Computerised decision support systems to support antimicrobial stewardship (AMS)

Definition of CDSS

"The provision of clinical knowledge, intelligently filtered and presented at appropriate times, to enhance patient care"

Purcell BMJ 2005

Overview

- How effective is computerised decision support for antibiotic stewardship?
- What are the factors that are likely to result in a successful system?
- What are the barriers to successful implementation?

Why do we need it?

The Prescriber

Infections are cognitively difficult to treat

Knowledge performance gap

Pressures to use knowledge (governance, cost)

Current access to information overload via internet

Standardise practice

The AMS team

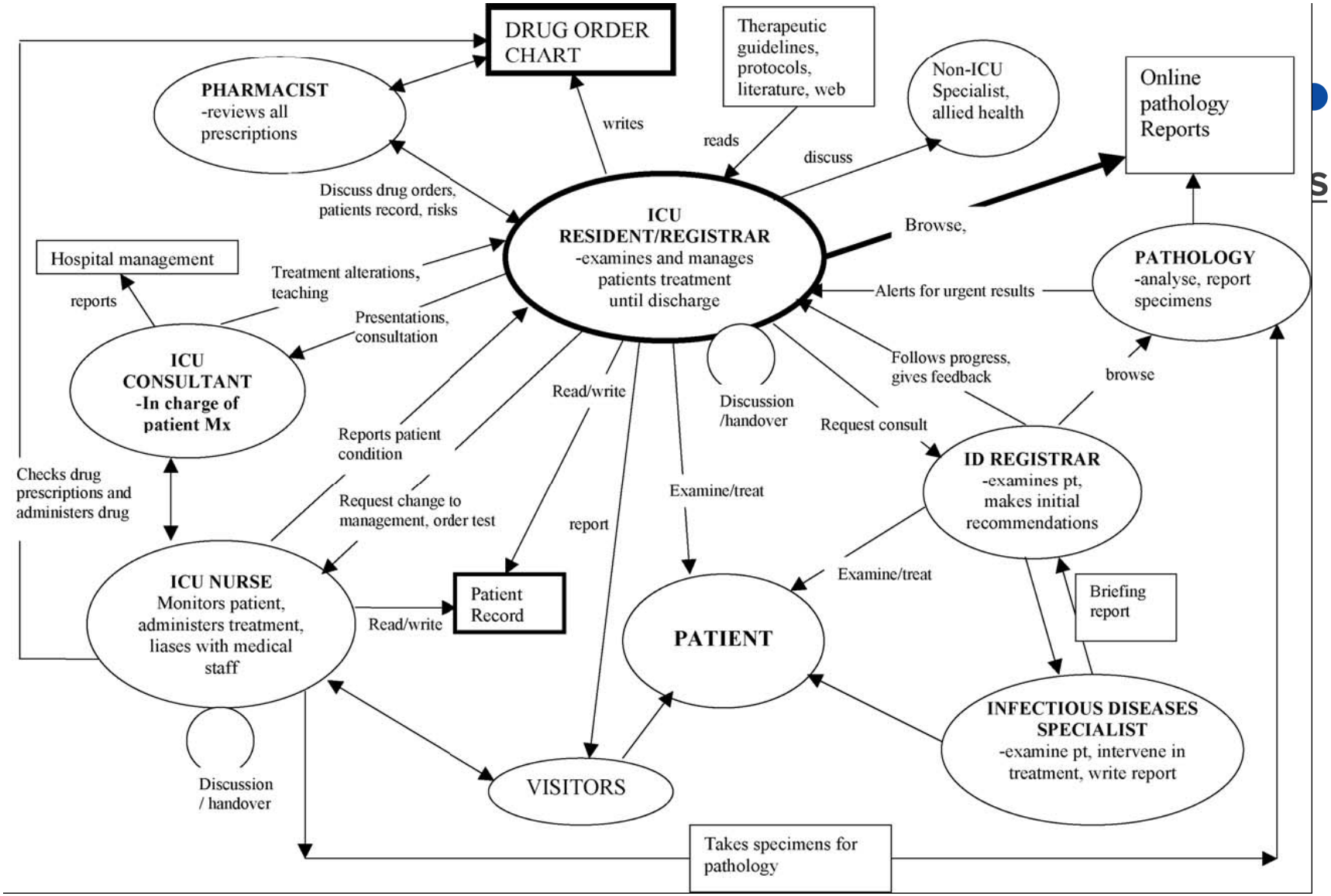
Workload of AMS program proportional to hospital size and complexity

