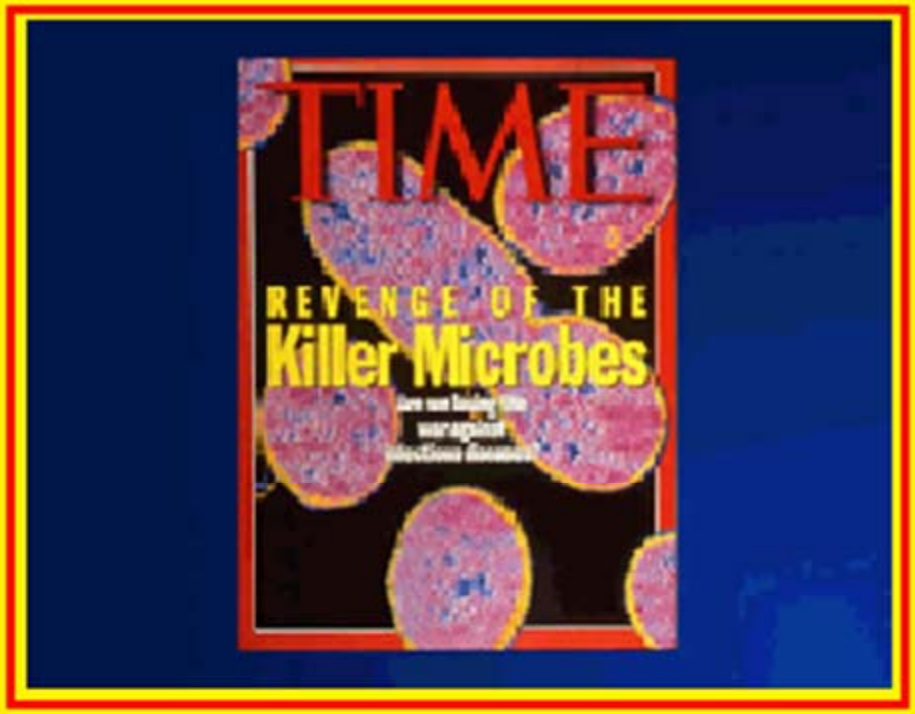
Antibiotic Stewardship Program



Dr David M Silverstein, FACC, FACP

7 November 2013

Mombasa, Kenya

Annual Report
World Economic Forum

"Arguably the greatest risk…to human health comes in the form of antibiotic resistant bacteria. We live in a bacterial world where we will never be able to stay ahead of the mutation curve.

A test of our resilience is how far behind the curve we allow ourselves to fall."

Global Risk 2013, 8th Ed; An Initiative of the Risk Response Network, World Economic Forum 2013

Antibiotic Stewardship Definition

- A multi-pronged approach designed to promote the optimal selection, dosing and duration of antibiotics throughout the course of their use.

- An effective antibiotic (anti-microbial) stewardship program (ASP) will limit inappropriate and excessive antibiotic use, but more importantly, will improve and optimize therapy and clinical outcomes for the individual infected patient.

Goals of ASP

- Prevent or slow emergence of antibiotic resistance
- Optimize selection, dose and duration of treatment
- Reduce adverse drug events

Up to 20% ED visits in US are due to complications of antibiotics:

  - Secondary infection, e.g., clostridium difficile
  - Antibiotic associated diarrhea

Goals of ASP, contd

- Reduce length of hospital stay
- Reduce health care expenditure
- IMPROVE INDIVIDUAL OUTCOMES

ASP Partnership

ASP with Infection Control Program

- Works in synergy to limit the emergence and transmission of antibiotic resistant bacteria

Antibiotic resistance –the three keys to control

- Antibiotic stewardship
- Infection Control
- Surveillance:
  *antibiotic usage
  *antibiotic resistant bacteria

Control of antibiotic resistance is like a three-legged stool –if you take away one of the legs –the whole thing falls over!

Why we need ASP

- Fact: Anti-infectives make up 30% of most hospital pharmacies
- Fact: Up to 50% of antibiotic use is inappropriate, and inappropriate use can lead to resistant pathogens
- Fact: Antibiotics are misused in a variety of ways

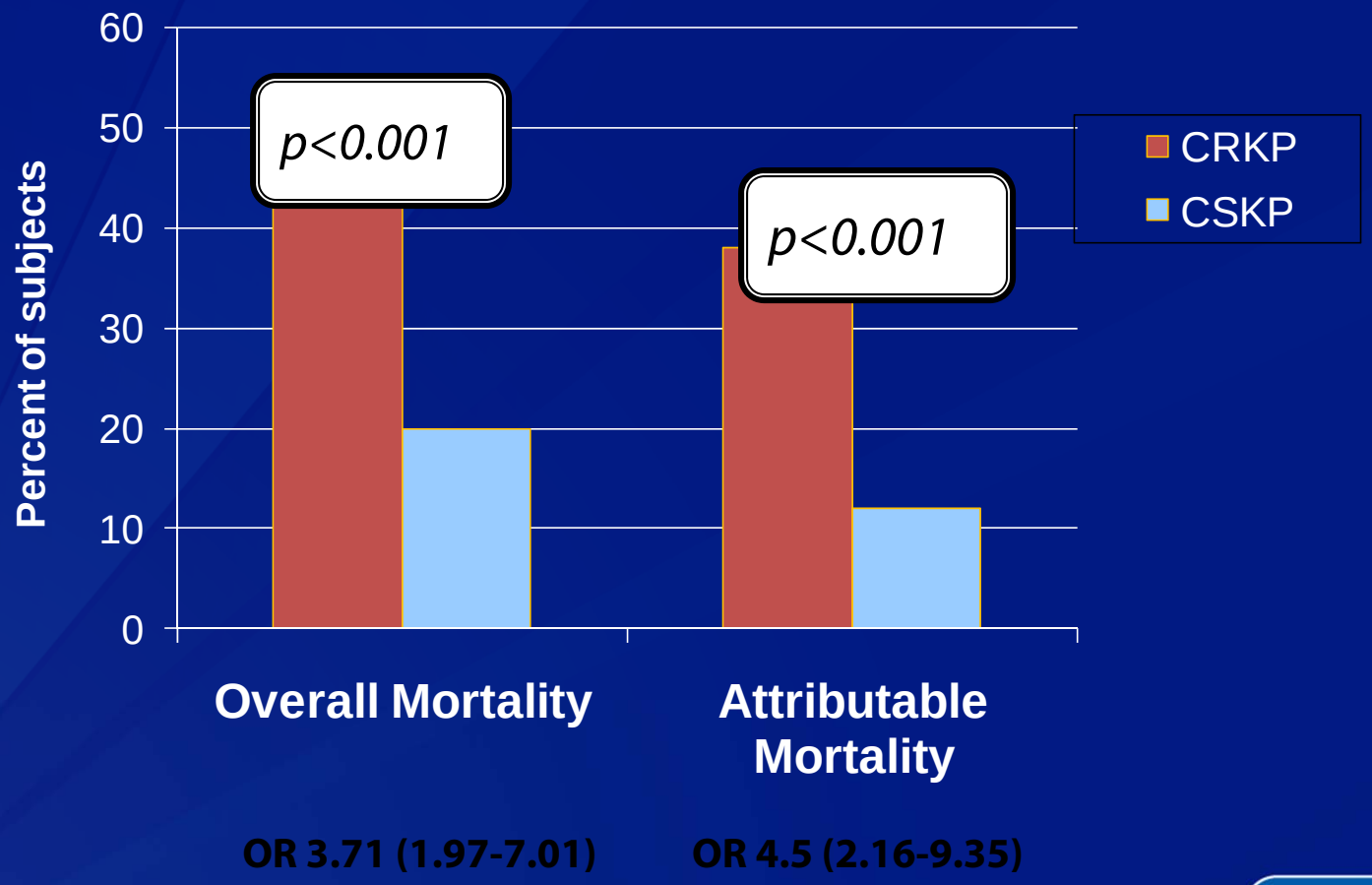
Antibiotics are misused in a variety of ways

