Targets for improvement in hospital antimicrobial use

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We have a problem….

NCAS

- 75% of hospitalised patients receive an antibiotic
  25-50% of use is inappropriate

- Antimicrobial use drives antimicrobial resistance
  Antimicrobial resistance is on the increase

- ‘Spiralling empiricism’ – further escalates broad spectrum use

We can do something about it

Current evidence on hospital antimicrobial stewardship objectives: a systematic review and meta-analysis

Emelie C Schuts, BSc, Prof Marlies E J L Hulscher, PhD, Prof Johan W Mouton, MD, Cees M Verduin, MD, James W T Cohen Stuart, MD, Hans W P M Overdiek, PharmD, Paul D van der Linden, PharmD, Stephanie Natsch, Pharm D, Prof Cees M P M Hertogh, MD, Tom F W Wolfs, MD, Jeroen A Schouten, MD, Prof Bart Jan Kullberg, MD, Prof Jan M Prins, MD

Adherence to prescribing guidelines

Reduced mortality RRR 35% p<0.001

Restriction of access to broad spectrum antibiotics

Reduces antibiotic consumption

Culture driven de-escalation

Reduces mortality RRR 56%p<0.001

Staph aureus bacteraemia ID expert review

Reduces mortality RRR 66%p<0.001

IV to oral switch strategies

Shorter length of stay, no difference in mortality

Use of therapeutic drug monitoring

Reduces nephrotoxicity

THE LANCET
Infectious Diseases

Interventions to improve antibiotic prescribing practices for hospital inpatients (Review)

Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, Gould IM, Ramsay CR, Michie S

High certainty evidence

AMS interventions **do improve prescribing behaviours**

Reduced antibiotic use **does not increase mortality**

They do reduce length of stay - **cost saving**

Effective dissemination could have high impact

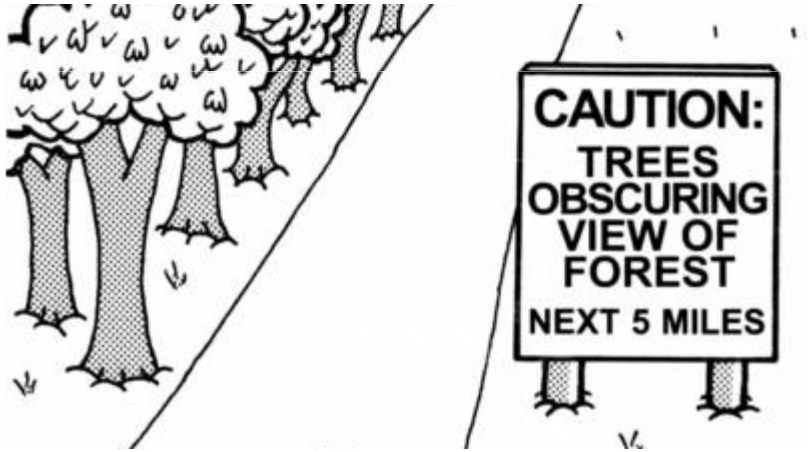
We need an AMS program

Where do I start??

Sometimes you cant see the wood for the trees!

Surrounded by so many problems

Can’t get perspective



Antimicrobial stewardship

Strategies to optimize the use of antimicrobials to:

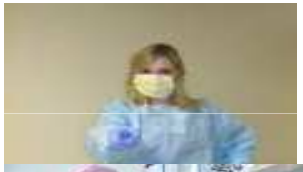
- *Improve **patient outcomes** - optimize prevention & treatment infections*
- *Minimize impact on local **ecology** - limit antimicrobial resistance*
- *Ensure **cost effective healthcare***

Safety and Quality	Public Health
Individual Patient care Infection rates, Mortality	Broader issues Communicable diseases (AMR), Costs

AMS at an Institutional level

Medication safety
- pharmacists, doctors (physicians)

Infection prevention
- ICPs, nurses, cleaners, (surgeons)



AMS doesn't fit neatly into one area
Lots of stakeholders

Philosophy

AMS is about '**quality and safety'**

– The patient is the centrepoint – our aim is to provide best care

AMS is a **whole hospital activity**, multi-disciplinary

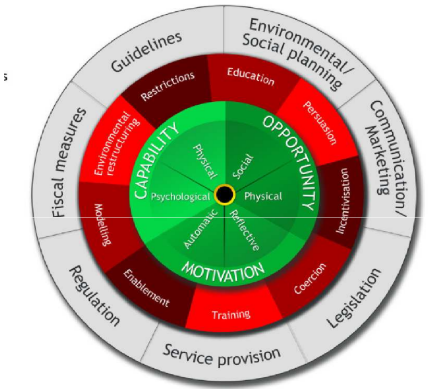
– not ID/micro owned, shared responsibility, we all have the same goals

Our approach must be coherent, aligned, practical, sustainable and it needs to lead to the changes that we want

The challenge

Antimicrobial use is very common- people are attached to what they do

We want to change their behaviour



Behaviour is the result of:

Knowledge (information) plus

Attitude (culture) influenced by

External enablers and barriers

Our job is to:

Educate and Motivate staff

- Understand perspectives/ concerns of all stakeholders

Remove Barriers, Enable better prescribing

- Make sure AMS interventions fit workflow of all stakeholders

Think about what you want to achieve

- *We want patients to get the right treatment*
- *We want to minimise unnecessary over use of antibiotics*
- *We want to shift from broad to narrow spectrum drugs*
- *We want local AMR pathogen rates to fall*
- *We want morbidity/mortality from infections to improve*
- *We want severely ill septic patients to get urgent treatment*
- *We want shorter lengths of hospital stay*
- *We want to prevent surgical site infections*
- *We want to minimize drug toxicity*

Choose a few targets

Look at local data

Start simple and small – just pick a few target issues per year

Choose the ‘friendly’ units first, Build momentum, Gain credibility

- Specific thing
- Measurable (plan this)
- Achievable (be realistic given resources)
- Relevant to clinicians (so they care)
- Time based

Specific target issues

Early issues – clear message, big gap to correct, important safety issue, acceptable

- Durations
- IV to oral switch
- Surgical prophylaxis – appropriate, c/w guidelines
- Antibiotic prescribing for cellulitis, pneumonia – appropriate, c/w guidelines
- Gentamicin / vancomycin dosing

More challenging issues – need to embed with the teams, understand why….

