How to control hospital antibiotic use

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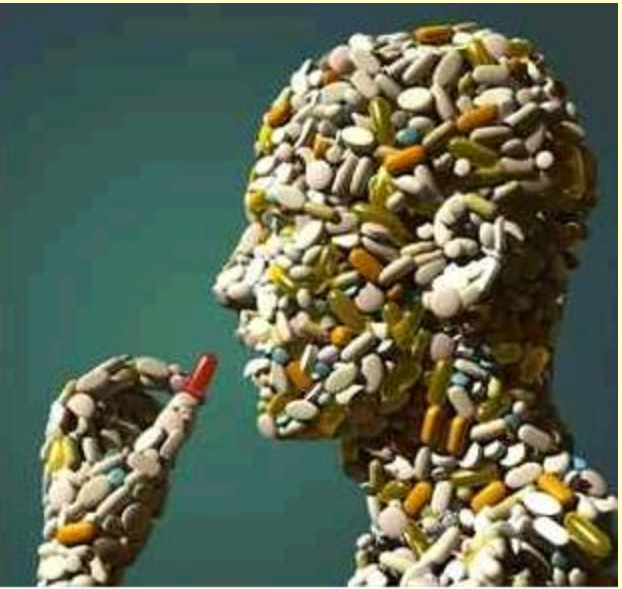


With acknowledgement to Ian Gould

High incidence of multi-resistant bacterial infections in Vietnamese patients

7. Infect Control Hosp Epidemiol. 2006 Aug;27(8):855-62. Epub 2006 Jul 24.

Microbiology of surgical site infections and associated antimicrobial use among Vietnamese orthopedic and neurosurgical patients.

Le TA, Sohn AH, Nguyen PT, Vo TC, Vo VN, Tran Nguyen TH, Ewald B, Dibley M.

- ***Nearly ALL post operative patients given antibiotics for median of 11 days. Nearly all organisms isolated were resistant to the antibiotics given.***

6. Trop Med Int Health. 2006 Nov;11(11):1725-30.

Prevalence of multiresistant Gram-negative organisms in a surgical hospital in Ho Chi Minh City, Vietnam.

Jones SL, Nguyen VK, Nguyen TM, Athan E.

- High incidence of resistance to quinolones, gentamicin and cephalosporins

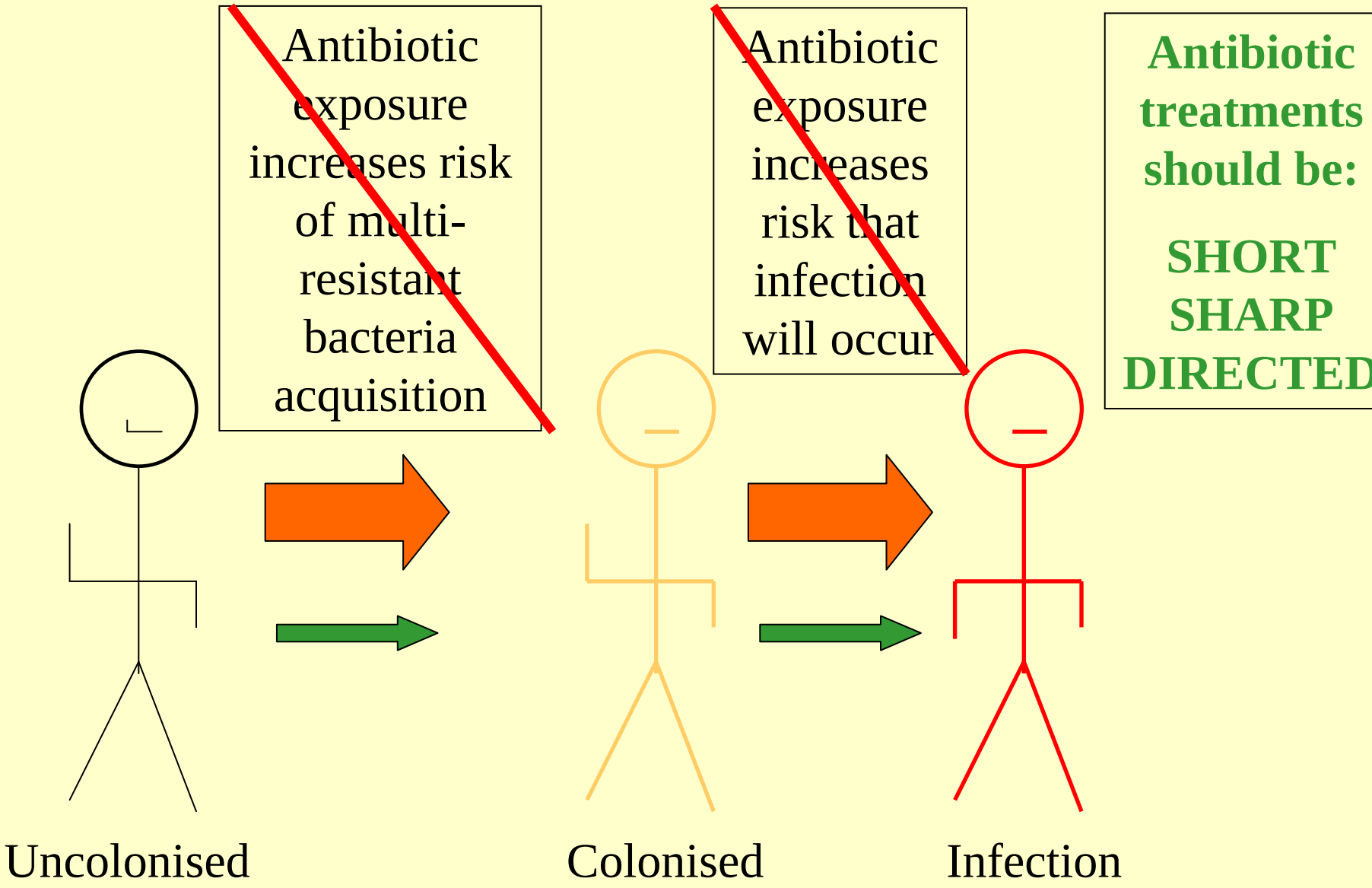
The impact of antimicrobial multi-resistant pathogens

- Many pathogens have a greater ability to cause disease (virulence)
- Increased capacity to spread between patients and to staff
- Increased complexity of treatment
- Increased liklihood of patient treatment failure, increased mortality
- Increased financial burden

What to do about resistance

- ***Use antibiotics less***
- ***Use antibiotics better***
- *Prevent cross-infection*
- *Develop new antibiotics*
- *Surveillance*

Antibiotics and infection



Evidence-based antibiotic treatment standard

- Don’t treat uninfected or colonised patients!