- Given when they are not needed
- Continued when they are no longer necessary
- Given at the wrong dose
- Broad spectrum agents are used to treat very susceptible bacteria
- The wrong antibiotic is given to treat an infection

Why we need ASP

- Fact: Misuse adversely impacts resistance
- Fact: Antimicrobial resistance
  - Increases morbidity and mortality
  - Increases cost

Mortality associated with carbapenem resistant (CR) vs susceptible (CS) Klebsiella pneumoniae (KP)



Patel G et al. *Infect Control Hosp Epidemiol* 2008;29:1099-1106

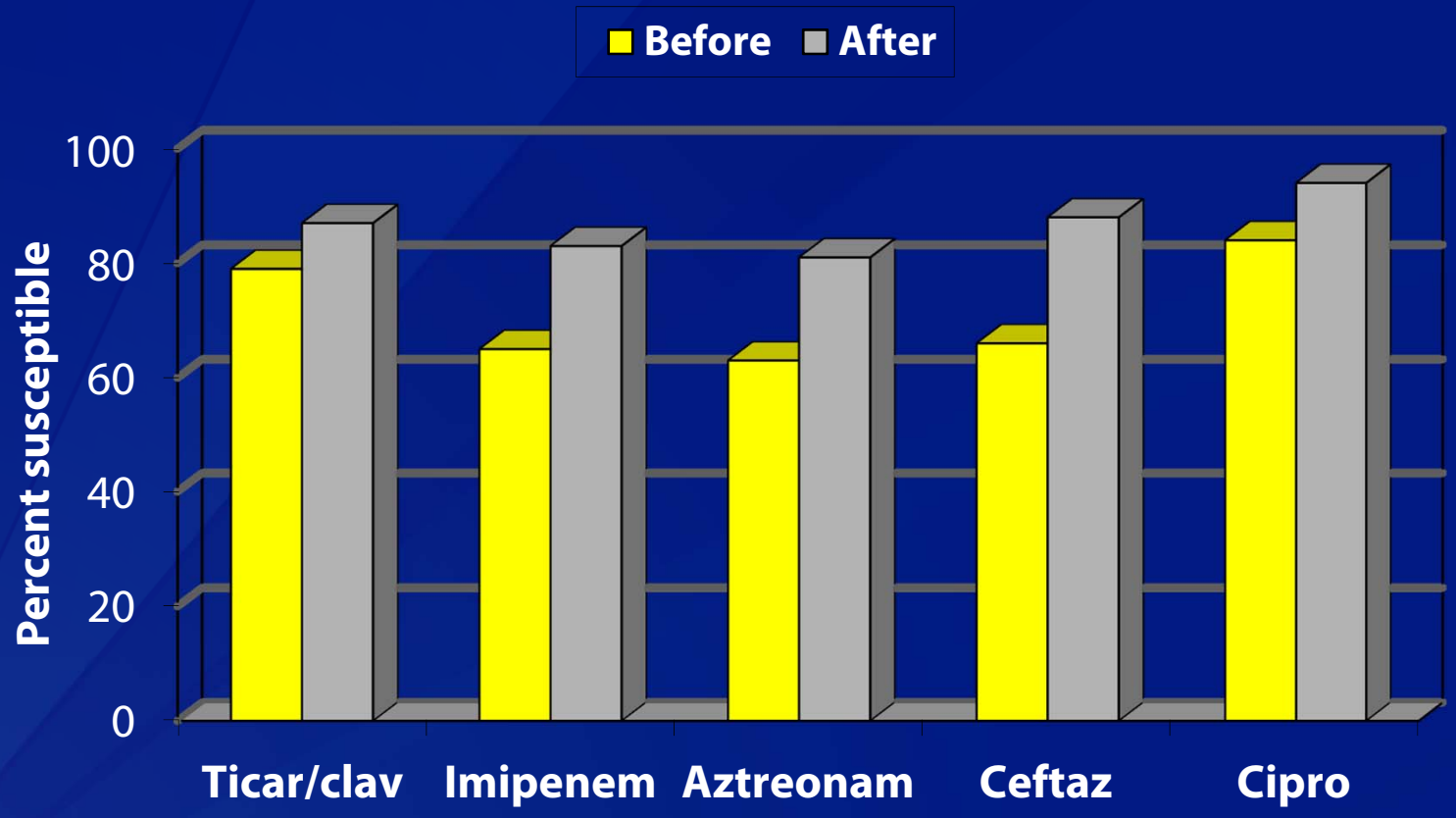
Mortality of resistant (MRSA) vs. susceptible (MSSA) *S. aureus*

- **Mortality risk associated with MRSA bacteremia, relative to MSSA bacteremia: OR: 1.93; p < 0.001.[1]**
- **Mortality of MRSA infections was higher than MSSA: relative risk [RR]: 1.7; 95% confidence interval: 1.3–2.4).[2]**

1. *Clin. Infect. Dis.*36(1),53–59 (2003).
2. Infect. Control Hosp. Epidemiol.28(3),273–279 (2007).

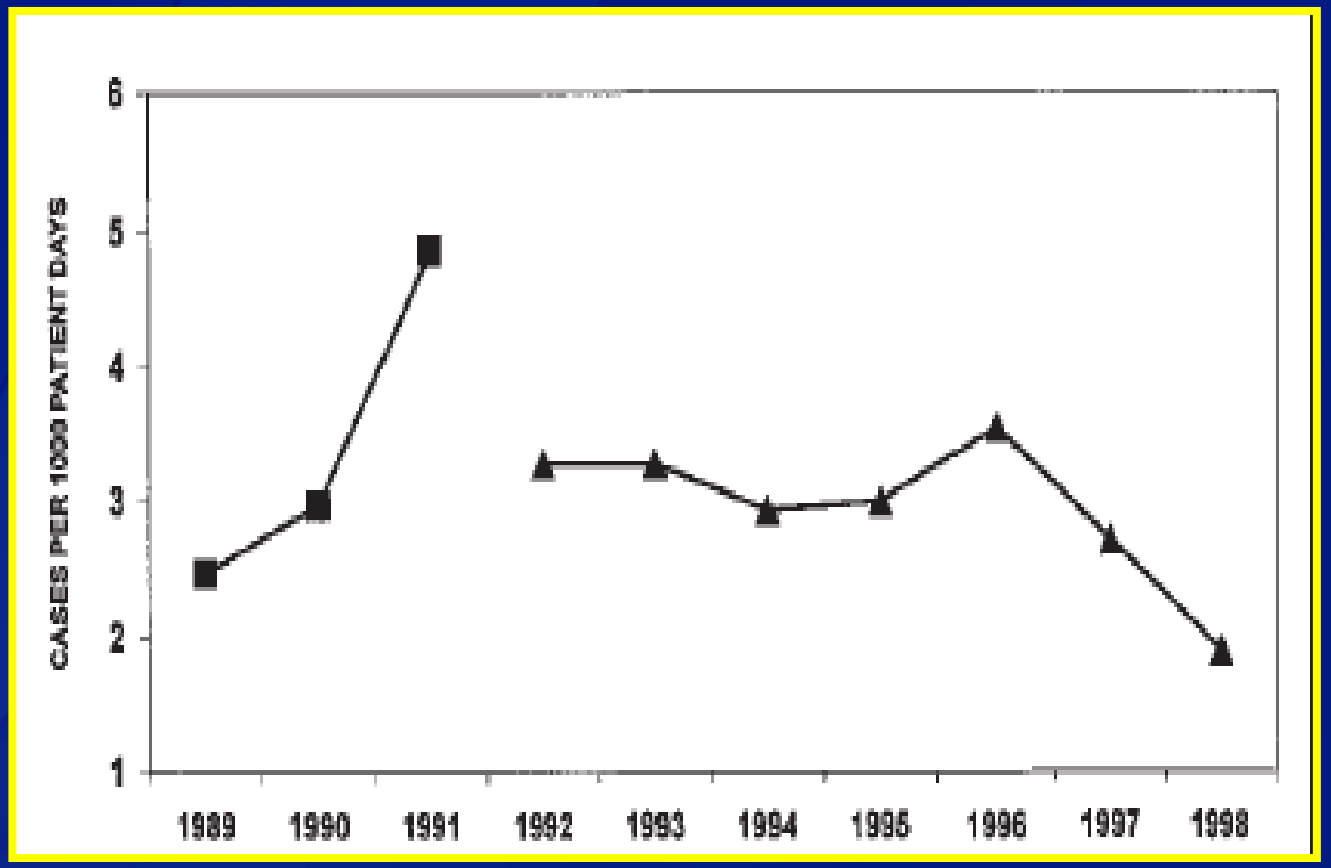
Fact: Improving antibiotic usage reduces resistance