- Meropenem use
- Antifungal use
- Antibiotic prescribing in hospital in the home
- Sepsis management

AMS Interventions

How might we achieve the change we want?

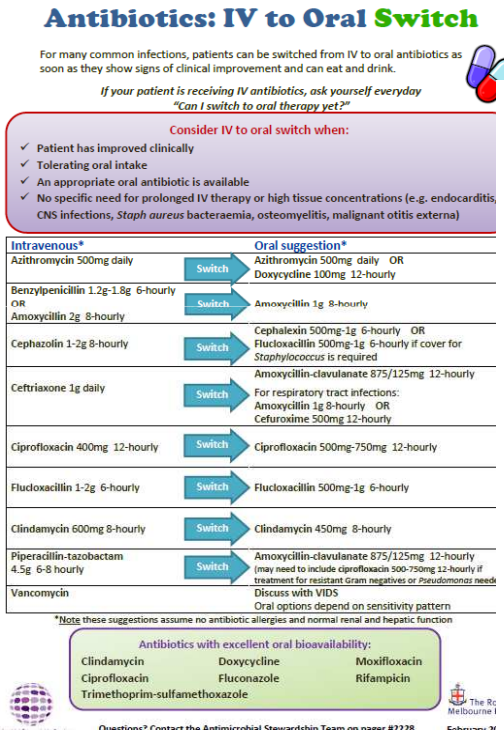
- Education
  - Access to information, establish a culture shift
    - Implement guidelines – make them easy to use – checklists, pathways, posters, apps
- Restrictive
  - Pre/ post prescription approval
    - Establish policies, procedures, tools,
- Persuasive
  - Patient centred discussion – pre or post prescription
    - Provide access to expert advice
- Audit and feedback
  - Identify issues, Monitor progess, Motivation/ Reinforcement

? What is possible given our resources

Interventions: IV to Oral switch, Durations

Posters, Mobile phone apps

Engaging nurses and pharmacists
to do this according to agreed criteria



Antibiotics: IV to Oral Switch

For many common infections, patients can be switched from IV to oral antibiotics as soon as they show signs of clinical improvement and can eat and drink.

If your patient is receiving IV antibiotics, ask yourself everyday "Can I switch to oral therapy yet?"

Consider IV to oral switch when:

- ✓ Patient has improved clinically
- ✓ Tolerating oral intake
- ✓ An appropriate oral antibiotic is available
- ✓ No specific need for prolonged IV therapy or high tissue concentrations (e.g. endocarditis, CNS infections, *Staph aureus* bacteraemia, osteomyelitis, malignant otitis externa)

Intravenous*		Oral suggestion*
Azithromycin 500mg daily	Switch	Azithromycin 500mg daily OR Doxycycline 100mg 12-hourly
Benzylpenicillin 1.2g-1.8g 6-hourly OR Amoxycillin 2g 8-hourly	Switch	Amoxycillin 1g 8-hourly
Cephazolin 1-2g 8-hourly	Switch	Cephalexin 500mg-1g 6-hourly OR Flucloxacillin 500mg-1g 6-hourly if cover for *Staphylococcus* is required
Ceftriaxone 1g daily	Switch	Amoxycillin-clavulanate 875/125mg 12-hourly For respiratory tract infections: Amoxycillin 1g 8-hourly OR Cefuroxime 500mg 12-hourly
Ciprofloxacin 400mg 12-hourly	Switch	Ciprofloxacin 500mg-750mg 12-hourly
Flucloxacillin 1-2g 6-hourly	Switch	Flucloxacillin 500mg-1g 6-hourly
Clindamycin 600mg 8-hourly	Switch	Clindamycin 450mg 8-hourly
Piperacillin-tazobactam 4.5g 6-8 hourly	Switch	Amoxycillin-clavulanate 875/125mg 12-hourly (may need to include ciprofloxacin 500-750mg 12-hourly if treatment for resistant Gram negatives or *Pseudomonas* needed
Vancomycin		Discuss with VIDS Oral options depend on sensitivity pattern

*Note these suggestions assume no antibiotic allergies and normal renal and hepatic function

Antibiotics with excellent oral bioavailability:

Clindamycin, Doxycycline, Moxifloxacin, Ciprofloxacin, Fluconazole, Rifampicin, Trimethoprim-sulfamethoxazole

Antibiotics: what duration?

The duration of antibiotic therapy needed for many common infections may be SHORTER than you think!

Always ASK

Does my patient still need antibiotics?
Can we switch to oral therapy yet?
What is the planned duration?

