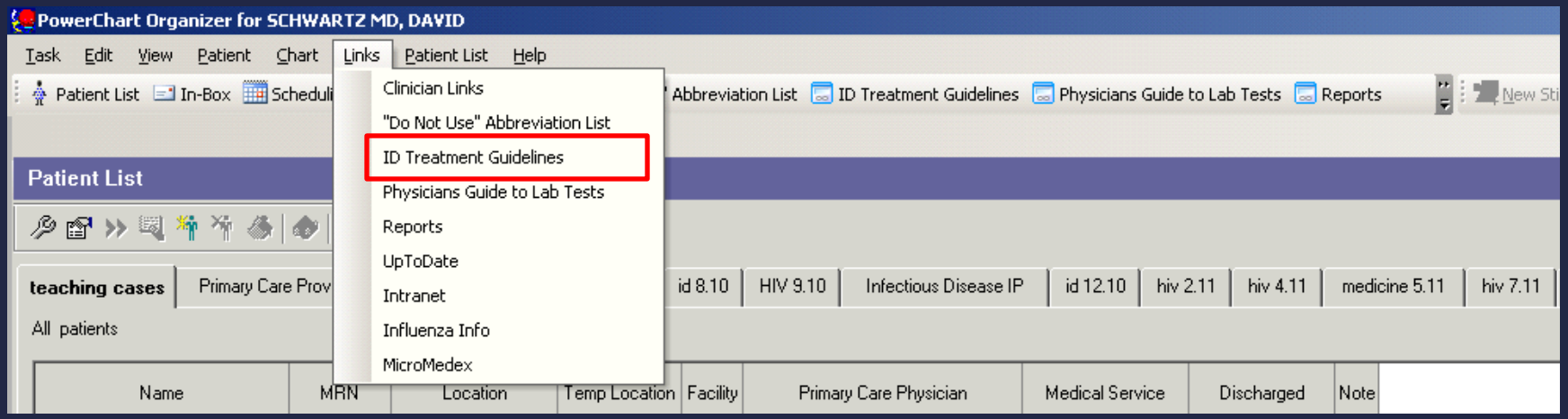
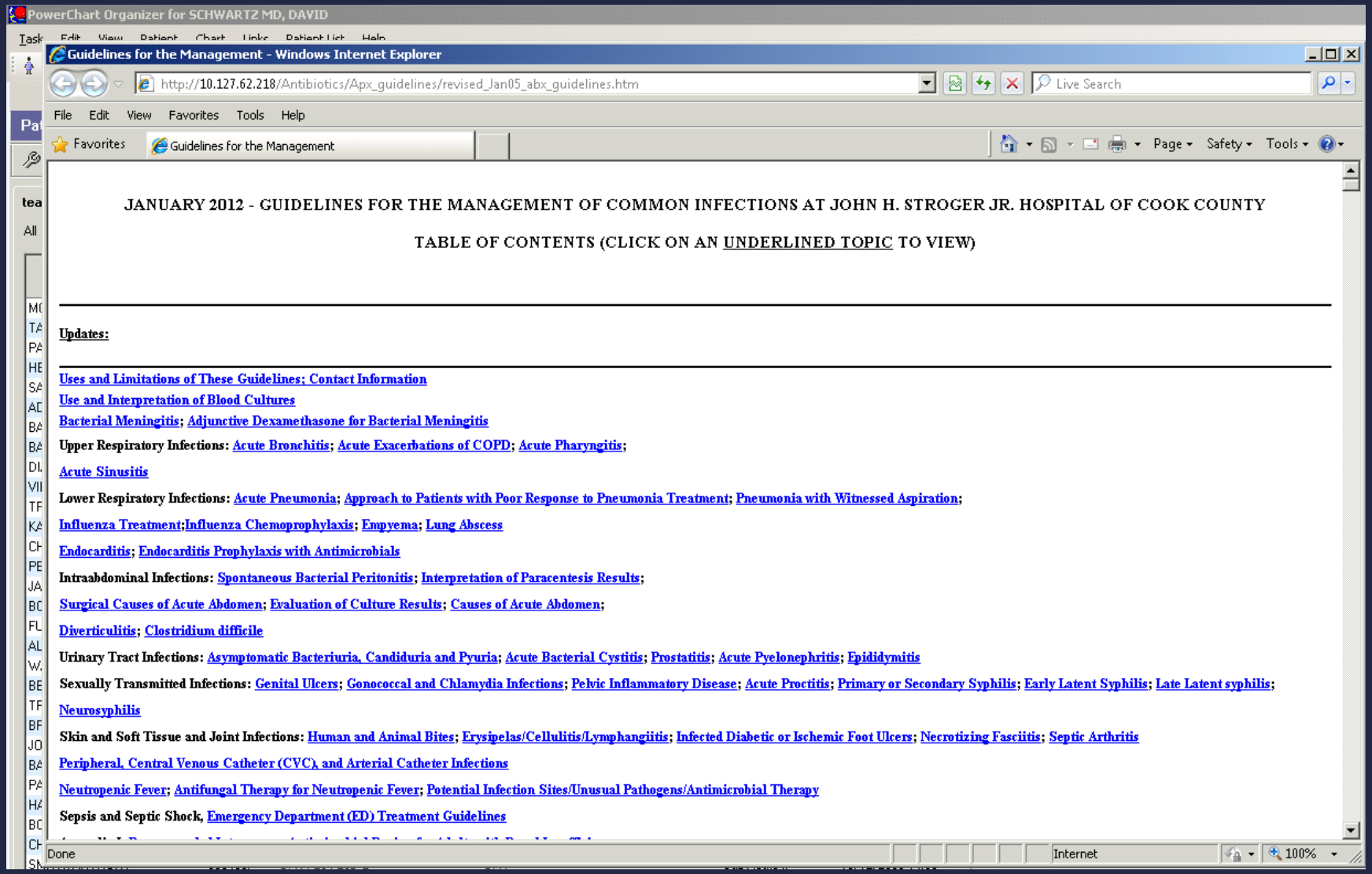
The Heart of the Matter