P. aeruginosa susceptibilities before and after implementation of antibiotic restrictions (CID 1997;25:230)



P<0.01 for all increases

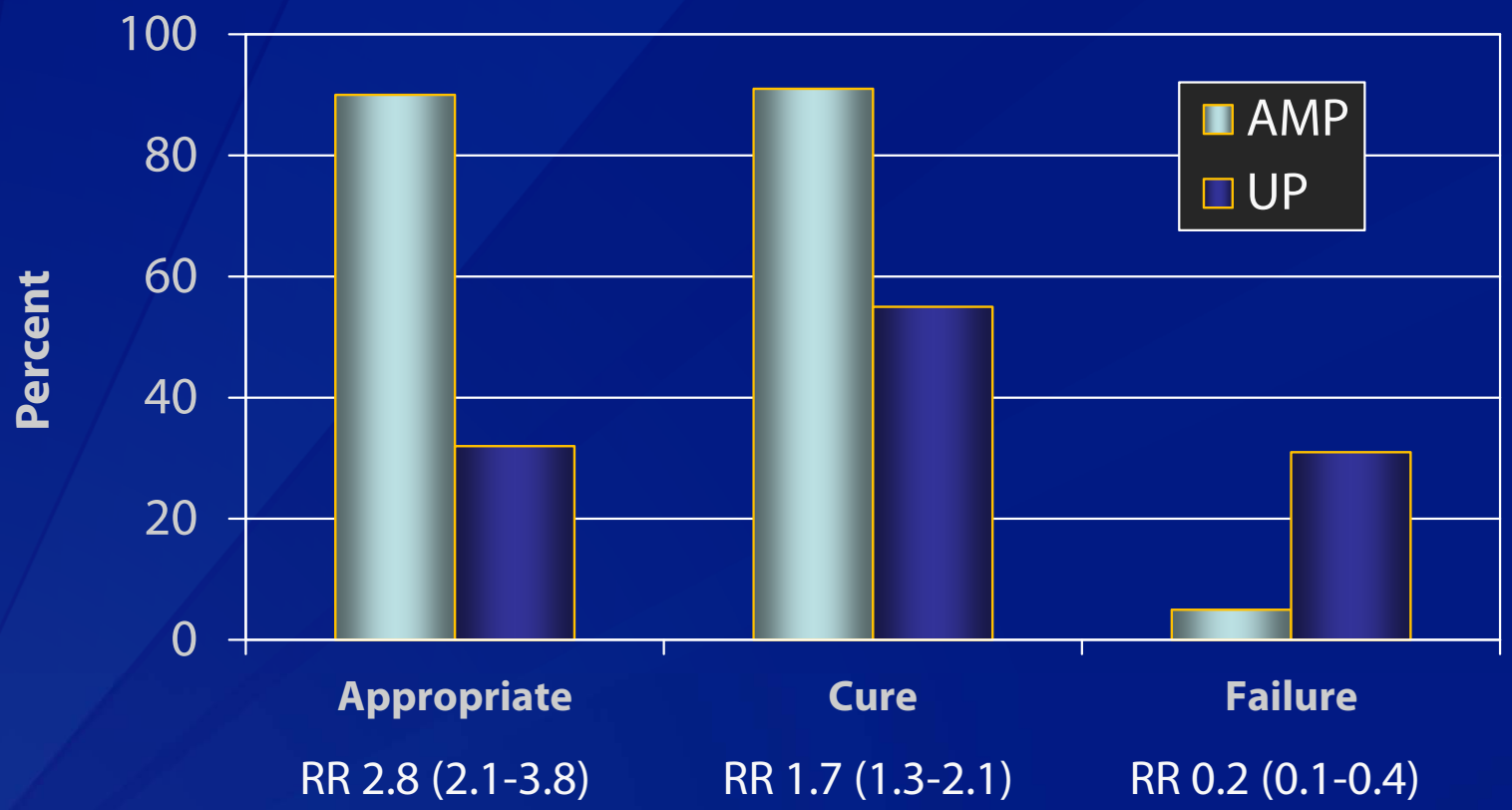
Impact of Improving Antibiotic Use on Rates of Resistant Enterobacteriaceae



Carling P et al. *Infect Control Hosp Epidemiol.* 2003;24(9):699-706.

Improving antibiotic use improves infection cure rate

Clinical outcomes better with antimicrobial management program



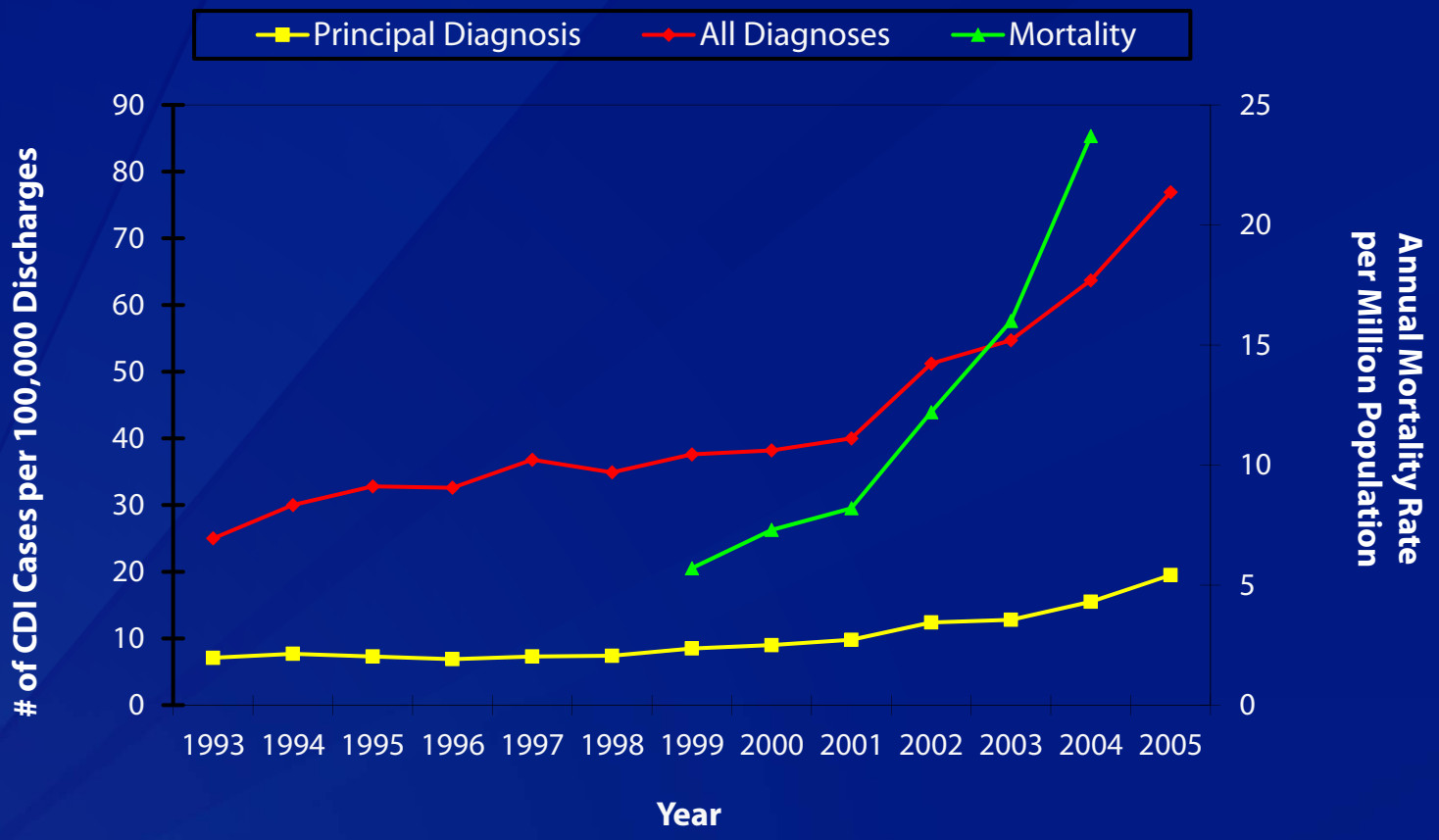
Fishman N. *Am J Med.* 2006;119:S53.