SHORT – use the shortest duration proven by clinical trials

SHARP – use correct dose, correct route

DIRECTED – use microbiology results to target the bacteria causing the infection

Evidence-based surgical prophylaxis standard

- Not all procedures need prophylaxis!

SHORT – one dose PRIOR to surgery

SHARP – correct dose, correct timing

DIRECTED – chose the agent based on known local bacterial causes of surgical infection

Standard for Antimicrobial Prescribing: 'AIMED'

1. **A ntimicrobial selection and dosage** should be compliant with guidelines; assess **Allergy** history prior to use
2. **I ndication for treatment** should be documented.
3. **M icrobiological assessment-** collect necessary specimens PRIOR to first dose
4. **E valuate at 48-72hrs**: assess whether antimicrobial treatment needs to be modified
5. **D uration or review date** should always be specified.

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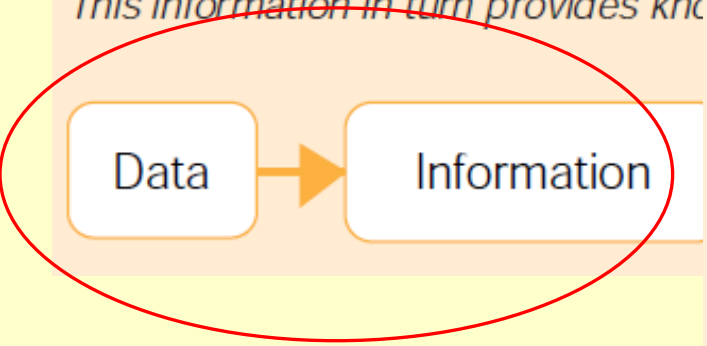
Controlling use- where to start?
Surveillance and Research

Data is the raw material from which
This information in turn provides kn



With (good) data you can:

- ✓ assess current performance and identify performance gaps
- ✓ understand the needs and opinions of stakeholders
- ✓ prioritise problems and improvement projects
- ✓ establish overall aims and targets for improvement
- ✓ establish a clear case for the need for improvement.

A guide to using data for health care quality improvement Victorian Quality Council 2008

What to measure?

- What pathogens are causing which community and nosocomial infections?
- Nosocomial infection rates
- Hospital/Unit antibiograms,
- Hospital/Unit antimicrobial (antibiotic) usage and cost
- How do doctors prescribe antibiotics?
  - Cohort studies
  - Point prevalence surveys

Surveillance of bacterial resistance

- Laboratory must use a standardised method for bacterial susceptibility testing (eg. CLSI or EUCAST Standards)
- Provide feedback to clinical units and infection control about:
  - *Staphylococcus aureus* (MRSA, Vancomycin-resistant SA)
  - *Enterococcus* species (VRE)
  - *E. coli*, *Klebsiella*, *Shigella* and other enteric organisms
  - *Pseudomonas*, *Acinetobacter*
- Summarise antibiotic resistance data annually for specific clinical units (antibiograms);
- Publish bloodstream infection (septicaemia) data separately

www.WHONET.org

Free software that enables data transfer from all lab packages in to WHONET which provides summary reports of antibiotic susceptibility.

Antibiogram example

Gram Positive	No. of isolates	Penicillin	Ampicillin*	Erythromycin	Amikacin**	Vancomycin	Ceftriaxone
Staphylococcus aureus	#		❍	❍	❍	■	
Coagulase negative staph	#		❍		❍	■	
Enterococcus	#		◆			■	
Strep pneumoniae#	12	◆		◆	◆	■	■

Gram Negative	No. of isolates	Ampicillin*	Gentamycin	Cephalothin**	Ceftriaxone***	Ceftazidime	Piperacillin+/-§	Cotrimoxazole	Imipenem§	Ciprofloxacin
Escherichia coli	#	❍	■	❍	■		■		■	■
Klebsiella species	#		■	◆	■		■		■	■
Haemophilus influenzae	42	◆			■					■
Stenotrophomonas maltophil	21				❍	❍	❍	■		❍
Pseudomonas species	#		■			◆	■		◆	◆
Acinetobacter species¶	17		■				◆		■	■
Enterobacter species¶	86		■				◆		■	■
Proteus mirabilis	55	◆	■	◆	■		■		■	■
Serratia species¶	22		■				■		■	■
Citrobacter species¶	33		■				◆		■	■
Morganella morganii¶	30		■				■		■	■

*Amoxycillin provides similar cov ***Cefotaxime provides similar cover
**Cephazolin provides similar cov §Meropenem provides similar cover

70-89% sensitive	◆	>=90% sensitive	■
Not reported	Blank	<70% sensitive	❍

Strep pneumoniae 73% Fully sensitive, 18% Intermediate

¶Don't use Cephalosporins - even if reported sensitive

XXX Hospital

Antibiotic sensitivity profile

Data from 1/1/200X to 31/3/200X

Whole Hospital

Antibiotic usage

- Pharmacy data – dispensed or purchased drugs; monthly quantities by antibiotic class
- Measure WHO-defined defined daily doses (DDD) for each antibiotic class; expressed as DDD per 1,000 patient days for different hospital units
- Use the results to determine your priorities for action, to calculate costs of treatment and savings from program