Stroger Hospital ID Treatment Guidelines



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Guidelines for the Management - Windows Internet Explorer
http://10.127.62.218/Antibiotics/Apx_guidelines/revised_Jan05_abx_guidelines.htm
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JANUARY 2012 - GUIDELINES FOR THE MANAGEMENT OF COMMON INFECTIONS AT JOHN H. STROGER JR. HOSPITAL OF COOK COUNTY
TABLE OF CONTENTS (CLICK ON AN UNDERLINED TOPIC TO VIEW)
Updates:
Uses and Limitations of These Guidelines; Contact Information
Use and Interpretation of Blood Cultures
Bacterial Meningitis; Adjunctive Dexamethasone for Bacterial Meningitis
Upper Respiratory Infections: Acute Bronchitis; Acute Exacerbations of COPD; Acute Pharyngitis;
Acute Sinusitis
Lower Respiratory Infections: Acute Pneumonia; Approach to Patients with Poor Response to Pneumonia Treatment; Pneumonia with Witnessed Aspiration;
Influenza Treatment;Influenza Chemoprophylaxis; Empyema; Lung Abscess
Endocarditis; Endocarditis Prophylaxis with Antimicrobials
Intraabdominal Infections: Spontaneous Bacterial Peritonitis; Interpretation of Paracentesis Results;
Surgical Causes of Acute Abdomen; Evaluation of Culture Results; Causes of Acute Abdomen;
Diverticulitis; Clostridium difficile
Urinary Tract Infections: Asymptomatic Bacteriuria, Candiduria and Pyuria; Acute Bacterial Cystitis; Prostatitis; Acute Pyelonephritis; Epididymitis
Sexually Transmitted Infections: Genital Ulcers; Gonococcal and Chlamydia Infections; Pelvic Inflammatory Disease; Acute Proctitis; Primary or Secondary Syphilis; Early Latent Syphilis; Late Latent syphilis;
Neurosyphilis
Skin and Soft Tissue and Joint Infections: Human and Animal Bites; Erysipelas/Cellulitis/Lymphangiitis; Infected Diabetic or Ischemic Foot Ulcers; Necrotizing Fasciitis; Septic Arthritis
Peripheral, Central Venous Catheter (CVC), and Arterial Catheter Infections
Neutropenic Fever; Antifungal Therapy for Neutropenic Fever; Potential Infection Sites/Unusual Pathogens/Antimicrobial Therapy
Sepsis and Septic Shock, Emergency Department (ED) Treatment Guidelines
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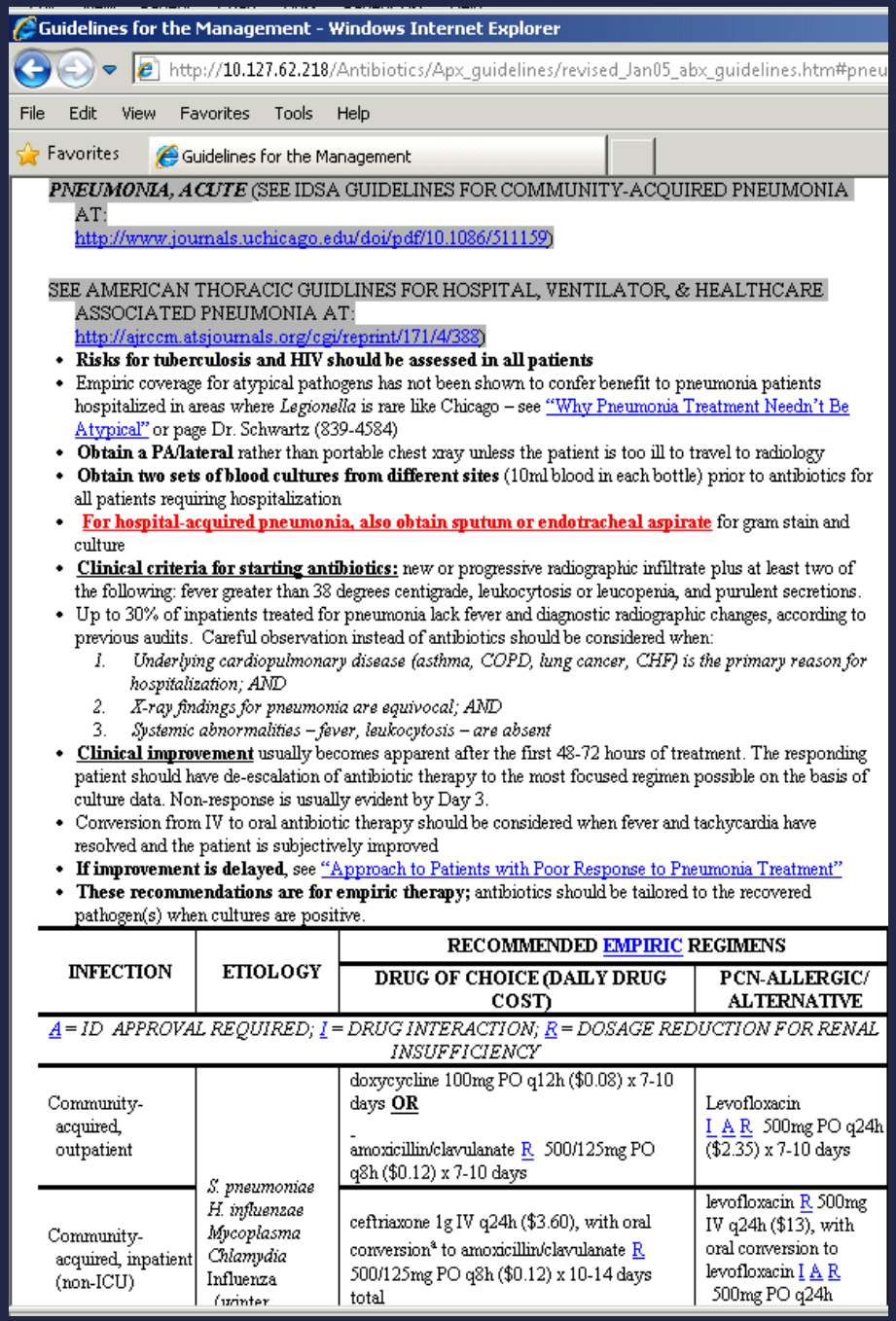
Internet
100%