AMP = Antibiotic Management Program
UP = Usual Practice

C. difficile

- Use of antibiotics has driven the epidemic of c. difficile, especially the NAP-1 strain
- Since yr.2000, 2.5 to 3-fold increase in mortality

Incidence and mortality are increasing in US



Elixhauser A, et al. Healthcare Cost and Utilization Project: Statistical Brief #50. April 2008. Available at: http://www.hcup-us.ahrq.gov/reports/statbriefs/sb50.pdf. Accessed March 10, 2010.

Redelings MD, et al. Emerg Infect Dis. 2007;13:1417-1419.

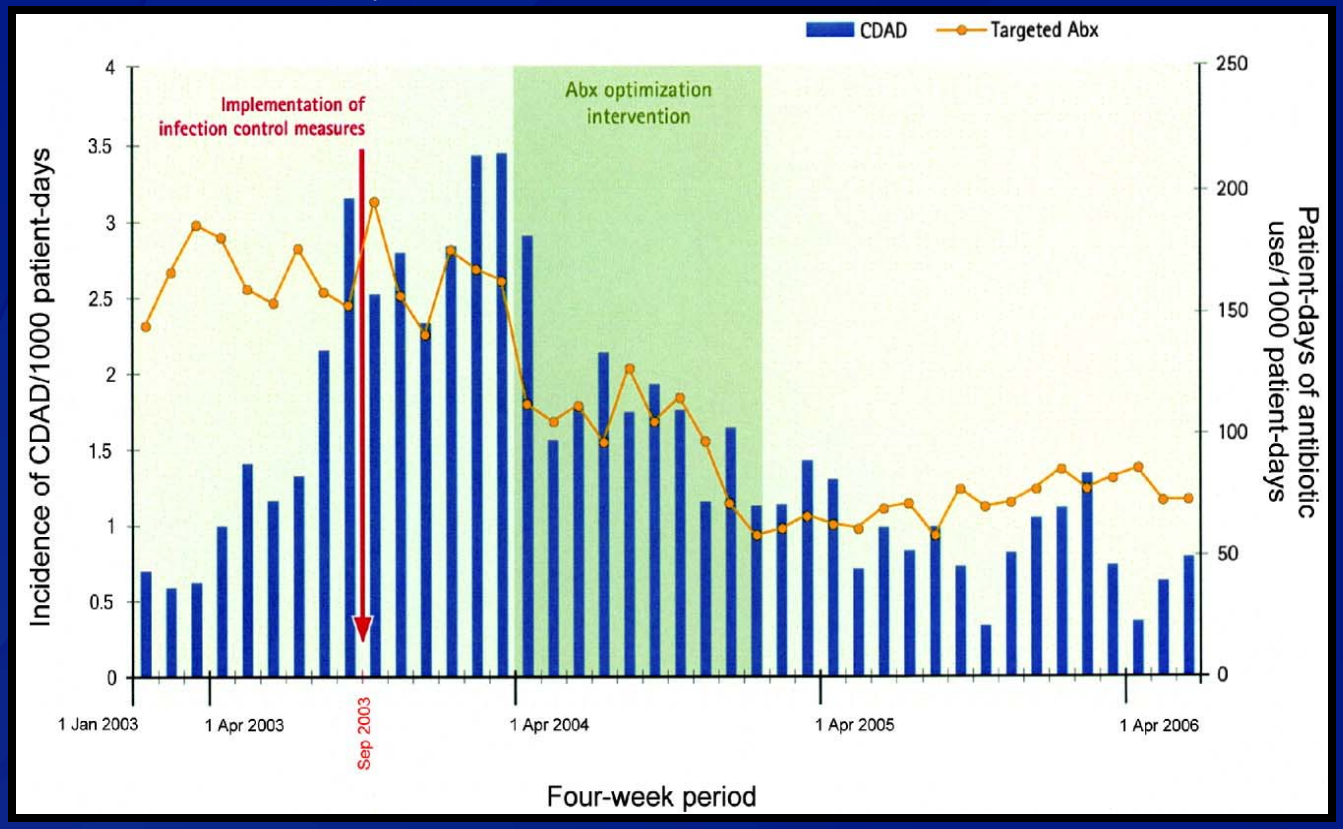
Improving antibiotic use reduces *C. difficile* infections

Impact of fluoroquinolone restriction on rates of *C. difficile* infection

Infect Control Hosp Epidemiol. 2009 Mar;30(3):264-72.

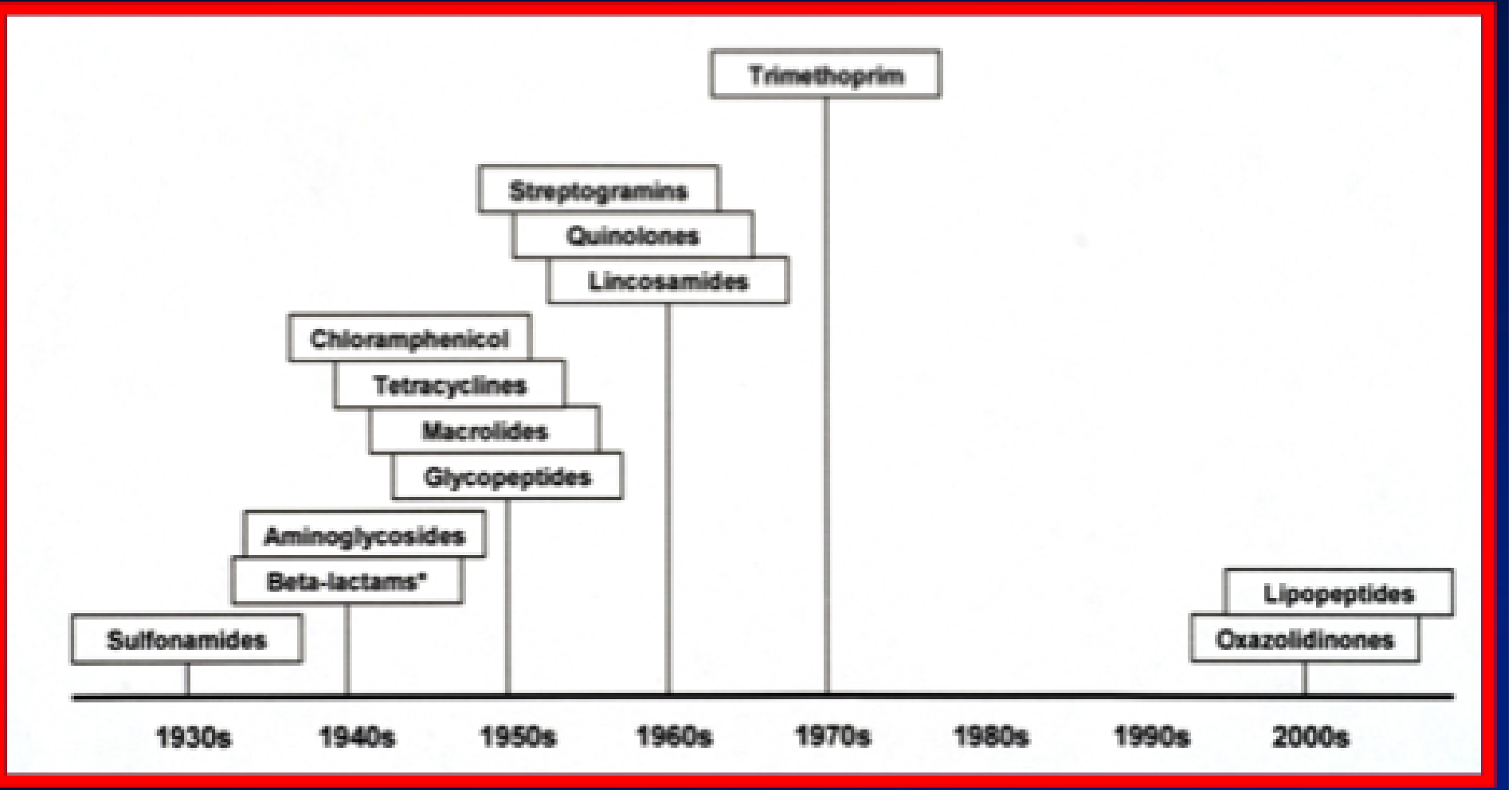
Targeted antibiotic consumption and nosocomial *C. difficile* disease