Condition	Recommended duration (Total IV and oral)
Community-acquired pneumonia	Mild: 5 days Moderate/Severe: 7 days
Hospital-acquired pneumonia	7 days
Uncomplicated aspiration pneumonia	7 days
Infective exacerbation of COPD	5 days
Cystitis	Female: 3 to 5 days* Male: 7 days
Pyelonephritis	7 to 14 days*
Cellulitis	Mild: 5 to 10 days Severe: 7 to 14 days*
Clostridium difficile infection	10 days

When your patient is being discharged, think about the TOTAL duration of therapy required

Infective endocarditis *Staphylococcus aureus* bacteraemia Central nervous system infections Complex intra-abdominal infection e.g. abscess Bone and joint infections Prosthetic device infections Prostatitis	Prolonged antibiotic therapy is required ➔ *Seek VIDS advice*

Interventions: Implementing guidelines

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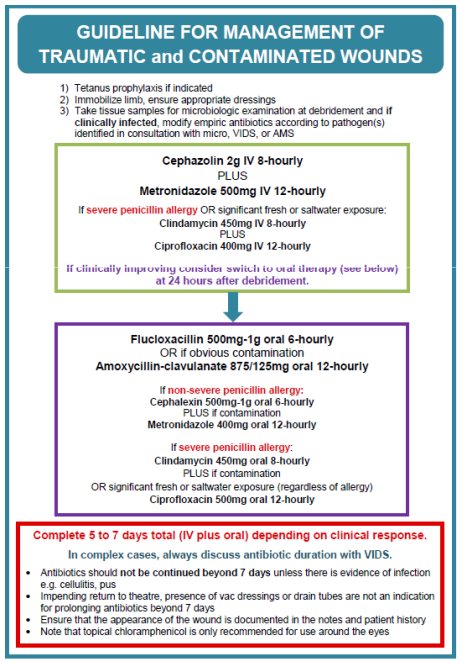
	No allergy to penicillin	Non-immediate penicillin hypersensitivity	Immediate penicillin / beta-lactam hypersensitivity
COMMUNITY ACQUIRED PNEUMONIA SEVERE	ceftriaxone 1g IV 12-hourly PLUS azithromycin 500mg IV daily	ceftriaxone 1g IV 12-hourly PLUS azithromycin 500mg IV daily	moxifloxacin 400mg IV daily
MODERATE	benzylpenicillin 1.2g IV 6-hourly PLUS doxycycline 100mg oral 12-hourly	ceftriaxone 1g IV daily PLUS doxycycline 100mg oral 12-hourly	moxifloxacin 400mg oral/IV daily
MILD	amoxycillin 1g oral 8-hourly OR/AND doxycycline 100mg oral 12-hourly 7 days	cefuroxime 500mg oral 12-hourly OR/AND doxycycline 100mg oral 12-hourly 7 days	doxycycline 100mg oral 12-hourly 7 days
Add oral oseltamivir 75mg 12-hourly if concerned about influenza			
Replace ceftriaxone with piperacillin-tazobactam 4.5g IV 6-hourly OR meropenem 1g IV 8-hourly if severe AND known respiratory colonisation with resistant bacteria eg. *Pseudomonas*			
Consider additional treatment with flucloxacillin 2g IV 6-hourly and vancomycin if strongly suspect *Staph. aureus* in severe cases (eg. cavitating pneumonia or rapid clinical deterioration) → Refer to VIDS			
HOSPITAL ACQUIRED PNEUMONIA SEVERE	piperacillin/tazobactam 4.5g IV 6-hourly OR ceftriaxone 1g IV 12-hourly*	cefepime 2g IV 8-hourly OR ceftriaxone 1g IV 12-hourly*	clindamycin 600mg IV 8-hourly PLUS ciprofloxacin 400mg IV 8-hourly
MODERATE	ceftriaxone 1g IV daily	ceftriaxone 1g IV daily	moxifloxacin 400mg IV/oral daily
MILD	amoxycillin/clavulanate 875/125mg oral 12-hourly 7 days	cefuroxime 500mg oral 12-hourly 7 days	moxifloxacin 400mg oral daily 7 days
*Ceftriaxone can be used for severe HAP if: no shock/organ failure and no additional risk factors for multidrug resistant (MDR) bacteria (e.g. <5 days in ICU, no recent broad spectrum antibiotic use, no known respiratory colonisation with MDR Gram-negative bacteria, no significant immunosuppression).			
Use meropenem 1g IV 8-hourly and consider adding stat gentamicin IV if severe sepsis and known respiratory colonisation with resistant bacteria e.g. *Pseudomonas* OR high risk travel within 12 months			
Add vancomycin if patient has severe sepsis or septic shock			
INTRA-ABDOMINAL INFECTION SEVERE	piperacillin/tazobactam 4.5g IV 6-hourly	cefepime 2g IV 8-hourly PLUS metronidazole 500mg IV 12-hourly	ciprofloxacin 400mg IV 12-hourly PLUS metronidazole 500mg IV 12-hourly
MODERATE	ceftriaxone 1g IV daily PLUS metronidazole 500mg IV 12-hourly OR amoxycillin plus gentamicin plus metronidazole*	ceftriaxone 1g IV daily PLUS metronidazole 500mg IV 12-hourly	ciprofloxacin 400mg IV 12-hourly PLUS metronidazole 500mg IV 12-hourly
MILD	amoxycillin/clavulanate 875/125mg oral 12-hourly 7 days	trimethoprim/sulfamethoxazole 160/800mg oral 12-hourly PLUS metronidazole 400mg oral 12-hourly 7 days	trimethoprim/sulfamethoxazole 160/800mg oral 12-hourly PLUS metronidazole 400mg oral 12-hourly 7 days