PNEUMONIA, ACUTE (SEE IDSA GUIDELINES FOR COMMUNITY-ACQUIRED PNEUMONIA AT: http://www.journals.uchicago.edu/doi/pdf/10.1086/511159)

SEE AMERICAN THORACIC GUIDLINES FOR HOSPITAL, VENTILATOR, & HEALTHCARE ASSOCIATED PNEUMONIA AT: http://ajrccm.atsjournals.org/cgi/reprint/171/4/388)

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- **For hospital-acquired pneumonia, also obtain sputum or endotracheal aspirate** for gram stain and culture
- **Clinical criteria for starting antibiotics:** new or progressive radiographic infiltrate plus at least two of the following: fever greater than 38 degrees centigrade, leukocytosis or leucopenia, and purulent secretions.
- Up to 30% of inpatients treated for pneumonia lack fever and diagnostic radiographic changes, according to previous audits. Careful observation instead of antibiotics should be considered when:
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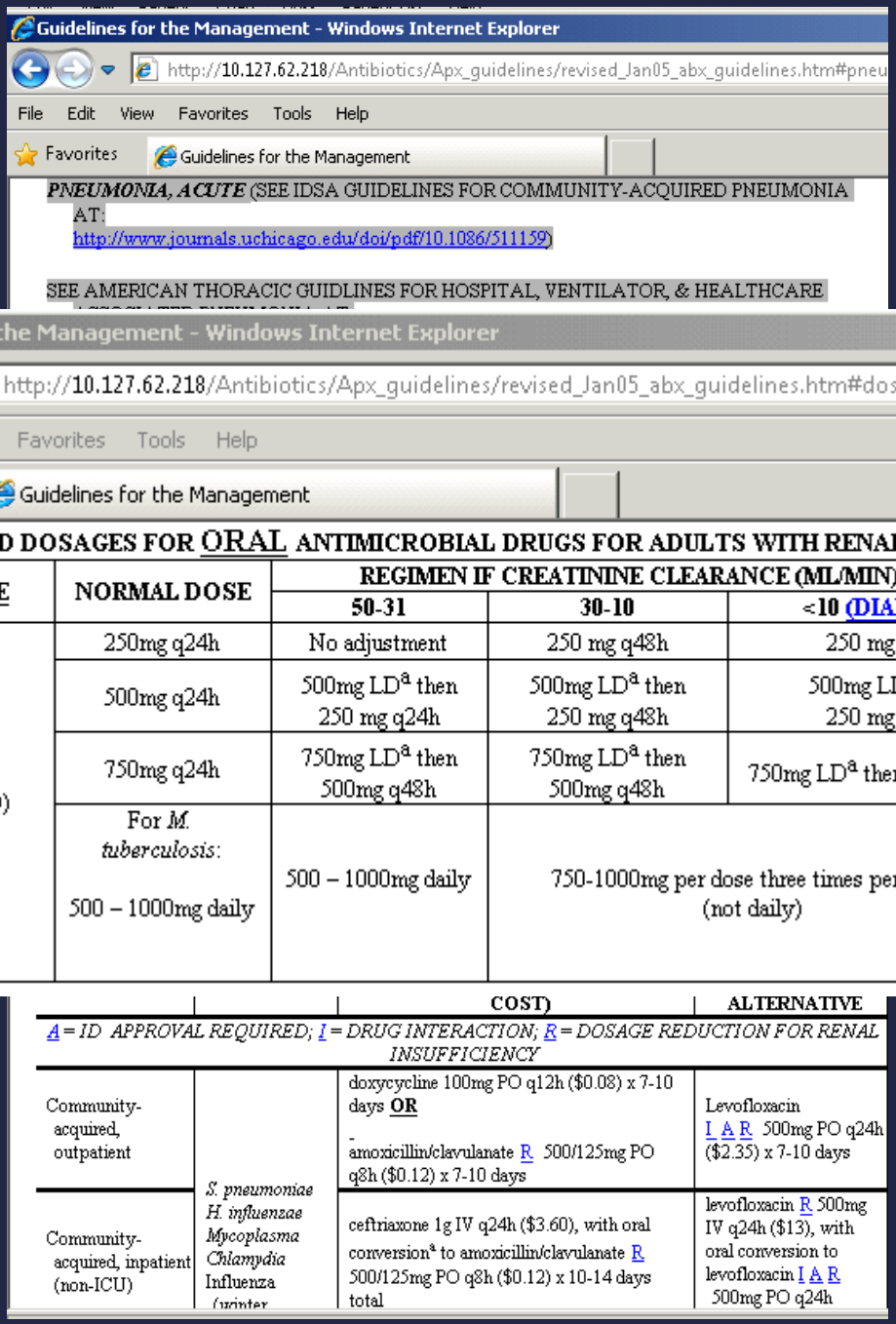
INFECTION	ETIOLOGY	RECOMMENDED EMPIRIC REGIMENS	
		DRUG OF CHOICE (DAILY DRUG COST)	PCN-ALLERGIC/ ALTERNATIVE
A = ID APPROVAL REQUIRED; I = DRUG INTERACTION; R = DOSAGE REDUCTION FOR RENAL INSUFFICIENCY			
Community-acquired, outpatient	*S. pneumoniae* *H. influenzae* *Mycoplasma* *Chlamydia* Influenza (winter	doxycycline 100mg PO q12h ($0.08) x 7-10 days **OR** - amoxicillin/clavulanate R 500/125mg PO q8h ($0.12) x 7-10 days	Levofloxacin I A R 500mg PO q24h ($2.35) x 7-10 days
Community-acquired, inpatient (non-ICU)		ceftriaxone 1g IV q24h ($3.60), with oral conversion[a] to amoxicillin/clavulanate R 500/125mg PO q8h ($0.12) x 10-14 days total	levofloxacin R 500mg IV q24h ($13), with oral conversion to levofloxacin I A R 500mg PO q24h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Favorites
Guidelines for the Management
RECOMMENDED DOSAGES FOR ORAL ANTIMICROBIAL DRUGS FOR ADULTS WITH RENAL INSUFFICIENCY
DRUG NAME
NORMAL DOSE
REGIMEN IF CREATININE CLEARANCE (ML/MIN)
50-31
30-10
<10 (DIALYSIS)
Levofloxacin (PO)
250mg q24h
No adjustment
250 mg q48h
250 mg q48h
500mg q24h
500mg LD[a] then 250 mg q24h
500mg LD[a] then 250 mg q48h
500mg LD[a] then 250 mg q48h
750mg q24h
750mg LD[a] then 500mg q48h
750mg LD[a] then 500mg q48h
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For M. tuberculosis: 500 – 1000mg daily
500 – 1000mg daily
750-1000mg per dose three times per week (not daily)
COST)
ALTERNATIVE
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The 6 Ds: Operational Goals of Antimicrobial Therapy and Stewardship

1. Right **D**iagnosis
   - What infection syndrome is being treated?
   - Is it responsive to antibiotics?
   - Have appropriate diagnostic tests been collected?
2. Right **D**rug(s)
   - Demonstrated effective
   - Safest
   - Narrowest spectrum
3. Right **D**ose

The 6 Ds: Operational Goals of Antimicrobial Therapy and Stewardship

4. Right **D**e-escalation: right Drug(s) redefined when:
   - Justified by culture results (positive or negative)
   - Clinical improvement (e.g., IV to PO switch)
5. Right **D**uration:
   - Minimum necessary
   - Defined infections requiring prolonged therapy
6. Right **D**ebridement or source control