Tertiary care hospital; Quebec, 2003-2006

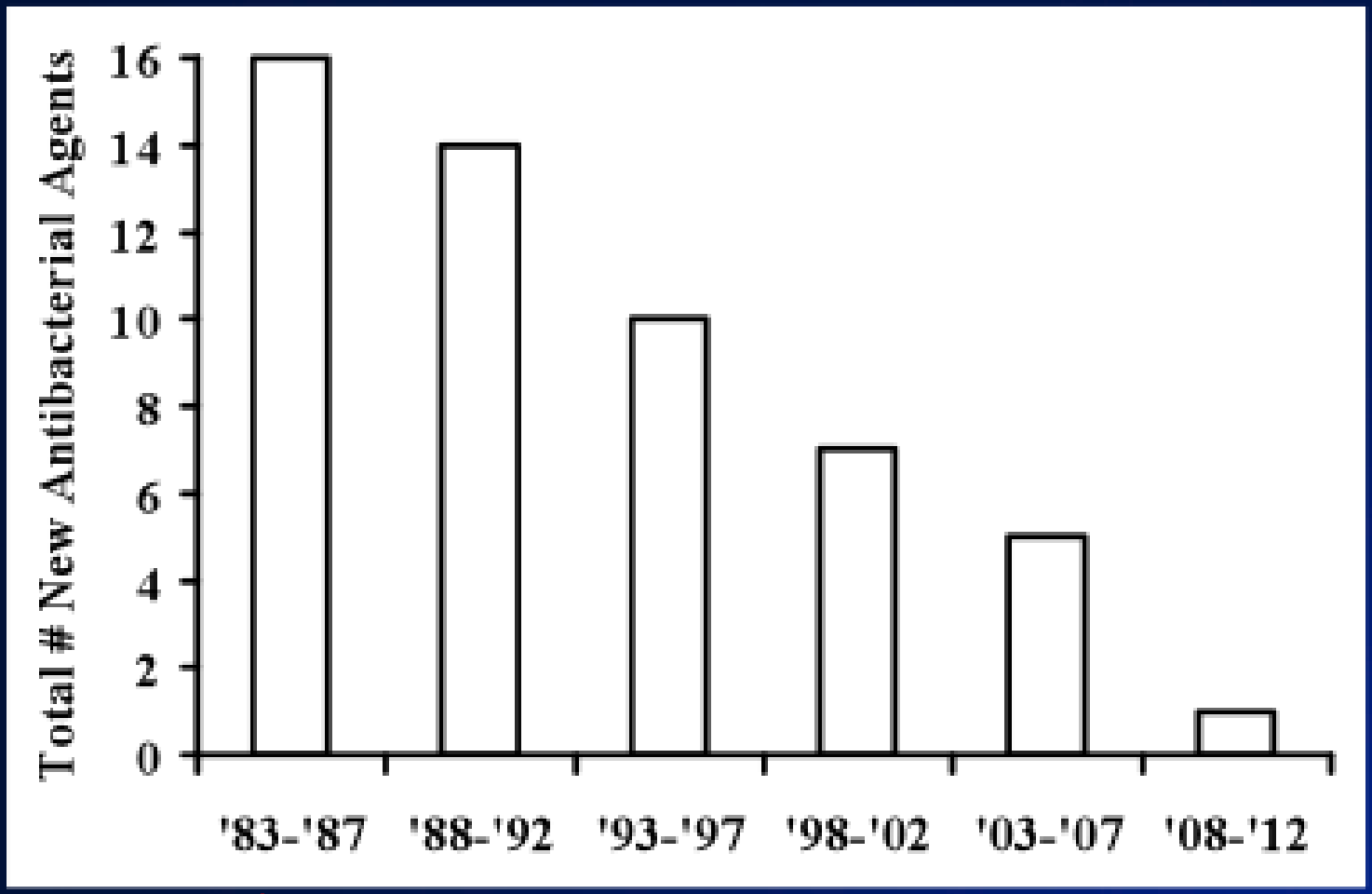


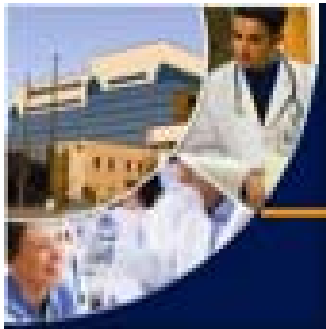
Valiquette, et al. *Clin Infect Dis* 2007;45:S112.