Antibiotic Consumption Calculator- ABCcalc- free software for calculating antibiotic use

http://www.escmid.org/research_projects/study_groups/esgap/abc_calc/

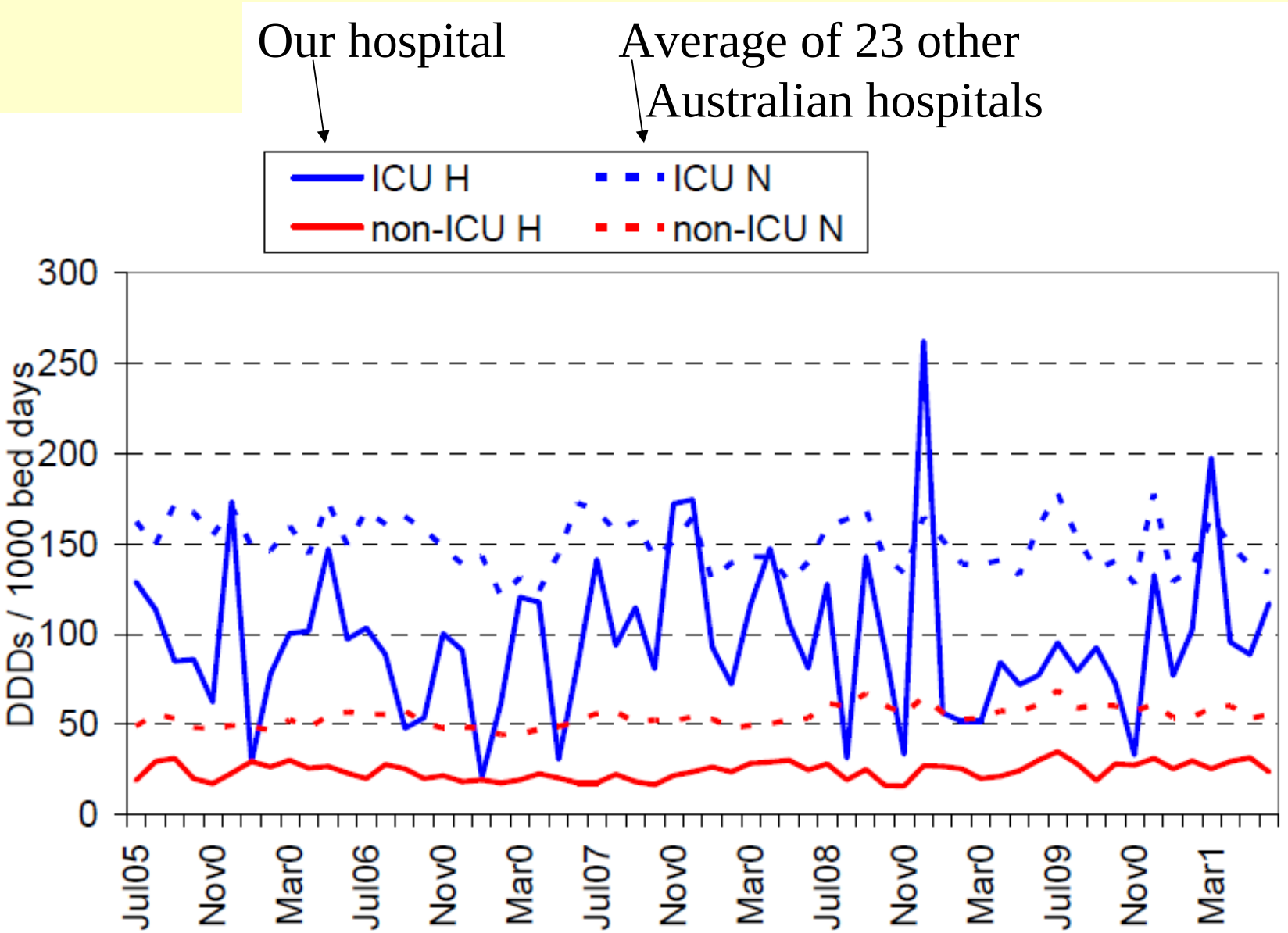
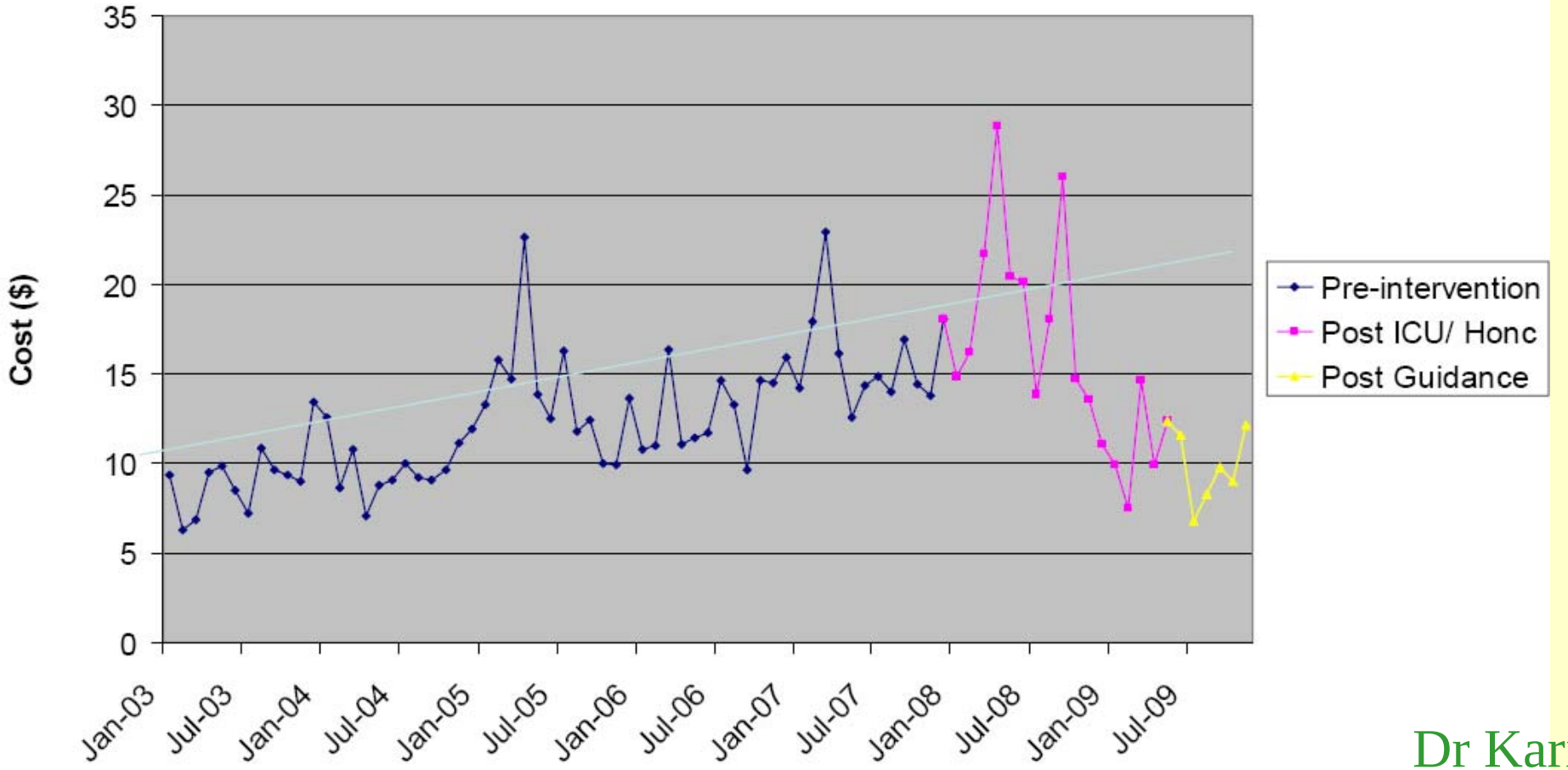