Case Report

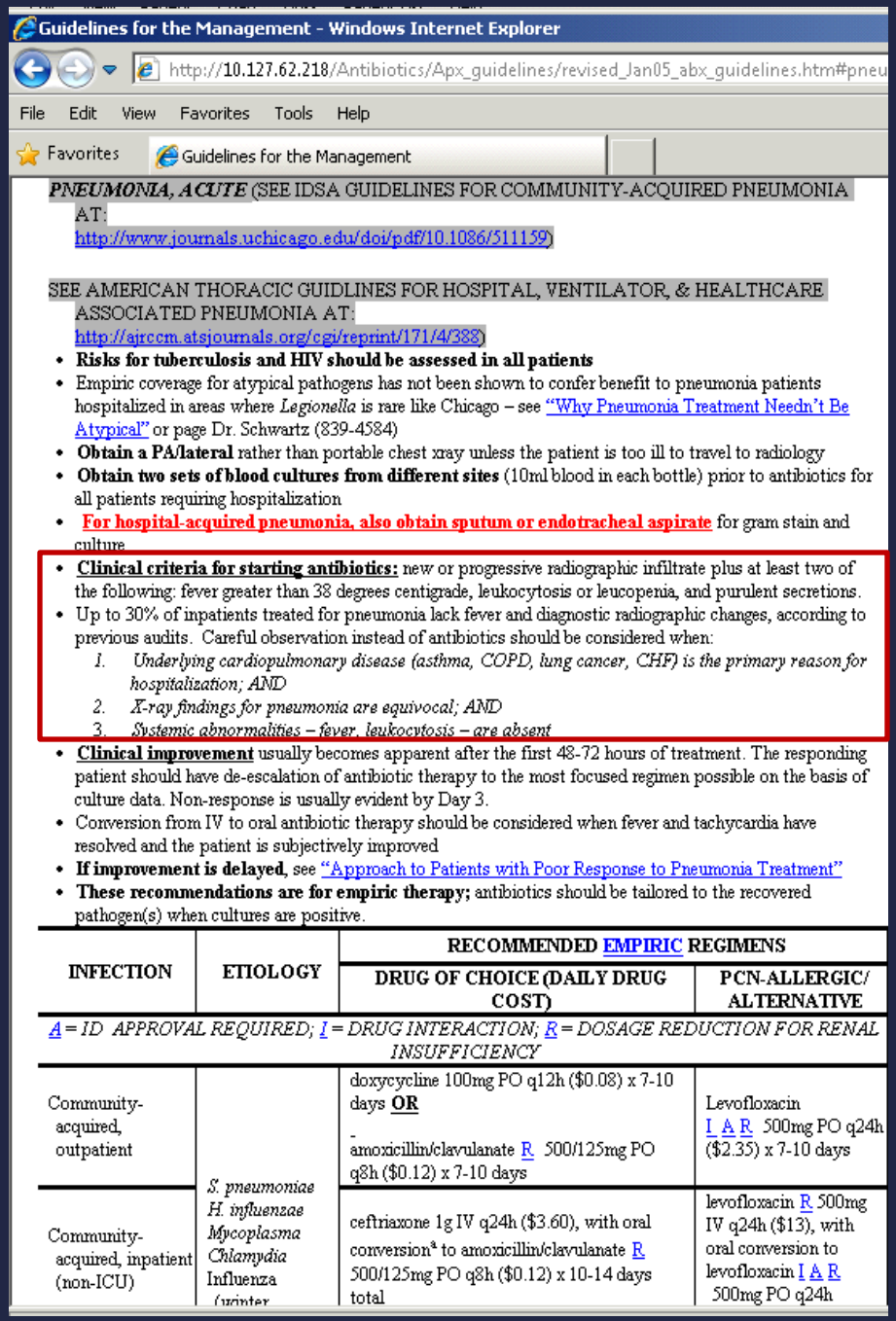
- 29-year-old woman presents to the ER with a one-week h/o dyspnea, palpitations and anxiety; dysphagia for six months
- Denies cough, fever, chest pain
- Prior hyperthyroidism; stopped propylthiouricil 4 weeks ago after rash, now on no medications
- In no distress T 100.1 179/69 HR 138 RR 20; large goiter; otherwise normal exam

Case Report – continued

- Levofloxacin begun in the ER, continued by the admitting ward service

Case Report – continued

- Levofloxacin begun in the ER, continued by the admitting ward service
- Antibiotics were discontinued after the clinical and chest radiograph findings (normal breast shadowing) were reviewed
- The patient did well with management of her hyperthyroidism



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How Did We Do That?

- Prospective audit and feedback implemented in patient's hospital ward
- Pharmacist reviewed charts of each antimicrobial recipient
- Guidelines served as reference standard
- Prescribing MD contacted when potential improvements were identified
- ID physician called to adjudicate clinical questions ("Does she have pneumonia?")

Targeting Diagnosis

- Error-prone diagnoses:
  - "Pneumonia" in patients with non-infectious cardiopulmonary disease
  - "UTI" in asymptomatic pyuria or bacteriuria
  - "Bilateral cellulitis," "osteomyelitis" in venous stasis, etc.
- Detection via "non-clinician" (e.g., pharmacist)
- Intervention via querying primary clinician, ID physician review
- Biomarker potential (e.g., procalcitonin)?

