

People.

Trust.

Experience.



Think Globally: Strategies to Improve the Culture of Antibiotic Prescribing

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Outline

- Introduction to stewardship
- Discuss stewardship activities
- Identify activities that can be addressed by global strategies
- Provide examples of global strategies
- Review outcomes of global strategies
- Conclusion/questions

The History of Antibiotics and Stewardship

Year	Events
Ancient	Egyptians and Greeks used plants and molds to treat infection
150 BC	Moldy Sri Lankan “sweetmeat” oil cakes used for battle wounds
1600s	Wet bread and spider webs used in wounds
1871	Joseph Lister noted that urine samples with mold did not grow bacteria
1877	Louis Pasteur observed anthrax did not grow in mold
1897	Ernest Duchesne cured typhoid in guinea pigs with <i>Penicillium glaucum</i>
1928	Sir Alexander Fleming discovered penicillin from <i>Penicillium notatum</i>
1940	First stable form of penicillin produced
1941	First patient given penicillin
1942	Penicillin-resistance first reported
1945	Fleming famously quoted saying: "The thoughtless person playing with penicillin treatment is morally responsible for the death of the man who succumbs to infection with the penicillin-resistant organism."

Background

- CDC recognizes this threat and cites that up to 50% of all antibiotics prescribed are inappropriate or unnecessary

Rates of
resistance

Incidence
of MDRO

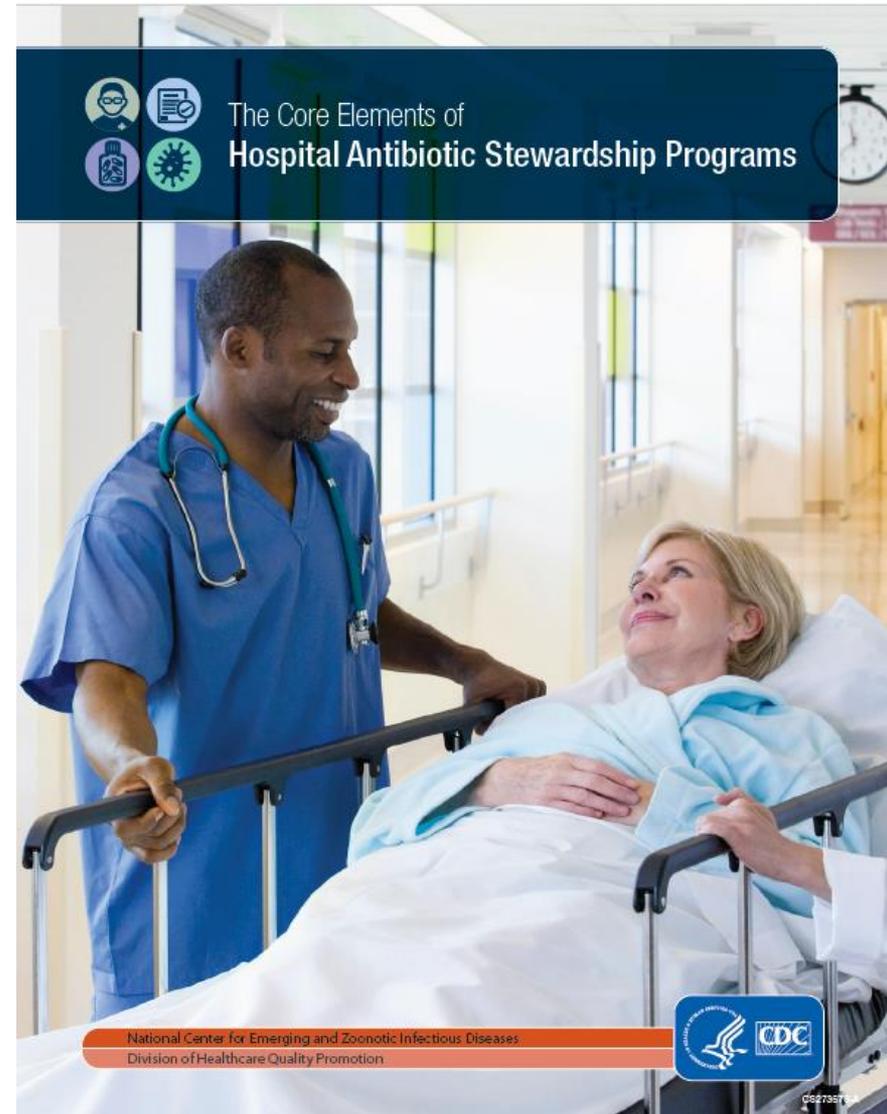
*Clostridium
difficile*

Adverse
events

Increased cost and burden on the health care system

CDC Checklist

- Leadership commitment
- Accountability
- Drug expertise
- Action
- Tracking
- Reporting
- Education