Chart 3: 3rd/4th generation cephalosporins

Royal Hobart post implementation: Combined antibacterial and antifungal cost data



Dr Karin Thursky

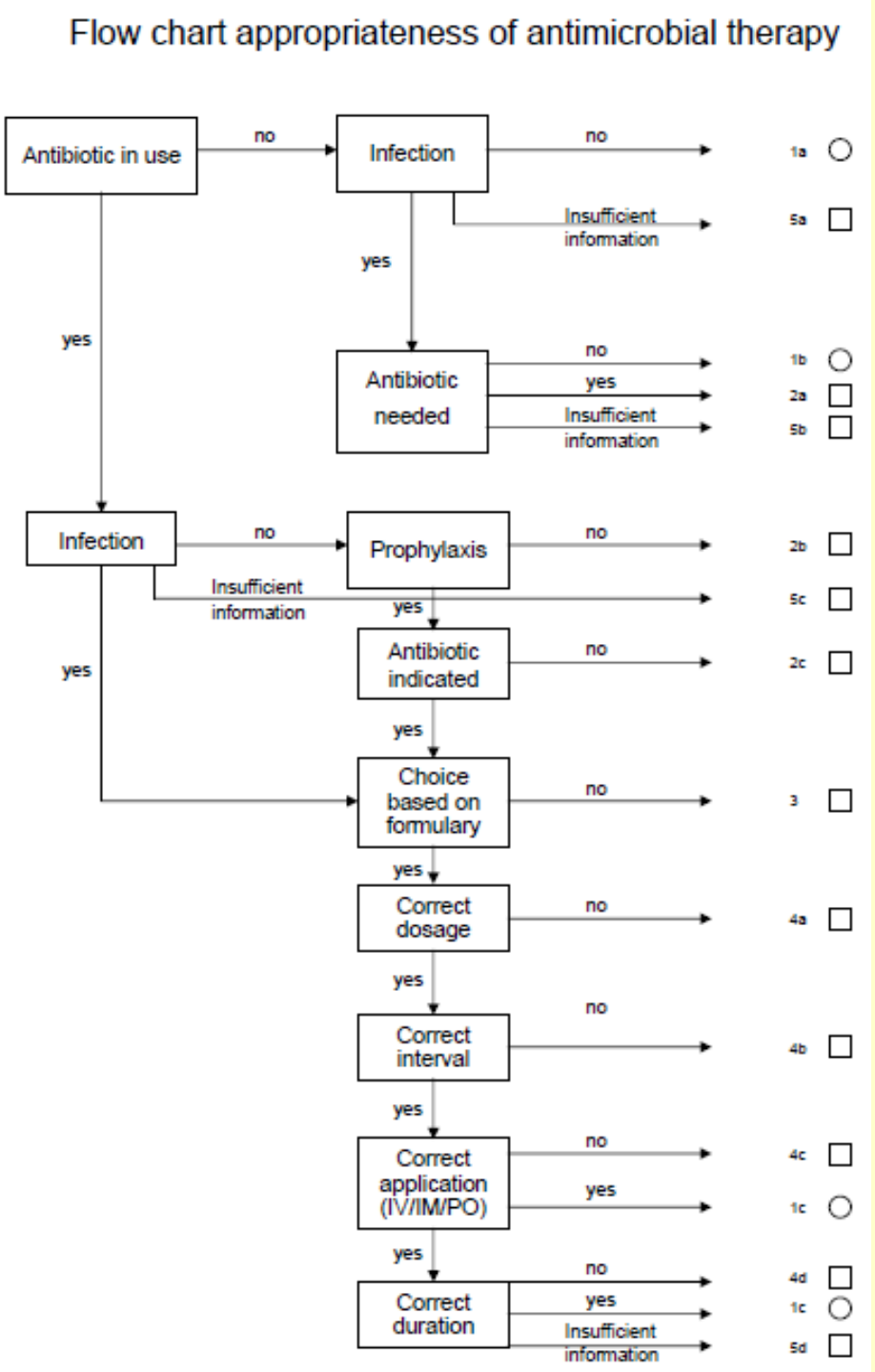
Cohort study: Surgical prophylaxis audit