CDSS can triage workload

Supports AMS key elements

Data aggregation

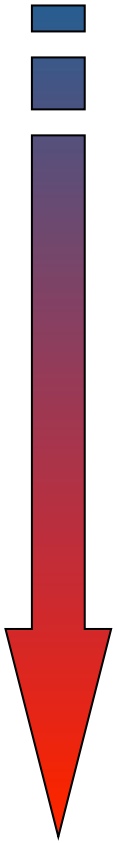
Reporting



Antibiotic prescribing decisions and communication of these is complex. How do we get to the decision maker?

Consolidated flow model for ADVISE development (Thursky, 2007)

Examples of Antibiotic DSS



- Passive: Intranet/internet guidelines
  - Smart phone apps
- Pharmacy-based (back-end)
  - Aminoglycoside monitoring, redundant antibiotic combinations, therapeutic mismatches
- Approval systems
  - Guidance MS (Melbourne), IDEA3S (Melbourne), John Hopkins Paediatric Medical Centre
- Computerised physician order entry/Electronic Medical Records
- Advanced CDSS with/without order entry
  - Antibiotic assistant/Theradoc (Hospira), TREAT (Tel-Aviv), Antimicrobial Resistance Utilization and Surveillance Control (ARUS-C) (Singapore)

Thursky, K (2006). Use of computerized decision support systems to improve antibiotic prescribing. *Expert Rev Anti Infect Ther,* **4:**491-507. Sintchenko, V., et al. Decision support systems for antibiotic prescribing. *Curr Opin Infect Dis* **21**, (2008). Cresswell K et al. A systematic assessment of review to promoting the appropriate use of antibiotics through hospital electronic prescribing systems. Int J Pharm Pract. 2016.

Are Computerised DSS effective for AMS?

- CDSS improve adherence to clinical guidelines and reduce medication error (Level I evidence)
- Almost all reported antibiotic DSS demonstrate a reduction in amount of or costs associated with antibiotic use, LOS
- Some evidence to demonstrate that they stabilise/prevent the development of antimicrobial resistance (Yong 2010; Pestotnik 1996)
- Impact of commercial CPOE systems?? (publication bias)

Few appropriately designed studies evaluating the impact of CDSS on patient outcomes and antimicrobial resistance