Case Report

- 58-year-old man underwent right hemi-colectomy and ileal resection for obstructing cecal carcinoma
- Complex surgery; prolonged recovery
- PICC for post-operative TPN
- 8th post-operative day: fever (102.2° F)
- Single blood culture: *Enterococcus faecalis*

Case Report – continued

- Given 3 doses vancomycin on 9th and 10th post-operative days
- PICC removed
- Fever resolved
- Discharged on no antibiotics

Case Report – continued

- Readmitted 3 months later with fever, confusion
- Found to have aortic valvular endocarditis caused by *Enterococcus faecalis*
- Required mitral and aortic valve replacement
- Prolonged ICU course, then rehab, with IV antibiotics
- Died of recurrent cancer months later

Infectious Diseases Surveillance for Positive Blood Cultures

- Computer program identifies all newly positive blood culture gram stains
- ID fellow on consult service reviews chart:
  - Calls primary provider when opportunities for improvement detected
  - Reviews cases with ID attending

Other Targets for Electronic Stewardship Surveillance

- Bug-drug mismatches – under- and overtreatment
- Regimens with redundant antimicrobial spectra
- Prolonged broad-spectrum drug use absent corroborative culture results
- Regimens discordant with entered indications

Clinician Training, Cohort Review/Feedback at Oak Forest Hospital

- 600-bed long-term/acute care hospital
- Bulk of care by 20 salaried internists
- Series of 2-hour trainings, guidelines issued
- Some of the lessons conveyed:
  - No abx for asymptomatic bacteriuria
  - Cultures, abx only useful for acutely ill patients
  - Avoid empiric levofloxacin (> 50% resistance)
- Cohorts reviewed, results given to clinicians