- Review medical records of individual surgical cases after discharge
- Assess compliance with guideline (antibiotic, dose, timing, duration)
- What infections occurred in the cohort? Were they due to:
  - pathogens that were resistant to the prophylaxis agent used?
  - Or was prophylaxis not effective because of dosing/timing factors

Point prevalence survey

- Every 6 or 12 months, unit or hospital-wide
- Every inpatient on an antibiotic at 0800hrs visited once on survey day to determine:
  - Antibiotics in use, start, date, route and dose
  - indication for treatment if known
  - reason for treatment- community/ nosocomial infection OR infection not present OR surgical prophylaxis
  - whether treatment was indicated
  - Whether it was compliant with guidelines

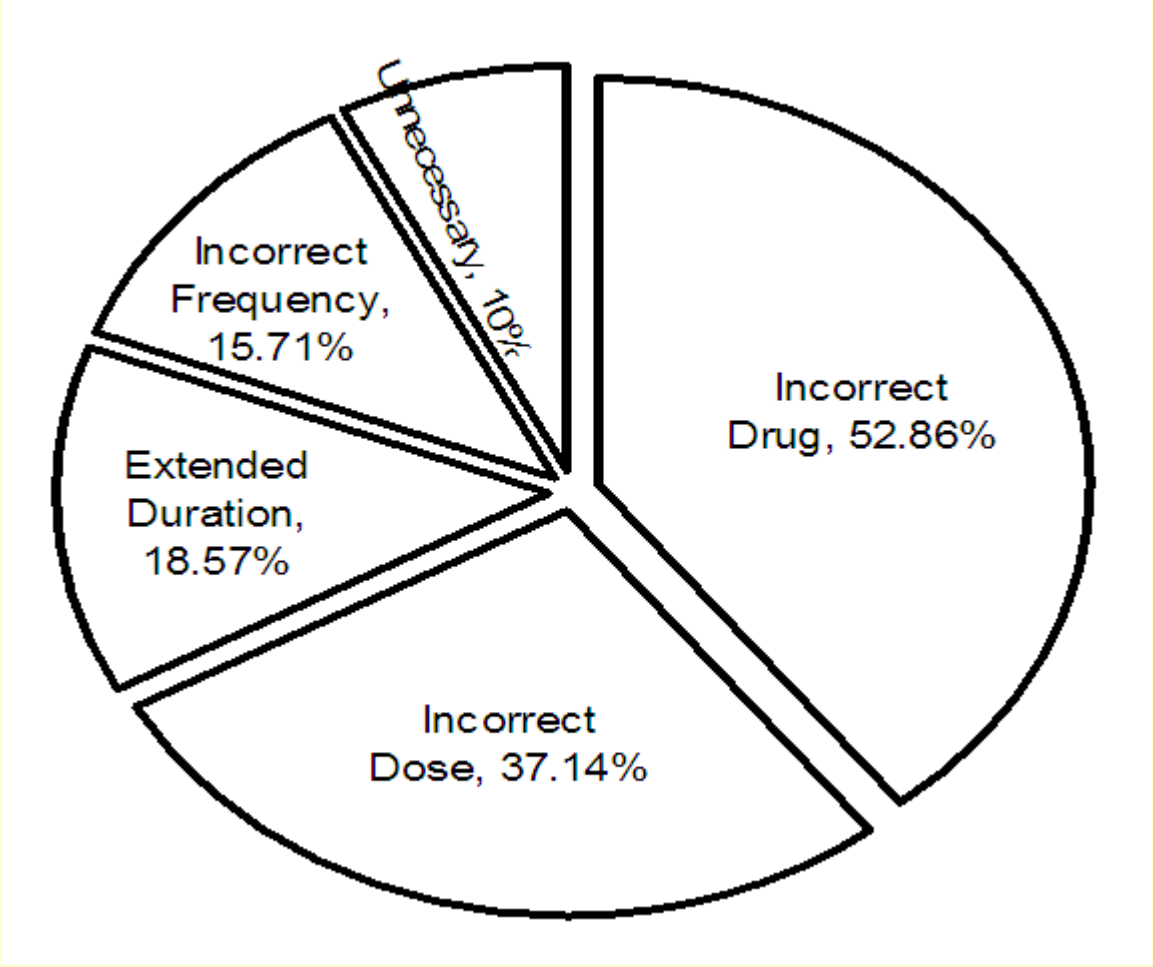
ESAC (Europe) methodology. **Ansari F, Erntell M, Goossens H, Davey P.** Clin Infect Dis. 2009 Nov 15;49(10):1496-504.



Amphia Hospital, Netherlands, Willemsen et al. AAC 2007, March, 864

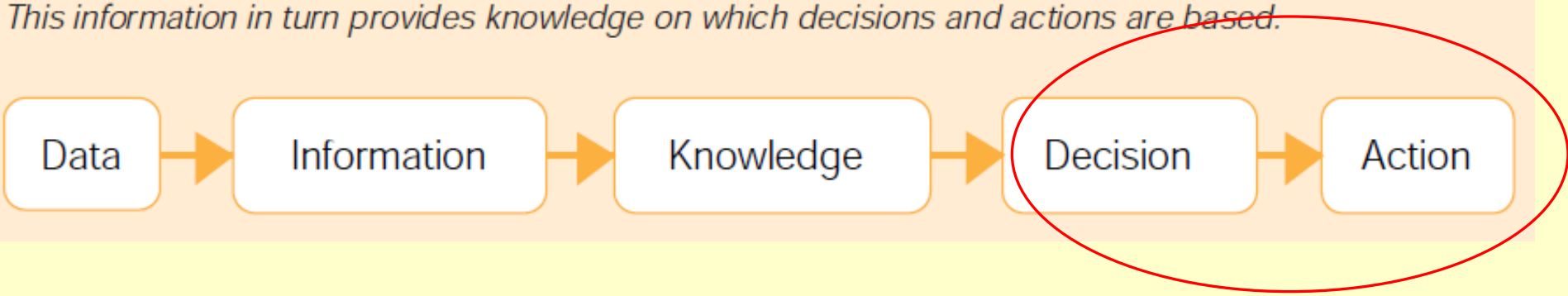
John Hunter Hospital point prevalence survey May 2010

- Conducted over 5 days by 4 staff/students
- 201/ 537 patients were receiving antibiotics
- 66% of courses were compliant with guidelines



Interventions

Data is the raw material from which information is constructed via processing or interpretation. This information in turn provides knowledge on which decisions and actions are based.