Make it easy to access information

Posters,

iPhone app,

Electronic decision support

Interventions: Pathways

<u>Sepsis Pathway</u>

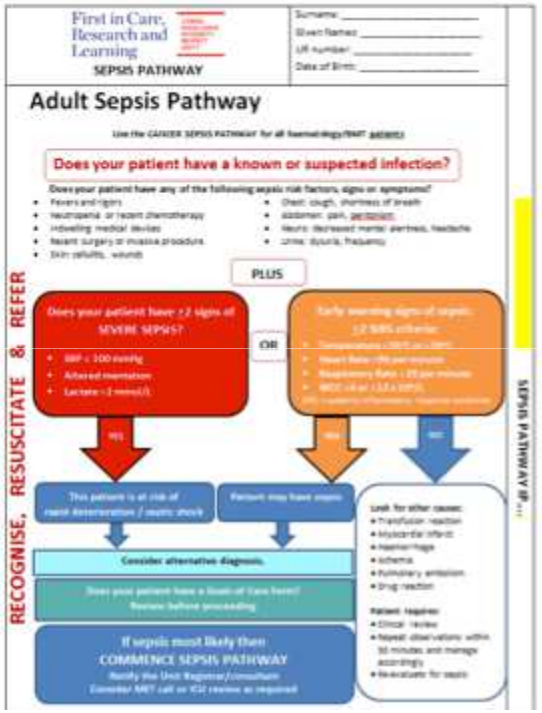
Whole of hospital activity

Nurses are the key users

Helped to make AMS a priority for them

Helped to ensure AMS was not just perceived as ‘the antibiotic police’

our priority is safest care



Intervention: Expert review

Post prescription AMS rounds

- ID Physician plus dedicated antimicrobial pharmacist
- 3x/week ward rounds
- Recruit patients via approval program (+ dispensing alert, electronic prescription, microbiology eg;C difficle or pathology eg; gentamicin level)
- Review notes/charts, document advice, call to discuss, ID refer if complex
- See all ICU patients – area of importance, coordination
- Embedded service in haematology/ bone marrow transplant

Antimicrobial Stewardship Team

Planning what to measure

how we will show improvement?

Measures – all the things we could choose to measure

Indicators - a few things we choose, as markers of how we are going

Goals – targets we set, what we aim to achieve

What to measure

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Structural measures
Who / What we have in place

Shows that our AMS program is functional

Process measures
What they are doing - activity

Assumption that these processes lead
to the outcomes we want
(based on prior evidence)
– often able to define and collect these data

Outcome measures
What this affects - consequences

What we want to achieve
Often very confounded
- limitations in interpretation

Structural measure Indicators & Goals

- AMS staff dedicated EFT
  - 500 beds = 2 EFT pharmacist, 1 EFT doctor
- Antimicrobial stewardship committee – frequency of meetings
  - Aim 6 weekly meetings
- Antimicrobial prescribing policy, Formulary with restrictions - updated
  - Aim 2 yearly review
- Guidelines, Clinical pathways – number provided/ updated
  - Aim update every 2 years, **Map how often they are accessed, how often they are used**
- Education sessions – number provided / attended
  - Aim to reach all levels/ disciplines every year – electronic plus in person
- Approval system (electronic, phone, paper) – procedure is present/ active
  - Target 300 approvals/month
- Post prescription review system - procedure is present/ active
  - Target to sustain 3 times weekly rounds on wards, daily in ICU

Process measure Indicators & Goals

- **Quantitative measures**

Indicators

Quantity broad spectrum Abx use measured as ddd/1000bd

Possible Goals

eg: vancomycin use - below national average (note; may be appropriate)

- **Qualitative measures**

Indicators

Appropriateness of use

Possible Goals

>95% of antimicrobial use judged appropriate at NAPS (KPI)

>95% of surgical prophylaxis stopped within 24 hours (KPI)

Outcomes measure Indicators & Goals

Clinical

- Mortality - Gram negative bacteraemia
- LOS, readmission - pneumonia
- C difficile events, SSI rates

Microbiologic

- ESBL, CRE, MRSA rates (what samples, which patients?)

Financial

- Cost effectiveness of AMS programs

- Useful to monitor BUT don’t promise to change things
- Don’t make them KPIs – too much you cannot control
- Can be used as balancing measures – no worse, no additional harm

Auditing

- Large audits
  - Annual whole hospital point prevalence surveys
  - Get a good overview of what is happening, Not much detail
  - May uncover new issues
  - More generalisable, more comparable,

- Small audits
  - Quality improvement audits – eg; 10 patients/month, regular, simple
  - Dedicated audits - delve a bit deeper, try to ‘understand why’

Auditing

Utilise established resources

- Standardised Validated
  - Antimicrobial Consumption Interactive Database (ESAC-Net) - European
  - National Antimicrobial Utilisation Surveillance Program (NAUSP) - Australian
  - National Antimicrobial Prescribing Survey (NAPS) – Australian

National activity

- sense of common purpose
- consistent definitions - **allows comparison between similar hospitals**

Focus on items that are ‘actionable’