Core Elements of Hospital Stewardship

Global Efforts

- Policies
 - Dose, duration, and indication for all antibiotics
 - Facility specific recommendations
- Antibiotic time out
- Time-sensitive stop
- Treatment pathways

Patient Specific Efforts

- Prior authorization
- Prospective audit with feedback
- IV to PO
- Dose adjustments
- Pharmacokinetics
- Unnecessary duplicative therapy

Patient Case

- A 63 yo F presents with shortness of breath, cough and fever. PMH includes osteoporosis, hypertension, and recent hospitalization for a total hip replacement 2 weeks prior.
- Chest x-ray shows left lower lobe infiltrate, atelectasis versus pneumonia and stable mild cardiomegaly
- She is diagnosed with sepsis (not severe, not shock) secondary to healthcare-associated pneumonia and admitted to a med/surg floor

Vital Signs and Labs

- WBC 13.7
- Temp 101 F
- BP 140/85
- RR 20
- Lactate 1.2
- SCr 0.6

Blood and sputum cultures are drawn
She is initiated on cefepime, vancomycin, and levofloxacin
Intravenous pantoprazole is initiated for stress ulcer prophylaxis

Patient Case

On day 2, the patient's condition slowly but steadily improves

On day 3, initial blood cultures remain negative, however sputum cultures grows *Candida albicans* and fluconazole is initiated

On day 5, all symptoms have resolved and ready for discharge. The patient is discharged on levofloxacin, linezolid, and fluconazole X 5 more days

Healthcare-Associated Pneumonia (HCAP)

Common Organisms in HCAP

Staphylococcus aureus

Streptococcus pneumoniae

Pseudomonas aeruginosa

Enterobacteriaceae

Rates of Legionella in Pneumonia

	HCAP	CAP
Mickek, 2007 (US)	0.2%	3.4%
Carratala, 2007 (Spain)	2.4%	8.8%
Shindo, 2009 (Japan)	0.7%	7%