Does reducing antimicrobial use lead to less antimicrobial resistance?

Evidence from good studies says YES!

Time series analysis demonstrating improved antimicrobial resistance patterns in Pseudomonas and other Enterobacteriaceae (Yong, JAC, 2010)

Core interventions to improve use

1. Surveillance of infections and antibiotic use
2. Administrative support and governance
3. Antimicrobial control team
4. Antimicrobial control (formulary) system
5. Antimicrobial prescribing guidelines
6. Role of the Clinical Microbiologist
7. Role of clinical pharmacists
8. Education of prescribers
9. Point-of-care interventions

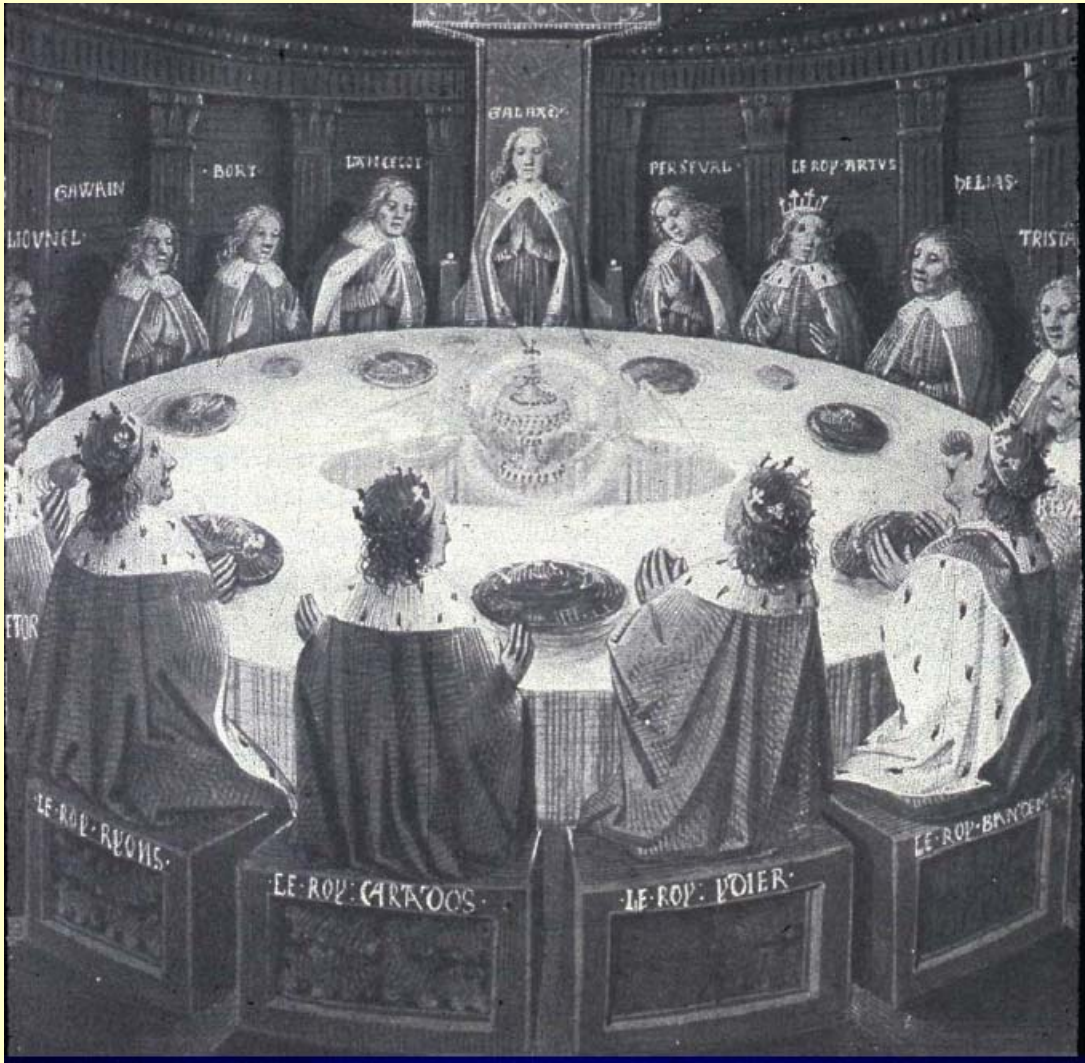
Antibiotic Policies: Theory and Practice Kluyer Academic 2005, Gould I

Administration Support

- Must persuade leaders that improving antibiotic use improves patient outcomes and is cost-effective:
  - For example, John Hunter Hospital antibiotic control program saves >A$350,000 (VD 8 billion) per year in drug costs alone
  - Must collect and present good data!
- Support required to:
  - Endorse an effective antimicrobial control plan
  - Establish and support the antimicrobial control team
- Ensure clear lines of accountability

The Antimicrobial Control ('Stewardship') Team/Committee …

- Infection specialist
- Microbiologist
- Pharmacist
- Physician
- Surgeon
- Trainee doctor