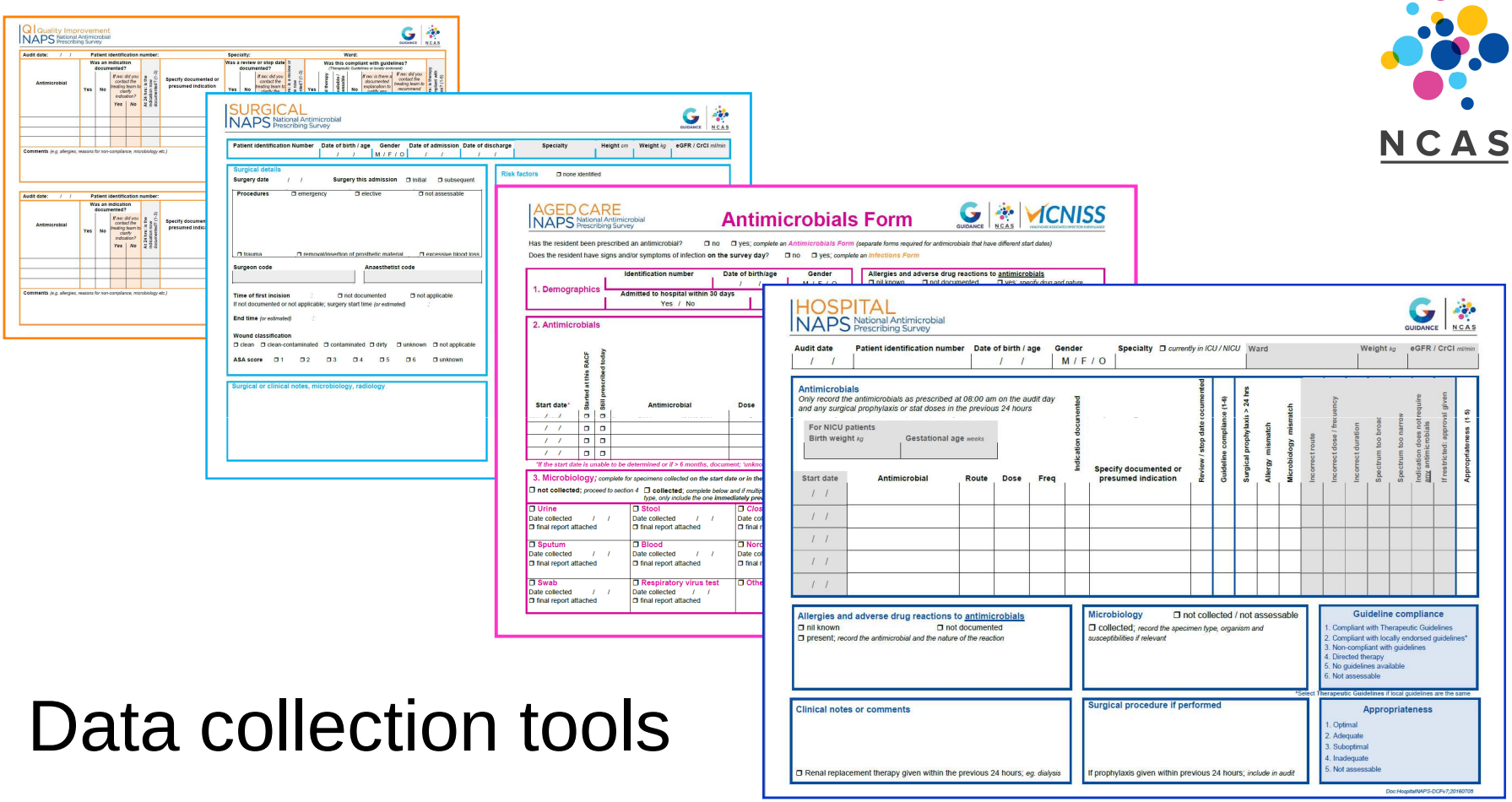
Appropriateness

Appropriate

Inappropriate

Not assessable

			If endorsed guidelines are present	If endorsed guidelines are absent
Appropriate	1	Optimal[1]	Antimicrobial prescription follows either the Therapeutic Guidelines[2] or endorsed local guidelines *optimally*, including antimicrobial choice, dosage, route and duration[3]	The antimicrobial prescription has been reviewed and endorsed by an infectious diseases clinician or a clinical microbiologist **OR** The prescribed antimicrobial will cover the likely causative or cultured pathogens ***and*** there is not a narrower spectrum or more appropriate antimicrobial choice, dosage, route or duration[3] available
	2	Adequate	Antimicrobial prescription does not optimally follow the Therapeutic Guidelines[2] or endorsed local guidelines, including antimicrobial choice, dosage, route or duration[3], however, is a ***reasonable*** alternative choice for the likely causative or cultured pathogens **OR** For surgical prophylaxis, as above ***and*** duration[3] is less than 24 hours	Antimicrobial prescription including antimicrobial choice, dosage, route and duration[3] is not the most optimal, however, is a ***reasonable*** alternative choice for the likely causative or cultured pathogens **OR** For surgical prophylaxis, as above ***and*** duration[3] is less than 24 hours
Inappropriate	3	Suboptimal	There may be a mild or non-life-threatening allergy mismatch **OR** Antimicrobial prescription including antimicrobial choice, dosage, route and duration[3], is an ***unreasonable*** choice for the likely causative or cultured pathogens, including: • spectrum excessively broad, unnecessary overlap in spectrum of activity, dosage excessively high or duration excessively long • failure to appropriately de-escalate with microbiological results	
	4	Inadequate	Antimicrobial prescription including antimicrobial choice, dosage, route or duration[3] is ***unlikely*** to treat the likely causative or cultured pathogens **OR** The documented or presumed indication does not require ***any*** antimicrobial treatment **OR** There may be a severe or possibly life-threatening allergy mismatch, or the potential risk of toxicity due to drug interaction **OR** For surgical prophylaxis, the duration[3] is greater than 24 hours (except where local guidelines endorse this)	
	5	Not assessable	The indication is not documented and unable to be determined from the notes **OR** The notes are not comprehensive enough to assess appropriateness **OR** The patient is too complex, due to multiple co-morbidities, allergies or microbiology results, *etc.*	