Risk Factors for Legionella in HCAP

Immunocompromised patients

Underlying lung disease

End-stage renal disease

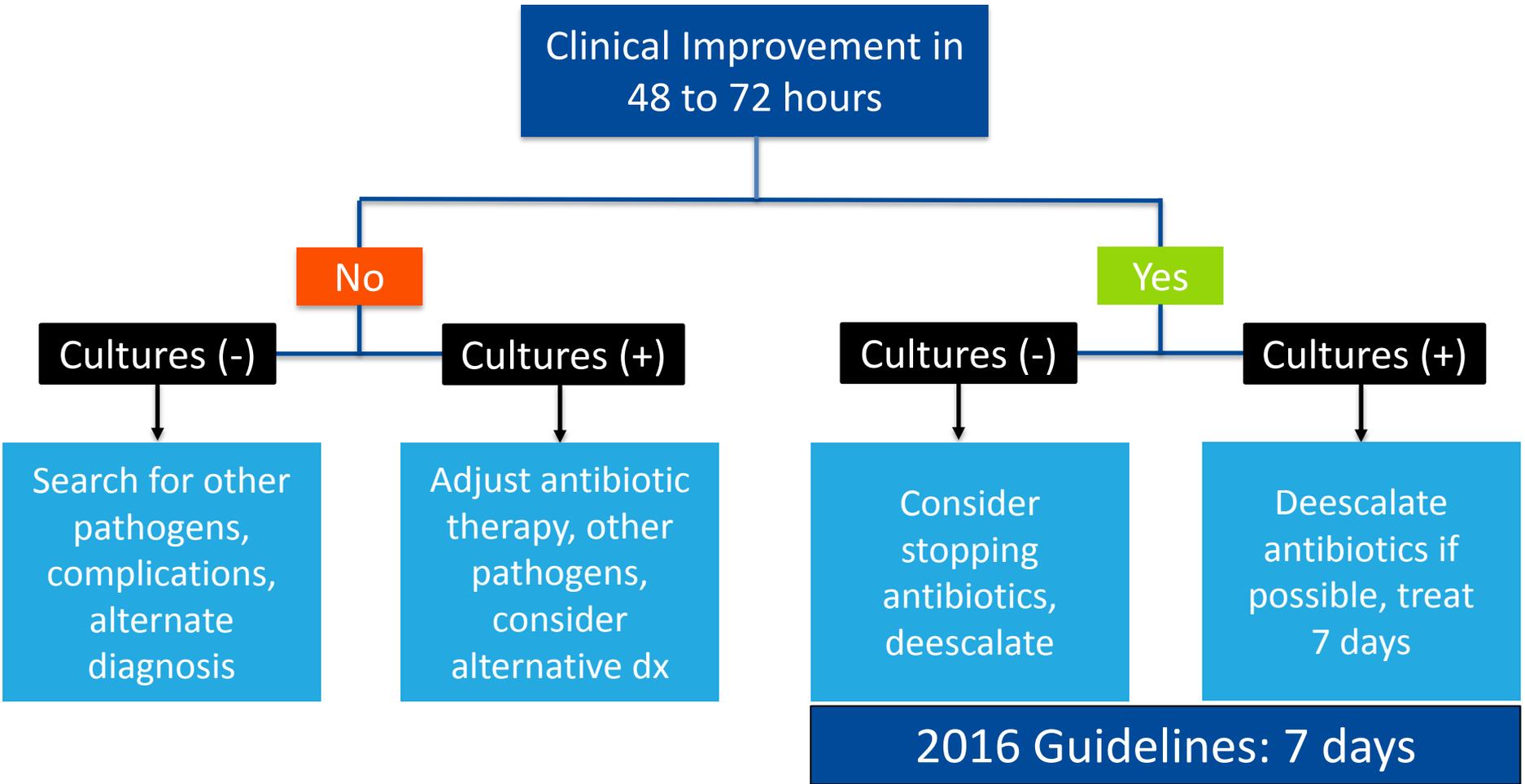
Diabetes mellitus

Legionella at Johnson City Medical Center (Jan 2009-Sep 2015) N=33

CAP	28 cases
HAP	3 cases
HCAP	2 cases

CAP: community acquired pneumonia; HAP: hospital acquired pneumonia; HCAP healthcare associated pneumonia

Duration of therapy



Pneumonia Order Set Revision

- Healthcare associated (HCAP) and hospital acquired (HAP)
 - Preferred:
 - vancomycin 20 mg / kg IV stat (maximum dose 2 grams) then dosed by pharmacy for a duration of **72 hours** unless otherwise specified by prescriber
 - cefepime (MAXIPIME) 2 g IV stat and every 8 hours X **7days**

- Other considerations:

For atypical coverage including *Legionella* (immunocompromised patients, diabetes mellitus, underlying lung disease, or end stage renal disease)

- ADD azithromycin (ZITHROMAX) 500 mg IV stat and every 24 hours for total 5 doses
- ADD levofloxacin (LEVAQUIN) 750 mg IV stat and every 24 hours

For patients at high risk of mortality (ventilator support due to pneumonia or septic shock) **OR** risk of MDR *Pseudomonas aeruginosa* (previous colonization or prolonged hospitalization)

- ADD tobramycin 7 mg / kg IV stat X1

Candida albicans in Sputum

- “Multiple prospective and retrospective autopsy studies consistently demonstrate the poor predictive value of the growth of *Candida* from respiratory secretions, including BAL fluid.”
- “Because of the rarity of *Candida* pneumonia, the extremely common finding of *Candida* in respiratory secretions, and the lack of specificity of this finding [329–331], a decision to initiate antifungal therapy should not be made on the basis of respiratory tract culture results alone.”

“A firm diagnosis requires histopathological evidence of invasive disease.”

Culture Reporting

Result Status: Final Result
Specimen Number: ██████████
Specimen Source: Sputum - Expectored

CULTURE,
RESPIRATORY

Normal respiratory flora was isolated in addition to:
Candida frequently colonizes upper airways, lower airways
in mechanically ventilated patients and contaminates
respiratory culture specimens, including BAL fluid, but
rarely causes invasive infection. Clinical correlation
is required to determine the significance of this result.
(See Clinical Infectious Disease 2009; 48: 503-35).
Candida albicans
Few (2+)

Comments

Requisition Comments:

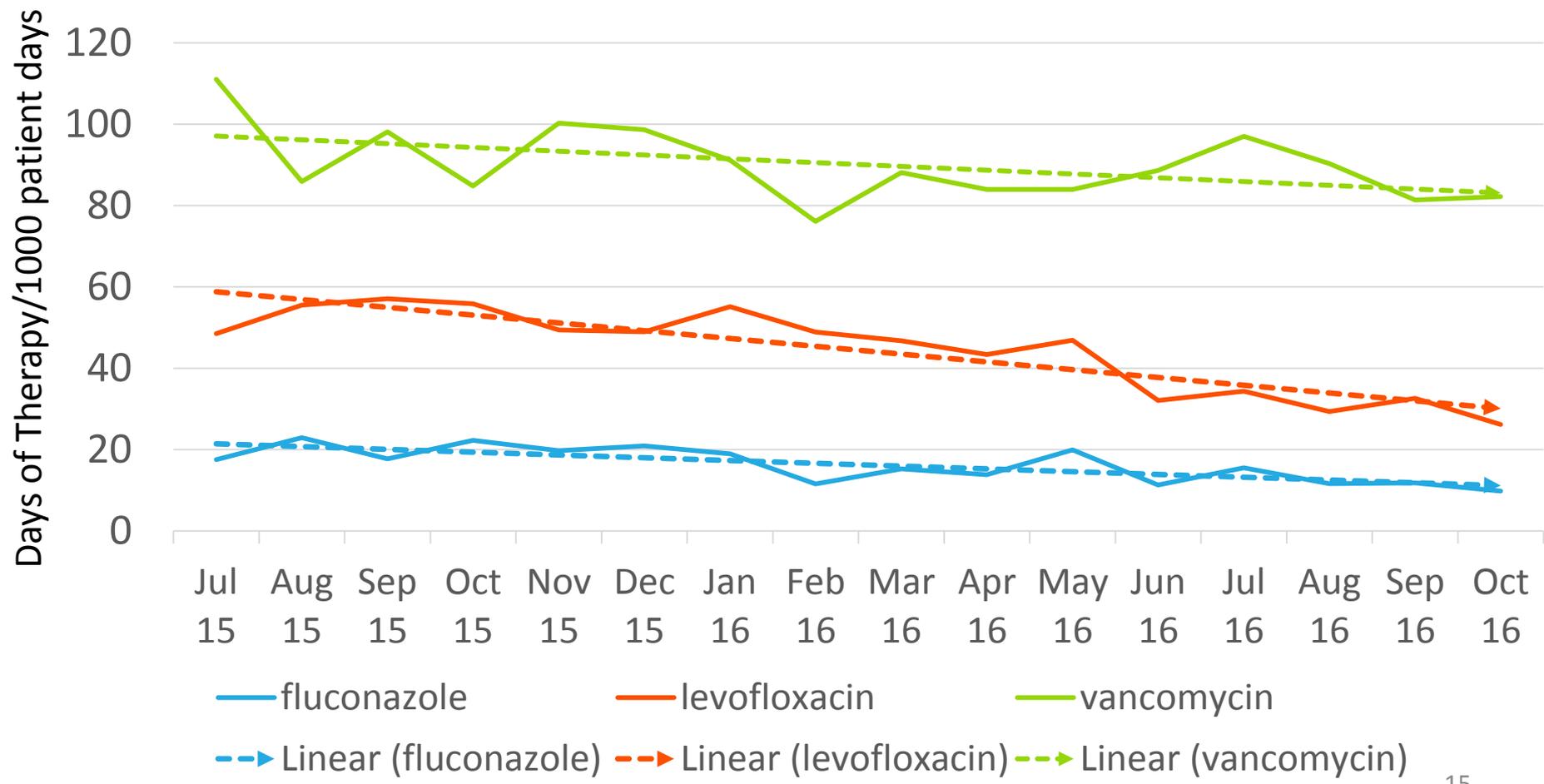
Ordering Dr:

Order Date/Time:
Ord#/Occurrence#: /

Stress Ulcer Prophylaxis

- American Society of Health-System Pharmacists guidelines define appropriate use as admission to the ICU PLUS
 - Mechanical ventilation greater than 48 hours
 - Coagulopathy (defined as an INR > 1.5 or PLT < 50000 cells/mcL)
- Possible consequences of PPIs
 - Opportunistic GI infections (including *C. difficile*)
 - Dementia (including Alzheimer's disease)
 - Pneumonia
 - Cardiovascular complications (including myocardial infarction)
 - Acute interstitial nephritis
 - Chronic kidney disease (including end-stage)
 - Osteoporosis-related fractures
 - Vitamin and mineral deficiency

Antibiotic Utilization Results





Residency Research Project

George Wohlford, et al

Vancomycin Utilization Outcomes

Variable	Before Change	After Change	Difference	p-value
Length of therapy on vancomycin (hrs)	113.52	64.89	48.63	0.0001
Length of stay (d)	8.313	7.797	0.516	0.3675
Number of orders continued past 72 hrs	66	33	33	0.0001
Number of orders continued past 84 hrs	62	18	44	0.0001

Results

Proton Pump Inhibitor Use and *Clostridium difficile* Infection

	FY14	FY15	Difference	P-value
Average PPI use/ 1000 PD	677	581	-96(14.2%)	0.0002
Average IV PPI use/ 1000 PD	229	158	-71 (31.1%)	0.0008
Number of HO-CDI cases/ 1000 PD	0.49	0.39	-0.1 (20%)	0.04

PPI: Proton pump inhibitor; PD: patient days; HO-CDI: hospital-onset *Clostridium difficile* infection

“The ultimate goal of any global initiative is to achieve a culture change, which is unlikely to be accomplished by any single approach.”

Call for Action

- Customize plans to address individual antimicrobial agents
- Develop global AND patient level strategies to address needs
 - **Global strategies** rely on system improvements
 - **Patient-specific strategies** rely on teams making interventions
 - **System improvements** can support teams
- Track results and change when something is not working or goals are achieved