Antimicrobial control committee: antimicrobial control plan

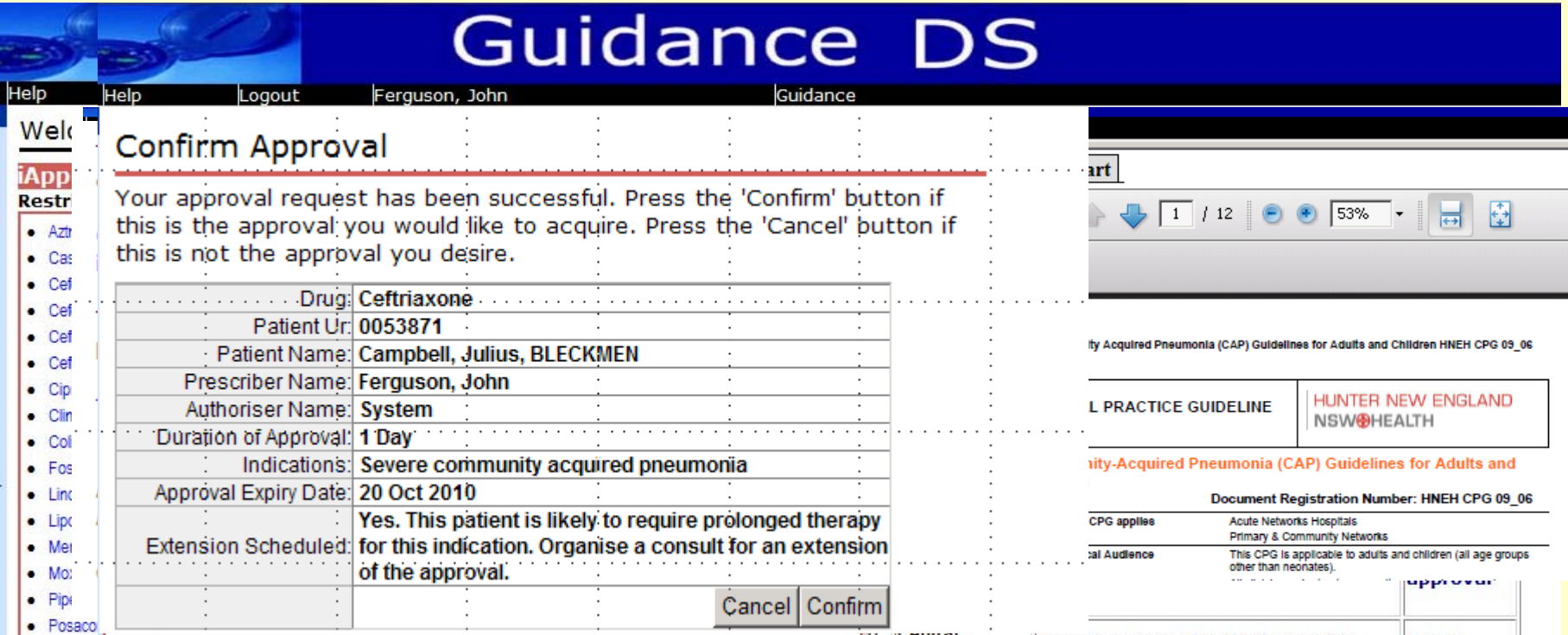
- Establish an antibiotic formulary
- Produce guidelines for antibiotic usage
- Develop and implement educational programmes
- Develop and implement other interventions
- Monitor the efficacies of and compliance with the various interventions through audit
- Undertake surveillance of antibiotic usage within each specialty, providing feedback of prescribers' own antibiotic practices in relation to those of peers or a standard
- Undertake regular reviews of interventions

Formulary Controls

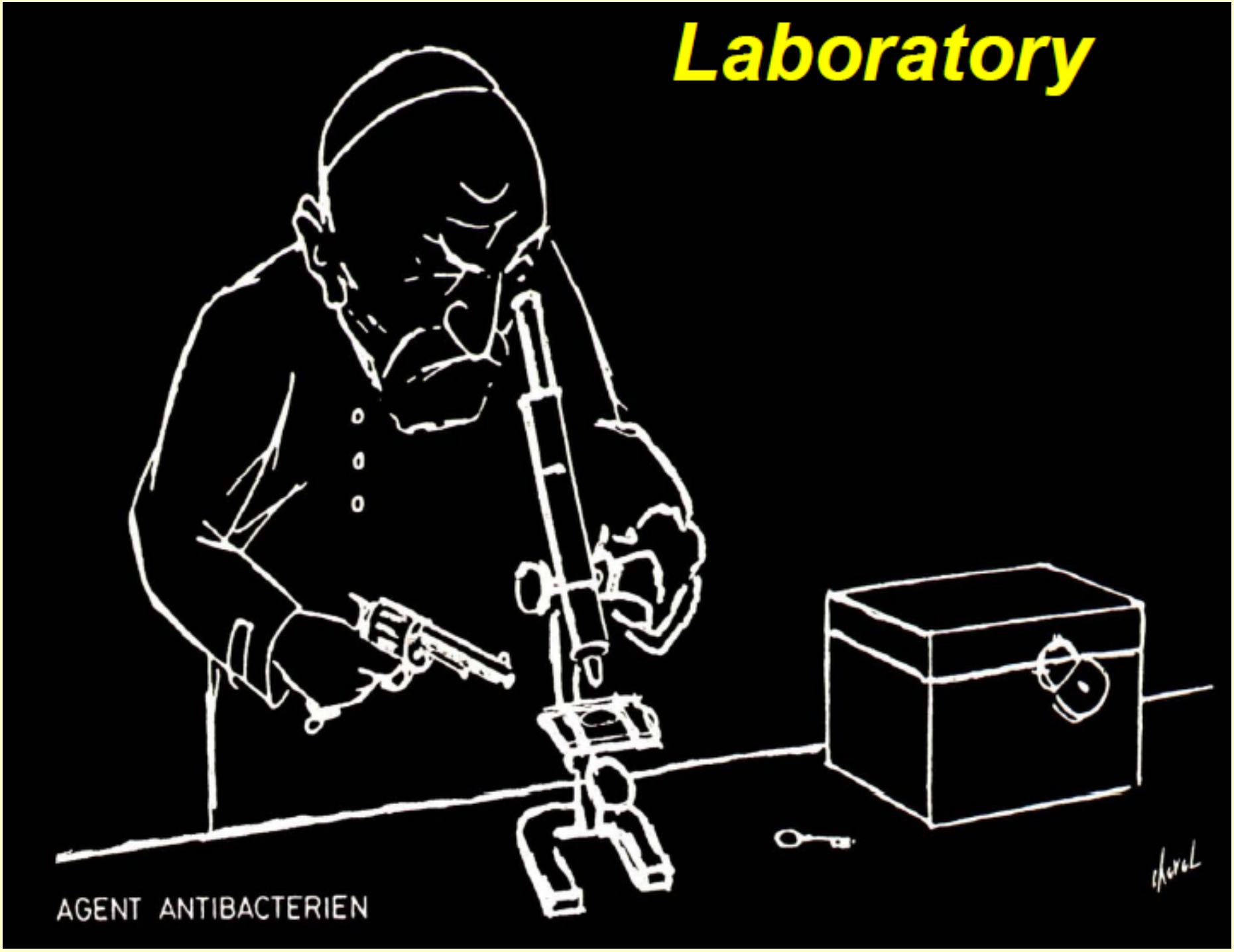
- A formulary is a restricted list of antimicrobials that prescribers can use within the hospital
  - Chosen after consideration of local infections and susceptibility patterns and other considerations
  - antibiotics that have potential for misuse, toxicity or likely to promote resistance are restricted
- Series of methods used to enforce the formulary controls