Schwartz DN, et al. J Amer Geriatr Soc 2007;55:1236-42

Fever Algorithm

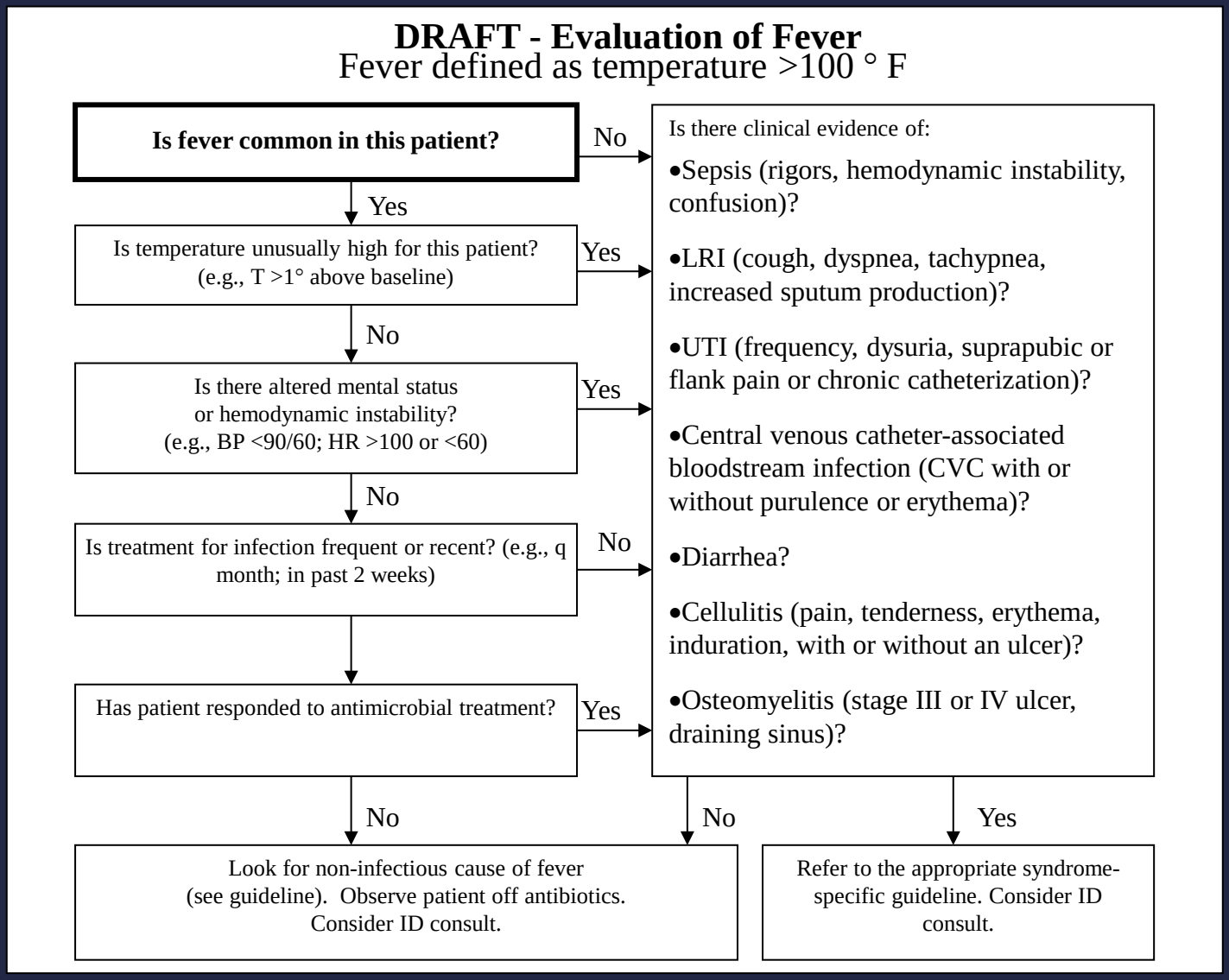
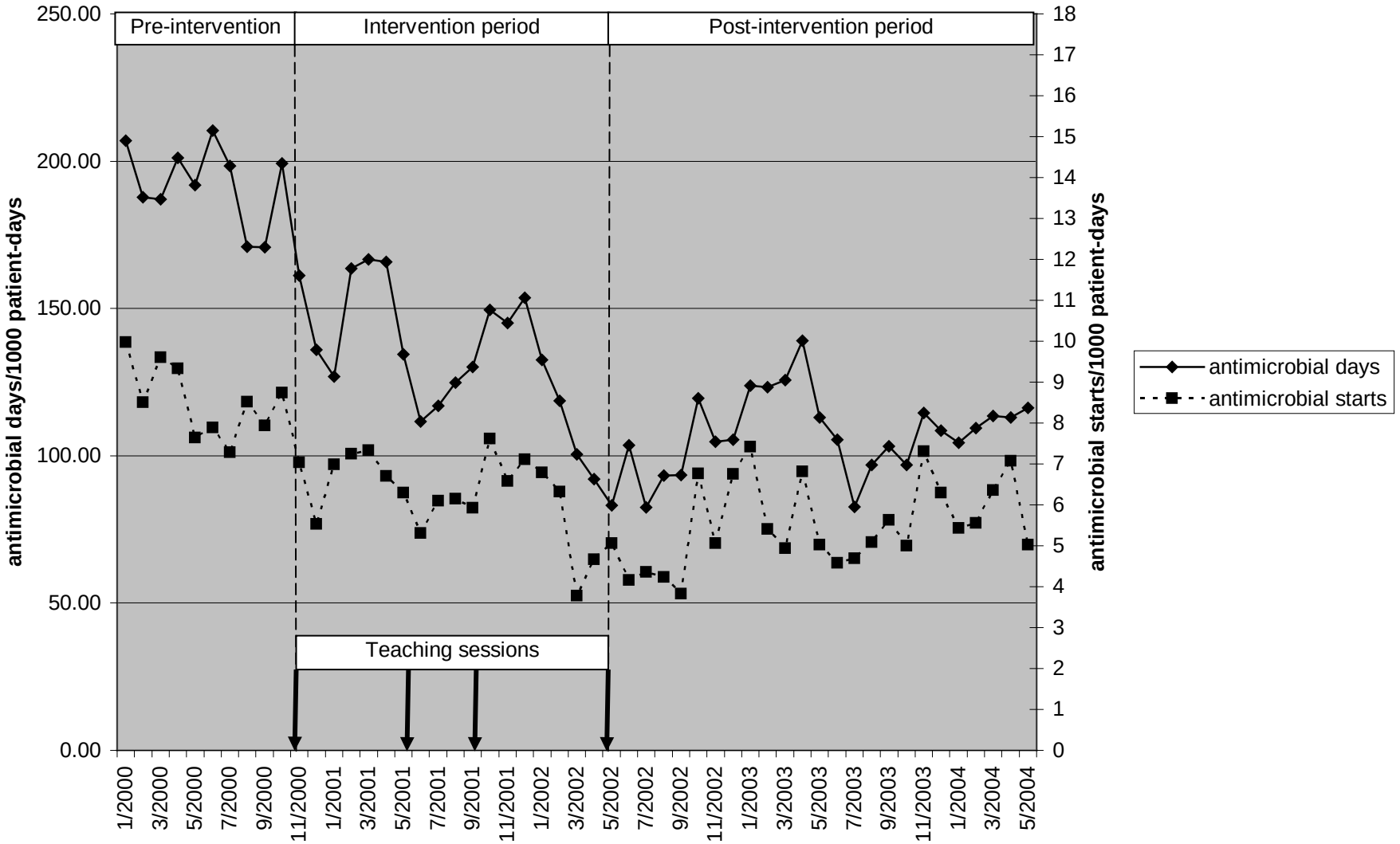