Discovery of New Classes of Antibiotics

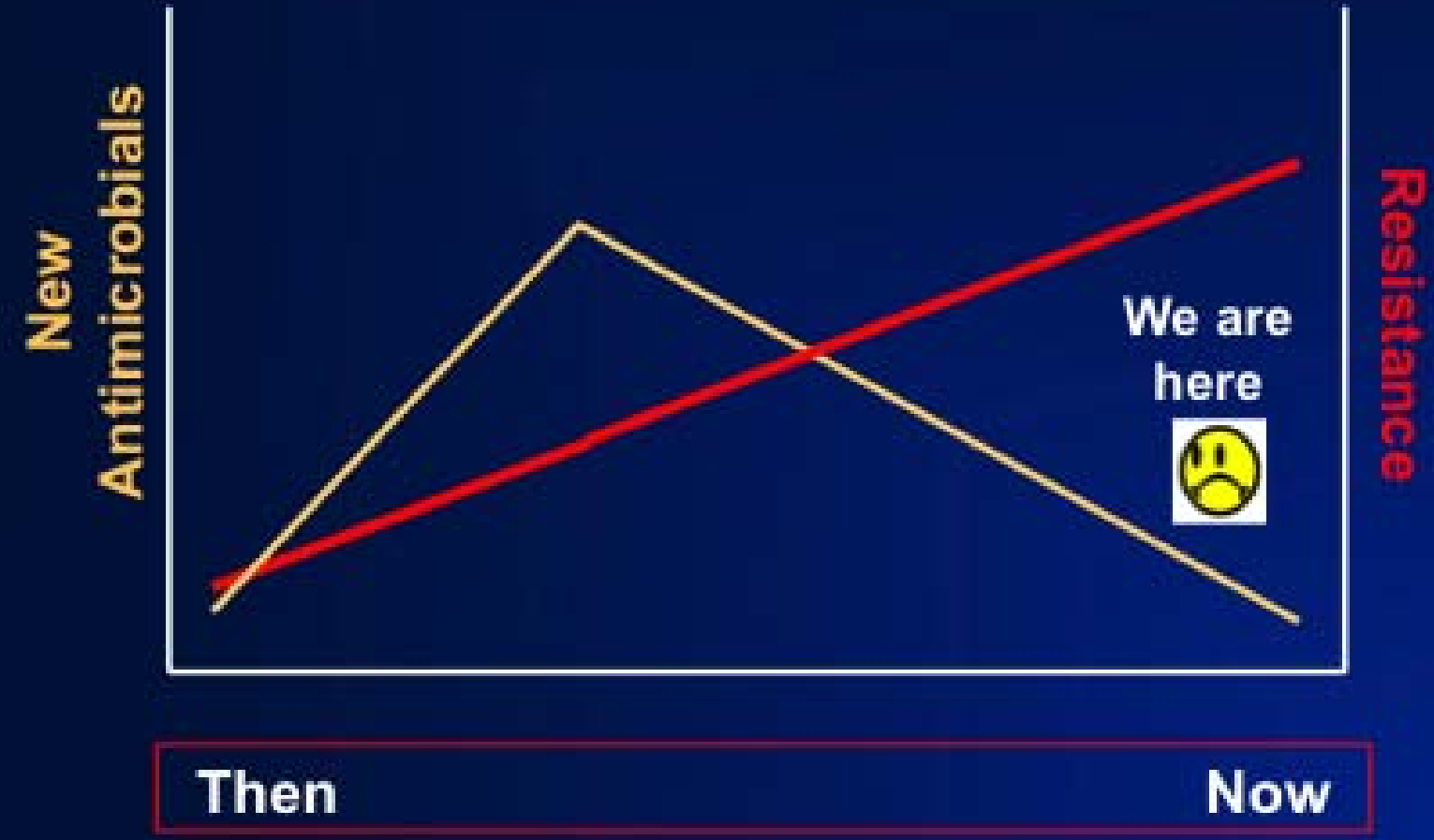


Number of New Antibiotics by Year





Antibiotic Armageddon



The Future of Antibiotics and Resistance

Bacteria "invented" antibiotics billions of years ago and resistance is primarily the result of bacterial adaptation to eons of antibiotic exposure.

- B. Spellberg, J. Bartlett and D. Gilbert, *NEJM*, 24 Jan 2013.

Bacteria *invented* Antibiotics

Fundamental Implications:

In addition to antibiotics' curative power, their use naturally selects for pre-existing resistant populations in nature.

Bacteria *invented* Antibiotics

Fundamental Implications:

It is not just "inappropriate" antibiotic use that selects for resistance. Rather, the speed resistance spreads is driven by microbial exposure to all antibiotics.

Bacteria *invented* Antibiotics

Fundamental Implications:

After billions of years of evolution, microbes invented antibiotics against every biochemical target that can be attacked, and developed resistance mechanisms to protect all those biochemical targets.

The microbes invented antibiotics, not man.

Resistance

- Widespread resistance was discovered among bacteria in caves isolated from the surface of the planet for 4 million years.
- Resistance even to new synthetic antibiotics
- Resistance exists globally to drugs not yet invented

Key Elements for Successful ASP

- Establishing compelling need and goals for ASP
- Enlisting senior leadership support and funding
- Effective local physician champion

Key Elements for Successful ASP

- Establishing team with requisite representation and resources
  - Pharmacy
  - Infection Control
  - Microbiology
  - Nursing
  - Doctors from different disciplines
  - IT
- Good teamwork
- Agreed upon process and outcome measures

Physician Champion

- Basic knowledge of antibiotics*
- Must show interest in taking a leadership role in the local community
- Respected by his or her peers
- Good interpersonal skills
- Good team player
- Basic understanding of human factors and culture transformation

*Does not need to be an infectious disease specialist.

Establishing compelling need and goals for ASP

THE NAIROBI HOSPITAL

MINUTES OF ANTIBIOTIC POLICY/STEWARDSHIP TASK GROUP
HELD ON 18TH NOVEMBER 2009
AT MAC'S BOARDROOM AT 7.00AM

Members Present
Dr. D. Muhindi – Chairing
Dr. M. Wambani
Mrs. Janet Mathiu
Dr. Mwongera F.
Dr. Mary Kisingu – taking Notes

Apologies
Dr. Were A.J.O.

Minute 1/09 Introduction
In a past MAC- Heads of Clinical Department's meeting, a concern was raised on the emerging levels of antibiotic resistance worldwide. In the discussion, it was agreed that as a Hospital we need to develop an antibiotic stewardship policy to guide the use of antibiotics.

In this regard, a task group named Antibiotic Policy/Stewardship Task group was appointed whose membership consists of:

1. Dr. Muhindi D. W – Physician/Chest Specialist
2. Dr. Wambani M - General Surgeon/ Urologist
3. Dr. Mwongera F. - Physician/Nephrologist
4. Dr. Were A.J.O. - Physician/Nephrologist
5. Mrs. Mathiu – TNH Matron/ Director Nursing Services
6. Dr. Kisingu – TNH Chief Pharmacist

During this first meeting, Dr. Muhindi was appointed as the Task group Chairman.

- Enlisting senior leadership support and funding

THE NAIROBI HOSPITAL

Our Ref: **TNH/ADMIN /CEO/28/06/12**

28 June 2012

To: All Admitting Staff Members
The Nairobi Hospital

Dear Colleagues,

RE: ANTIBIOTIC STEWARDSHIP COMMITTEE

Warm greetings!

As you all know, hospital acquired infections has become an increasing problem all over the world, especially in the third world. As a Hospital we have to be alert to the fact and put in place systems to mitigate the problem.

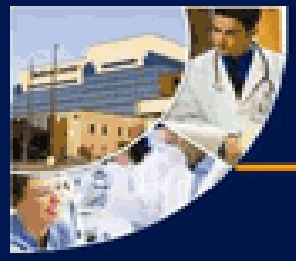
In this respect, we have therefore appointed an Antibiotic Stewardship Committee to monitor the incidences of infections in our Hospital as well as the sensitivity trends of the various organisms. In addition, this Committee will be putting out guidelines for antibiotic usage under various circumstances.

To ensure compliance and good practice, should the Committee together with the respective Heads of Departments believe that any of the Admitting Staff Member or doctor is not following the guidelines, they will be talking or writing to the individual doctor to justify his/her use of antibiotics. Failure to answer a letter may as well result in disciplinary action.
Guidelines, as the name implies are not rules that have no exceptions. Thus the individual Doctor will be invited to justify why he did not follow the guidelines. If the explanations are not considered satisfactory, he/she will be cautioned not to repeat improper use of antibiotics. I trust that you shall cooperate.

Establishing team with requisite representation and resources

- LOCAL PHYSICIAN CHAMPION
  - Dr. David M. Silverstein
- PHARMACY
  - Dr. M. Kisingu
- INFECTION CONTROL
  - Sr. R. Ngugi
- MICROBIOLOGY
  - Dr. C. Mwachari, Ms. F. Musyoki
- NURSING
  - Matron J. Mathiu
- DOCTORS FROM DIFFERENT DISCIPLINES
  - Dr. M. Saio, Dr. F. Mwongera, Dr. M. Wambani
- IT
  - Nobody

NH ASP Activities – Surveillance of Antibiotic Usage: *NO*



Front-end Approach

Physician writes order for "restricted drug"

Order arrives in pharmacy; pharmacist informs the physician that the drug is "restricted"/"not part of the pathway"/"nonformulary"

Prescribing physician and the "GATE KEEPER" converse

Approval or alternative antibiotic selected

NH ASP Activities – Surveillance of Antibiotic Usage: *YES*

Back-end Approach

Physician writes order → Antibiotic is dispensed

↓

At a later date, antibiotics are reviewed

(Targeted list of antibiotics, culture/sensitivity mismatches, ICU patients)

↓

1) Antibiotic changed or continued based on practice guidelines
2) Prescribing physician contacted and recommendation made

NH ASP Activities - Restricted use of formulary compounds

THE NAIROBI HOSPITAL

INTER- OFFICE MEMORANDUM

TO: ALL CLINICIANS

FROM: CHIEF EXECUTIVE OFFICER

DATE: 13TH MAY 2010

SUBJECT: **RESERVE DRUGS – COLISTIN AND TIGECYCLINE**

As a means of optimizing clinical management of infections in the Hospital, the Antibiotic Stewardship Task Group recommends that Colistin (Colistimethate) and Tigecycline be used as reserve antibiotics. These two drugs are restricted for use in ICU patients with severe infections, strictly based on clinical evidence of infection/sepsis and microbiological confirmation of multi-drug resistant micro-organisms.