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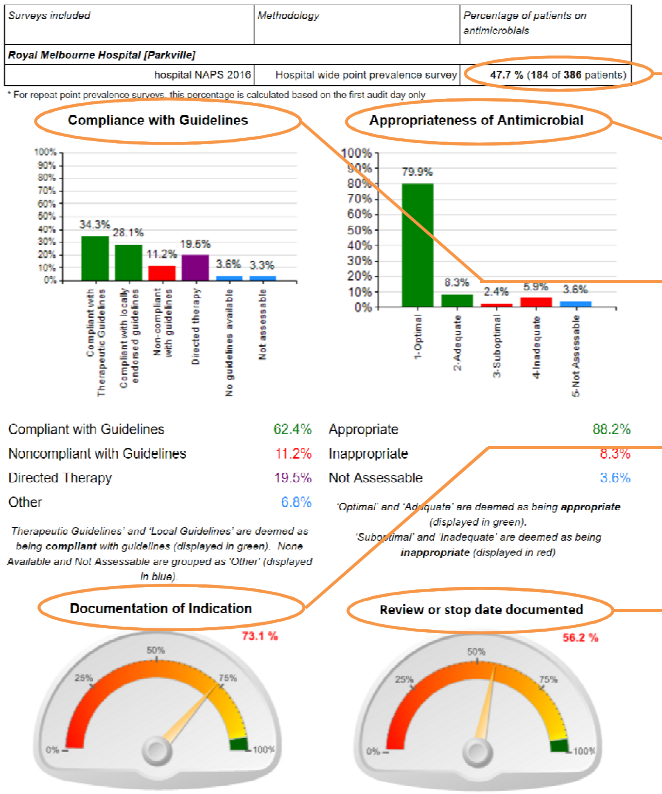
Data collection tools

Reports



Surveys included	Methodology	Percentage of patients on antimicrobials
Royal Melbourne Hospital [Parkville]		
hospital NAPS 2016	Hospital wide point prevalence survey	**47.7 % (184 of 386 patients)**

* For repeat point prevalence surveys, this percentage is calculated based on the first audit day only

Compliance with Guidelines

Compliant with Guidelines	62.4%
Noncompliant with Guidelines	11.2%
Directed Therapy	19.5%
Other	6.8%

*Therapeutic Guidelines' and 'Local Guidelines' are deemed as being **compliant** with guidelines (displayed in green). None Available and Not Assessable are grouped as 'Other' (displayed in blue).*

Appropriateness of Antimicrobial

Appropriate	88.2%
Inappropriate	8.3%
Not Assessable	3.6%

*'Optimal' and 'Adequate' are deemed as being **appropriate** (displayed in green).*
*'Suboptimal' and 'Inadequate' are deemed as being **inappropriate** (displayed in red)*

Documentation of Indication

Review or stop date documented

Prevalence

Appropriateness

Compliance with guidelines

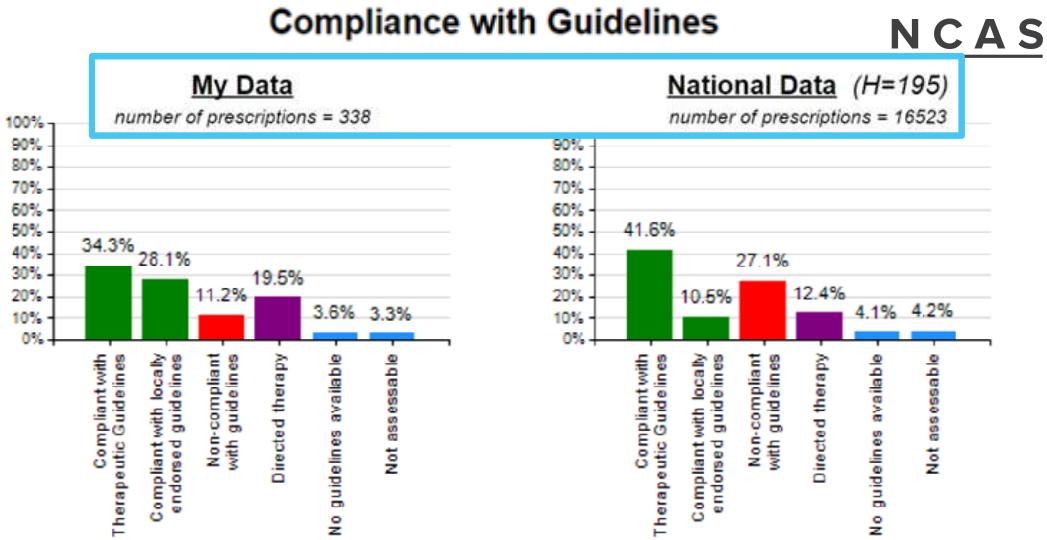
Documentation of indication

Review or stop date documented

Benchmarking

Apply benchmarking filters

- Public or private
- State or territory
- Remoteness
- Number of beds



Compliant with Guidelines	62.4%	Compliant with Guidelines	52.2%
Noncompliant with Guidelines	11.2%	Noncompliant with Guidelines	27.1%
Directed Therapy	19.5%	Directed Therapy	12.4%
Other	6.8%	Other	8.3%

*Therapeutic Guidelines' and 'Local Guidelines' are deemed as being **compliant** with guidelines (displayed in green).*
None Available and Not Assessable are grouped as 'Other' (displayed in blue).