Are such controls possible in Vietnamese hospitals?

Formulary controls: computerised approval and decision support



Laboratory



The role of the clinical microbiologist

- Promote collection of correct patient microbiological specimens BEFORE antibiotics are started
- Contact the doctors about critical results – (eg. positive blood or CSF culture) to advise on treatment
- Report microbiology results to support better use:
  - Release only the relevant antibiotic susceptibility results
  - Provide comments about the significance of a culture result
  - Provide comments that give guidance about treatment
- Interact with clinical doctors on antibiotic control rounds

The important role of the ward pharmacist

- Train pharmacists about guidelines and antibiotic control!
- Give pharmacists the authority to help implement the local antimicrobial control plan
- Pharmacist can organise interventions at the ward level with backup from infection specialist or microbiologist
  - Eg. Automatic stop orders for antibiotics
- Pharmacist does surveillance and checking of prescribing
- Participates in Antimicrobial Control Rounds

Antimicrobial control rounds

- Overall aim- to ensure patients are receiving correct treatment for correct duration
- Infection specialist, clinical microbiologist, pharmacist and trainee specialist doctor
- Australia:
  - Intensive care rounds – daily or twice weekly
  - Hospital: Review patients receiving ‘restricted’ antibiotics
  - review of patients with proven bloodstream infection and ensure that they are getting correct antibiotic treatment
- Vietnam: initial hospital priorities
  - Intensive care units
  - Surgical patients

Intensive care antibiotic control: practical steps

1. Feedback surveillance data to ICU specialists regularly; discuss the results, discuss local research on antibiotic resistance that might be useful
2. Build trust - Clinical Microbiologist/Infectious Diseases specialist visits ICU daily to provide /discuss new microbiology results
3. Start joint rounds between ICU, Infectious Diseases, Microbiology and Pharmacy
   - Review every patient who is on an antibiotic
   - intensive care specialist gives a case summary
   - microbiology results for patient are reviewed
   - antimicrobial plan for each patient agreed, documented and implemented
4. Review the impact of rounds and changes to antibiotic usage (research)

Use local research to drive change: examples

- Antibiotic usage and resistance
  - time series studies of usage and resistance – identify which antibiotics are the main drivers of hospital resistance
- Microbiology:
  - Improved diagnosis of infection
- Surgical prophylaxis and wound infection:
  - Complete avoidance of cephalosporins (no rationale to use in Vietnam owing to very high ESBL carriage in community);
- Community acquired pneumonia:
  - return to narrow spectrum treatment (benzylpenicillin) for mild/moderate disease
- Ventilator associated pneumonia:
  - local studies of causes, diagnosis, treatment approaches

Other key factors

- Pharmaceutical industry promotion amongst prescribers- needs control
- How do we change patient expectations – public campaigns in high income countries - some success
- Using effective educational strategies for implementing change

Lancet Infect Dis. 2010 Jan;10(1):17-31. **Characteristics and outcomes of public campaigns aimed at improving the use of antibiotics in outpatients in high-income countries.** Huttner B, Goossens H, et al

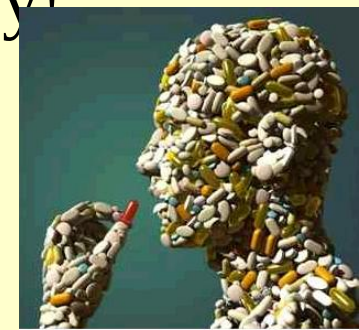
Is antimicrobial control worth the trouble?

Yes we can!

- *decrease multi-resistant infections by reducing antibiotic use!*
- Reduce costs
- Reduce patient side effects

Summary

- Urgent need for effective antimicrobial control programs that reduce usage and reduce bacterial resistance
- The basis of such programs is surveillance and research of resistance, usage and prescribing behaviour
- Multi-faceted interventions are required to change behaviour of prescribers- study behavioural science!
- Evaluate the impact. Pay attention to significant barriers and change interventions if necessary!
- Publicize your success and the cost-benefits of your program!



References

Web resource: www.hicsiganz.org

Antibiotic Policies: Theory and Practice Kluyer Academic 2005, Gould I

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Infectious Diseases Society of America/SHEA: Guidelines for stewardship. Clinical Inf Diseases 2007 Dellit et al.

Journal of Antimicrobial Chemotherapy (2006) 57, 1189–1196
doi:10.1093/jac/dkl137
Advance Access publication 19 April 2006

JAC

Antimicrobial prescribing policy and practice in Scotland: recommendations for good antimicrobial practice in acute hospitals

Dilip Nathwani* on behalf of Scottish Medicines Consortium (SMC) Short Life Working Group, The Scottish Executive Health Department Healthcare Associated Infection Task Force†

ARPAC

Antibiotic Resistance Prevention And Control