This practice among other guidelines is being instituted in the Hospital to curb the ever emerging worldwide antimicrobial resistance. Prescriptions for these reserve drugs will require to be endorsed by the consultant microbiologist before dispensing.

THE NAIROBI HOSPITAL

INTER- OFFICE MEMORANDUM

TO: ALL CLINICIANS

FROM: CHIEF EXECUTIVE OFFICER

DATE: 2ND AUGUST 2012

SUBJECT: **PCR TEST FOR MRSA**

Following a significant decline in the incidence of MRSA at The Nairobi Hospital, the Antibiotic Stewardship Task Group recommends that before ordering any reserve antibiotics for the possibility of MRSA, its presence requires to be confirmed by PCR on the involved tissue or secretions excluding blood. This will help us preserve the potency of such antibiotics as Linezolid, Vancomycin and Teicoplanin in the setting of MRSA when we really need them.

I confirm that MRSA PCR test reports could be available within 6 hours if test is requested before noon or in any case within 24 hours. For high suspicion however, empiric treatment should be started pending results. Your compliance with this requirement will ensure that reserve antibiotics are not used empirically on suspicion of the possibility of MRSA but only on confirmed cases.

This practice among other guidelines is being instituted in the Hospital to curb the ever emerging worldwide antimicrobial resistance.

Dr. Cleopa Mailu, EBS
Chief Executive Officer

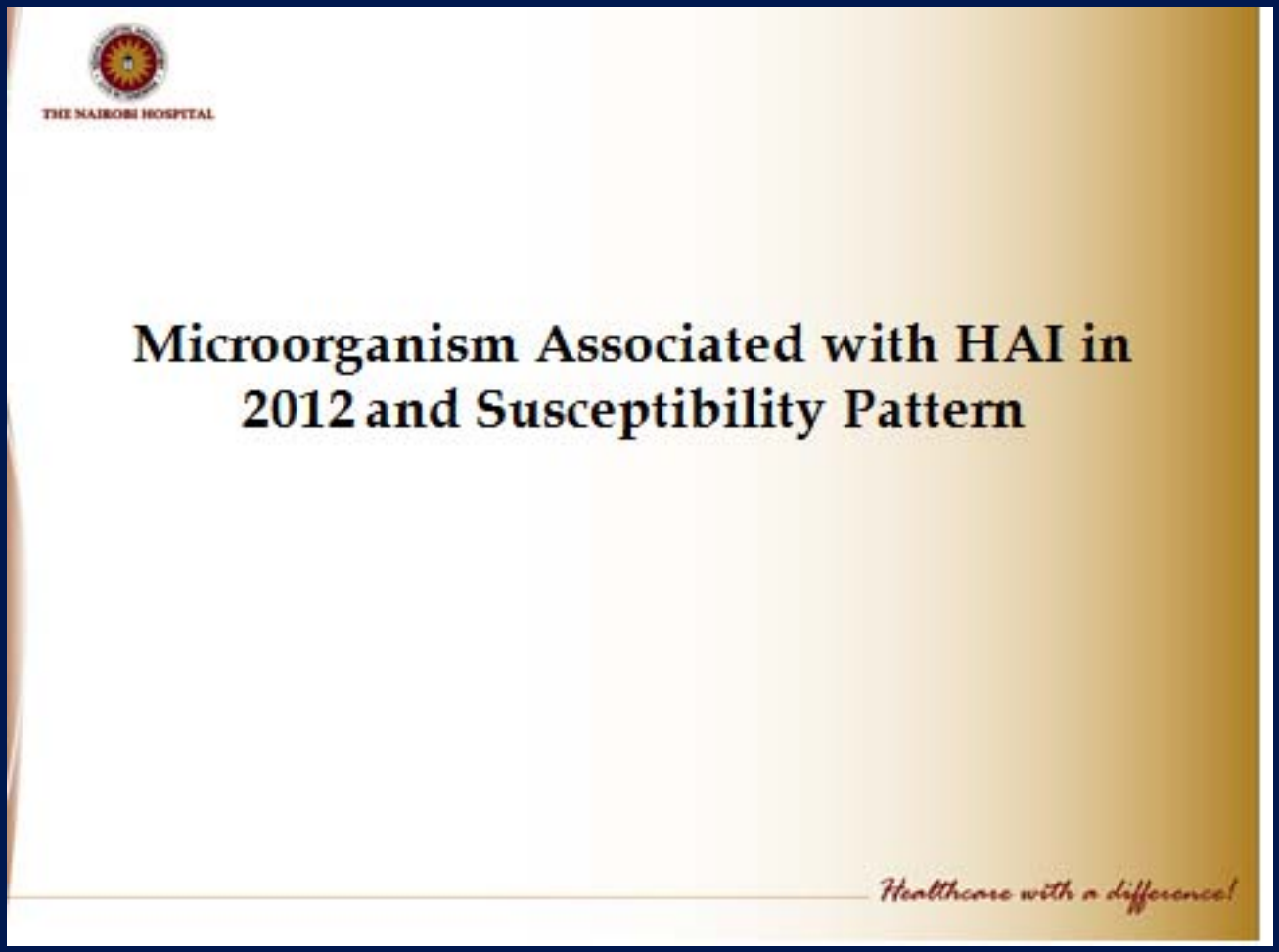
NH ASP Activities – Use of Generics

- 9th March 2012: NH ASP requires all drug companies to provide evidence of FDA or EMA approval

NH ASP Activities – Antibiotic Order Sheet

- 18th September 2012: New Order Sheet approved
- Requires justification for prophylactic antibiotic use with automatic discontinuation after 24 hours
- Automatic stop date after 7 days for any antibiotic
- Requires culture and sensitivity verification

NH ASP Activities – Surveillance of Microbes and Sensitivities



Antibiotic Guidelines for Management of Patients with CAP

Patient Category	Clinical Setting	Antibiotic Choice
Presence of co-morbidities, e.g., chronic heart, lung, renal disease, DM, alcoholism, asplenia, immunosuppressive conditions (malignancies, chronic use of oral corticosteroids, HIV), use of antibiotics or admission to hospital < 3 months CURB 0-1	Outpatient	**Beta Lactams** Amoxicillin 1 g TDS po tds, Amoxicillin/Clavulinic 1 g po BD, Cefuroxime axetyl 500 mg po BD ***PLUS*** Macrolide PO (as above) if atypicals are a concern DURATION 5 days – should be afebrile within 48-72 hrs ***OR*** **Respiratory quinolone*** Moxifloxacin 400 mgs OD x 5-7 days, Levofloxacin 750 mgs OD x 5-7 days

Respiratory quinolone*

- Respiratory quinolones should be avoided if there is a consideration of TB.
- If they are to be used with the consideration of TB then a PCR for TB should be taken immediately, ideally before the course is initiated.

- The course should never exceed 7 days.

Antibiotic Usage for Pneumonia in A&E by CMOs

- No parenteral antibiotics are to be prescribed by CMOs without prior authorization by a consultant
- Proposed oral antibiotics to be used:
  - Amoxicillin, Amoxicillin/Clavulinic, Cefuroxime, Azithromycin, Clarithromycin, Clindamycin

NH ASP Activities – IT

- IT system must support data collection and analysis. It must interlink as appropriate .

- Currently is being done manually.