Inappropriate use

Table 11 The 20 indications for which antimicrobials were most commonly prescribed inappropriately in hospitals, 2015[a]

Indication	Number of prescriptions	Appropriate (%)	Inappropriate (%)	Not assessable (%)
Bronchitis	68	57	41	2
Surgical prophylaxis	3404	56.0	40.5	3.5
Infective exacerbation of asthma	75	60	37	3
Infective exacerbation of COPD	661	64.1	34.3	1.5
Fever/pyrexia of unknown origin	152	59	31	10
Pancreatitis	42	67	29	5
Abscess (includes quinsy)	35	71	29	0
Tonsillitis	39	67	28	5
Cholecystitis	309	71	28	1
Trauma (includes wound)	187	70	28	3
Colitis	36	64	28	8
Bronchiectasis	123	72	26	2
Aspiration pneumonia	408	74	25	2
Catheter-associated infection	69	70	25	6
Community-acquired pneumonia	2315	74.6	24.4	1.0
Premature rupture of membranes	30	77	23	0
Empyema	66	74	23	3
Abscess/boils/folliculitis	118	78	22	0
Wound infection: surgical	404	74	22	5
Cystitis	205	77	22	2

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Target areas

-Surgical prophylaxis

-Resp infections

-Skin soft tissue infn

Common things are being done poorly, responsible for large volumes of antibiotics

Detailed audits

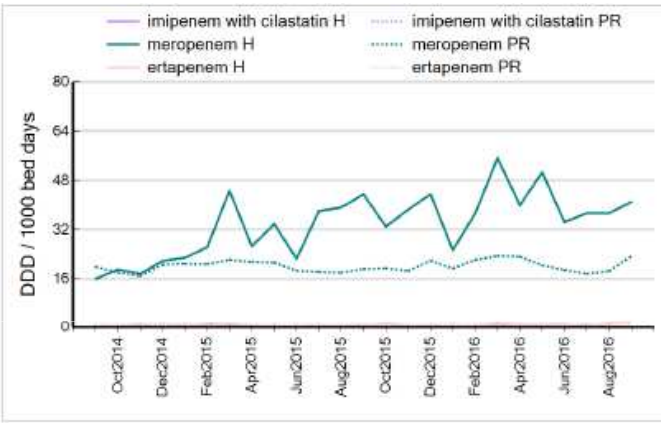
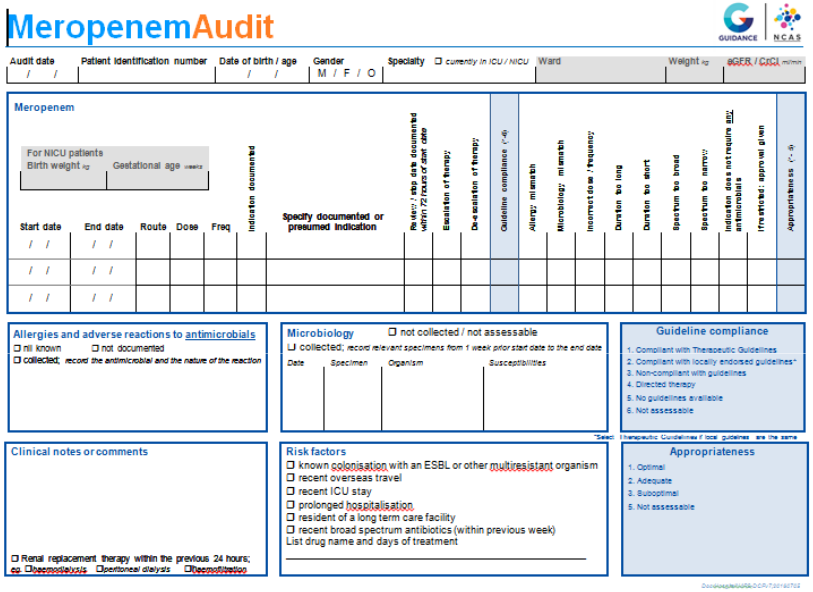
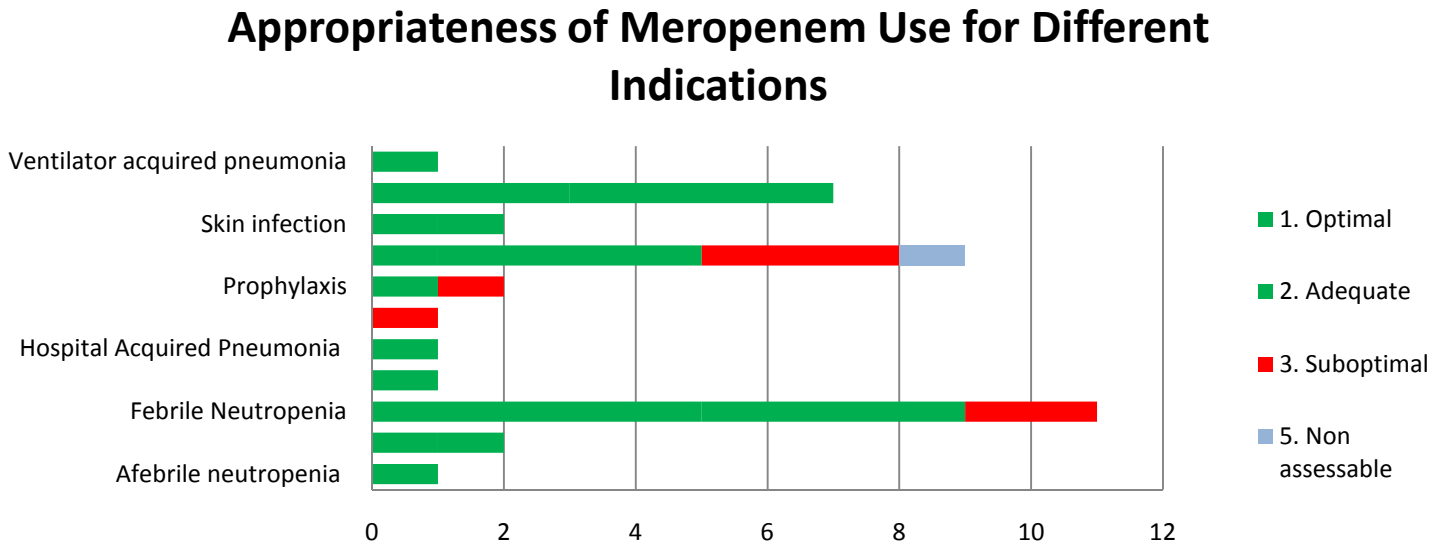