Figure 1a. LTC Antimicrobial Days and Starts per 1000 Patient-Days



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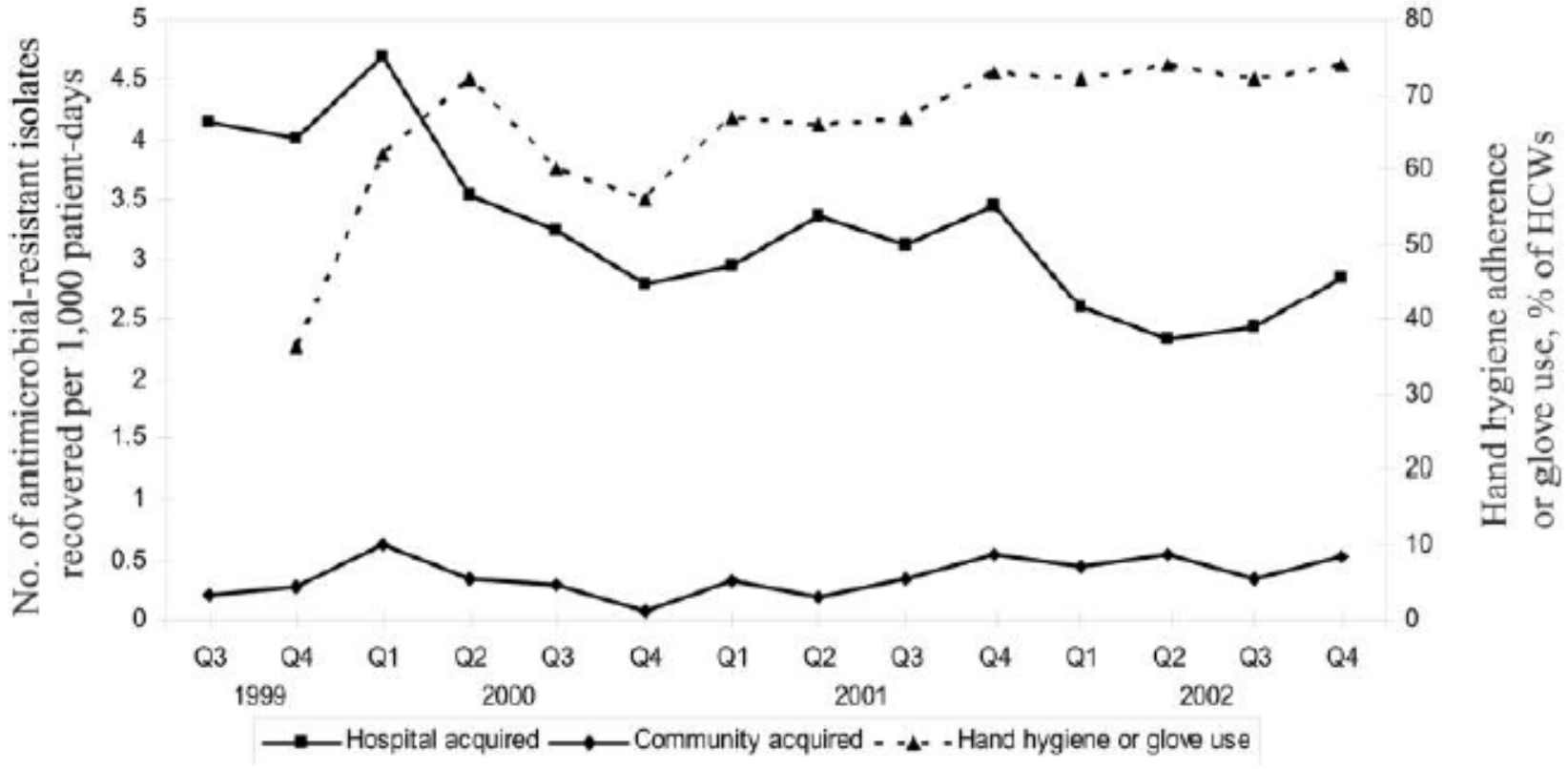

Trick WE, et al. Infect Control Hosp Epidemiol 2007;28:42-49

Restrictions/Prior Authorization: Use with Care

- Reliably reduce use of targeted drugs
- Can promote clinician education during calls for approval; BUT
- Reliably increase use of unrestricted drugs, sometimes inappropriately so
- Can delay antibiotic administration
- Candidate drugs:
  - High cost and/or toxicity
  - Availability of lower cost/toxicity alternative with equivalent efficacy
  - Examples: linezolid, daptomycin, colistin

Additional Stewardship Strategies

- Surveillance and intervention for error-prone regimens:
  - Redundant antimicrobial spectra
  - Regimen-indication mismatch
  - Prolonged use with negative cultures
- Leverage computer support
  - Provider order entry
  - Decision support
- Optimize dosage regimens (e.g., piperacillin-tazobactam)

We Can Do This

- Stewardship is amenable to centralized resources, oversight, remote (computer-based) applications
- General goals, paradigm apply equally to other areas of medical care:
  - Analyses of surgical volume, procedures and outcomes
  - Procedural checklists
  - Patient-centered medical homes
  - Infection control

Questions?

312-864-4559 office

dschwartz@cookcountyhhs.org

Thank you!

- A certificate of participation will be made available to participants after taking the evaluation

  (as webinar ends the evaluation comes on your screen)
- An agenda of this program is available here: http://www.qualityinsights-qin.org/Initiatives/Hospital-Infections.aspx
- Join us for **Antimicrobial Stewardship – *Let's Do It!***

  A webinar on Wednesday, July 15th at 2 p.m. ET
- Any questions? Contact:

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