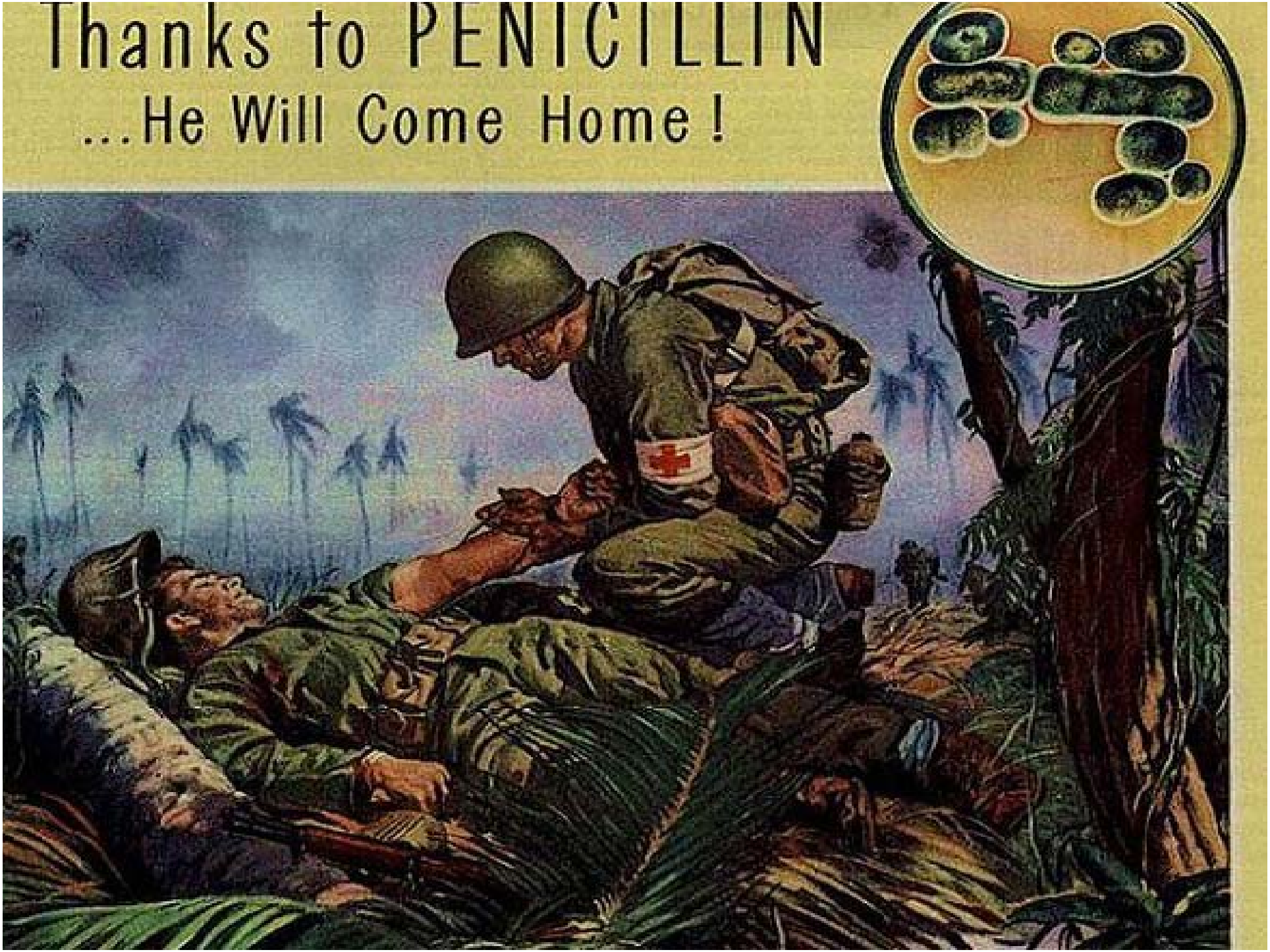
NH ASP Activities – IT

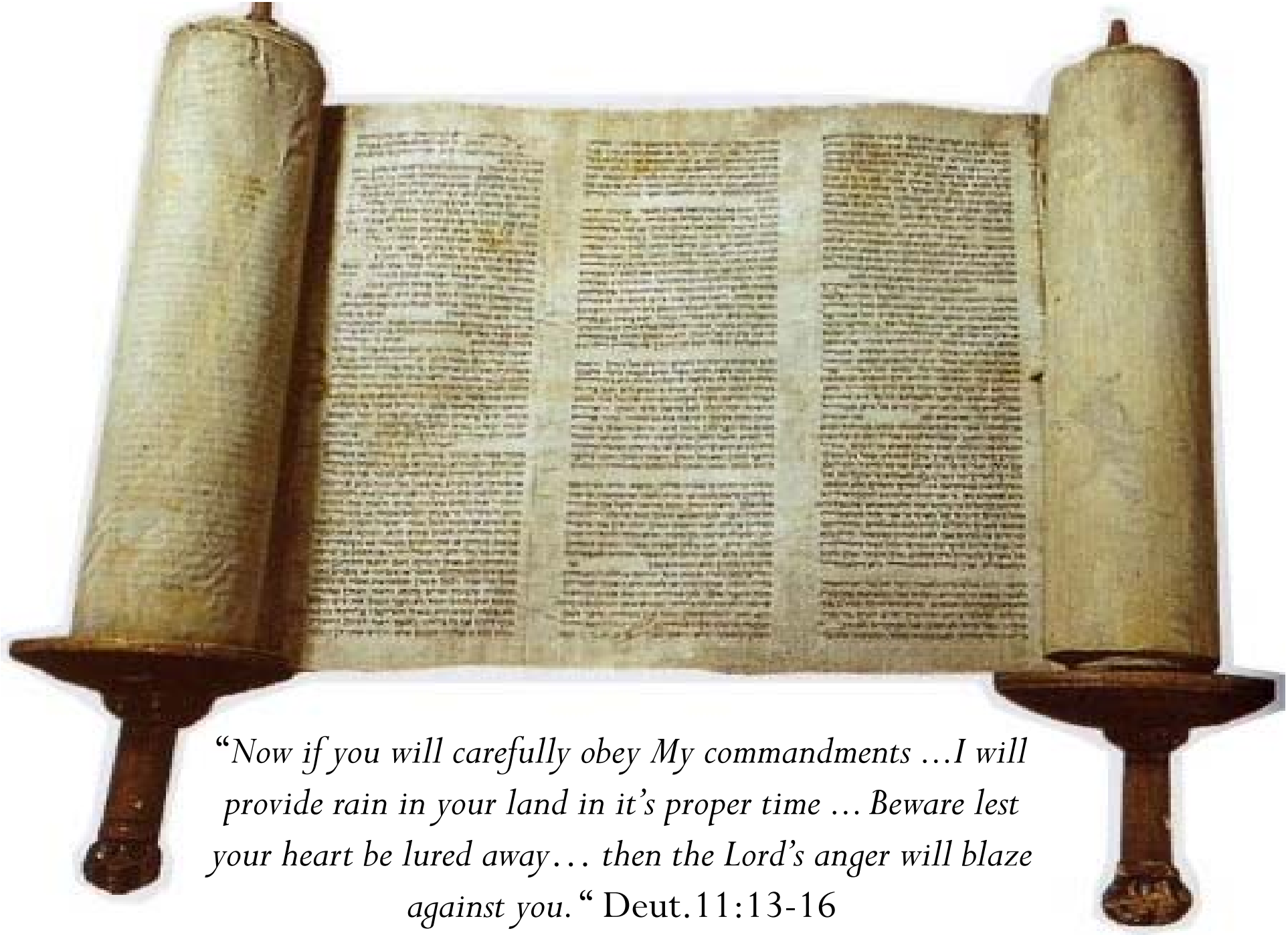
- IT system must support data collection and analysis. It must interlink as appropriate .

- Currently is being done manually.

NH ASP Challenges

- Improved infrastructure for continuous and current tracking of antibiotic use (IT)
- Ongoing audit with efficient and timely intervention and feedback to prescribers
- More educational opportunities on departmental level
- Earlier conversion from parenteral to oral route
- Shorter courses of antibiotics
- Stronger monitoring of antibiotic combinations and de-escalation
- Stronger monitoring of optimal dosing and administration
- Development of antibiotic guidelines


Thanks to PENICILLIN
...He Will Come Home !



"Now if you will carefully obey My commandments …I will provide rain in your land in it's proper time … Beware lest your heart be lured away… then the Lord's anger will blaze against you." Deut.11:13-16