Chart 17: carbapenems



Understanding prescribing behaviour
Ask the right questions
Design interventions to address what you find

Actionable information



Leads to action – who to talk to, what to discuss, what education/intervention we might need

Ideas for targets

- Appropriateness vs c/w guidelines (>95%)
  - NAPS (whole hospital) or conditions - cellulitis, pneumonia etc
- Surgical prophylaxis durations <24 hrs (>95%)
  - NAPS/SNAPS/ dedicated one unit
- IV to oral switch opportunities at 72 hours
  - Dedicated - one unit
- Documentation of indication (>95%)
  - NAPS QI, 5x5
- Durations c/w recommendations (>95%)
  - Dedicated – one condition

  Time to antibiotics for severe sepsis

  Dedicated audit ? those admitted to ICU from ED

Feedback Reports

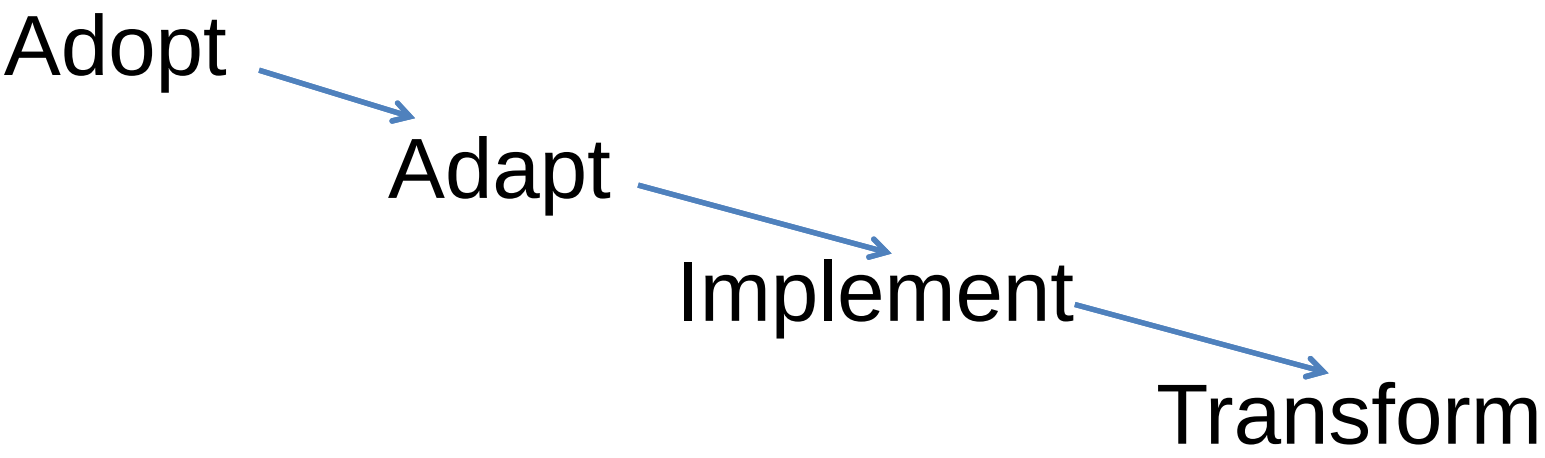
To Executive and Heads of Unit and Head Nurse and Prescribers

In real time, ideally with a visit to discuss

Keep it very short (one page)

- What we audited
- Dot points
  - what we found
    - Ideally how it compares to others
  - the action we propose in response
    - How we will follow up to look for improvement

Collaboration



No need to reinvent the wheel!

Share resources, collaborate, Be part of an AMS community

This makes your data more meaningful, and your work has broader impact

Your target groups

Antibiotics are Everyone's Business

The Royal Melbourne Hospital

- Antibiotics are one of the most common medicines prescribed in hospital
- Antibiotics are medicines used to treat or prevent infections caused by bacteria. They do not work for viruses which cause most 'colds' and 'flu'
- If you take antibiotics when they are not needed, bacteria can become resistant to them
- We all need to be careful with antibiotics. By using antibiotics wisely, everyone can help protect them for the future

What can YOU do?

During your hospital stay

- Talk to your doctors about your antibiotic treatment.
- Tell doctors about any allergies to antibiotics you have had in the past. It is helpful if you also remind staff whenever they start you on a new antibiotic.
- If you are on antibiotics and you get a rash, nausea, diarrhoea or other side effects, tell your doctor, nurse or pharmacist as soon as possible. Your doctor can investigate if this is due to the antibiotic and advise you on what to do.

- If you are in hospital but you are eating and drinking comfortably, ask your doctor if you can change from intravenous (directly into the blood) antibiotics to antibiotic tablets.
- Tell your doctor or pharmacist about all medications that you are taking at home, including those you bought at the pharmacy or supermarket, so that they can check if the medicines are safe to be taken together.

On discharge from hospital and at home

- Take the right number of your antibiotic tablets at the right time as prescribed by your doctor, and try not to miss doses. If you forget to take it and miss a dose, do not take a double dose to make up for it.

Get everyone interested

Nurses, pharmacists, students

Patients and families

Thankyou

First they ignore you, then they ridicule you, then they fight you, and then you win

Gandhi