Garg, JAMA 2005; Hunt JAMA, 1998; Thursky Exp reviews 2006. Creswell 2015

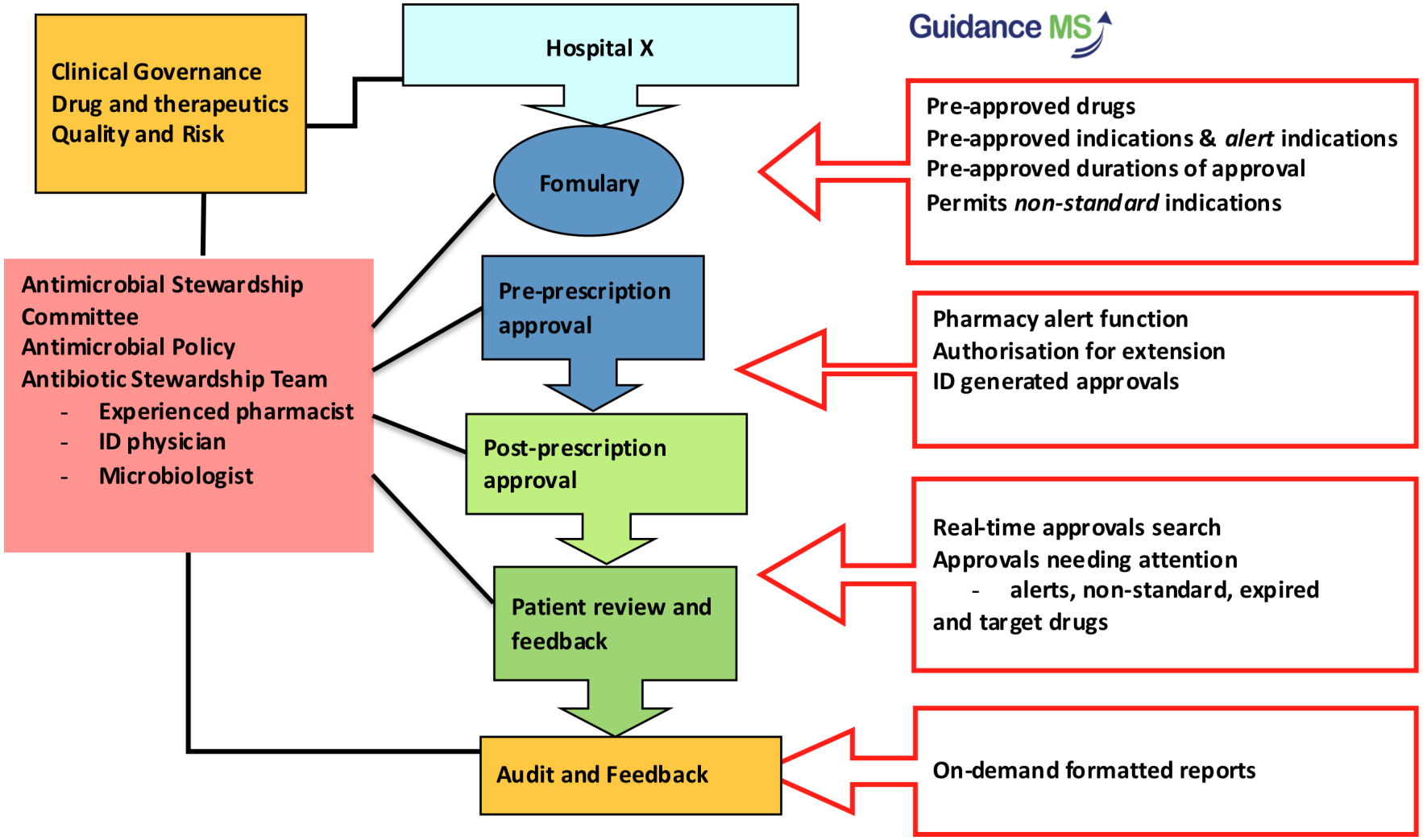
Antimicrobial Approval Systems

Antimicrobial restriction and approvals are an essential element of AMS

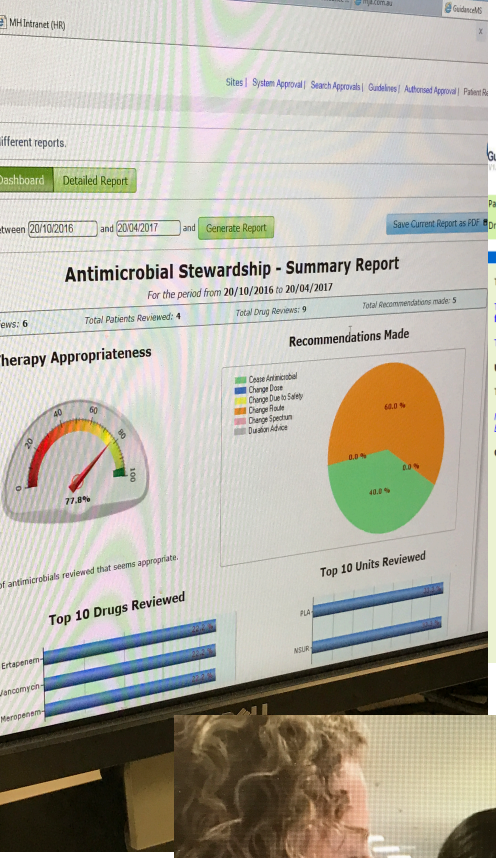
1. Support the formulary
2. Restrict use base on indication
3. Opportunity for education at the point of prescription
4. Phone, web-based, within EMM

NATIONAL ACCREDITATION STANDARD 3.14

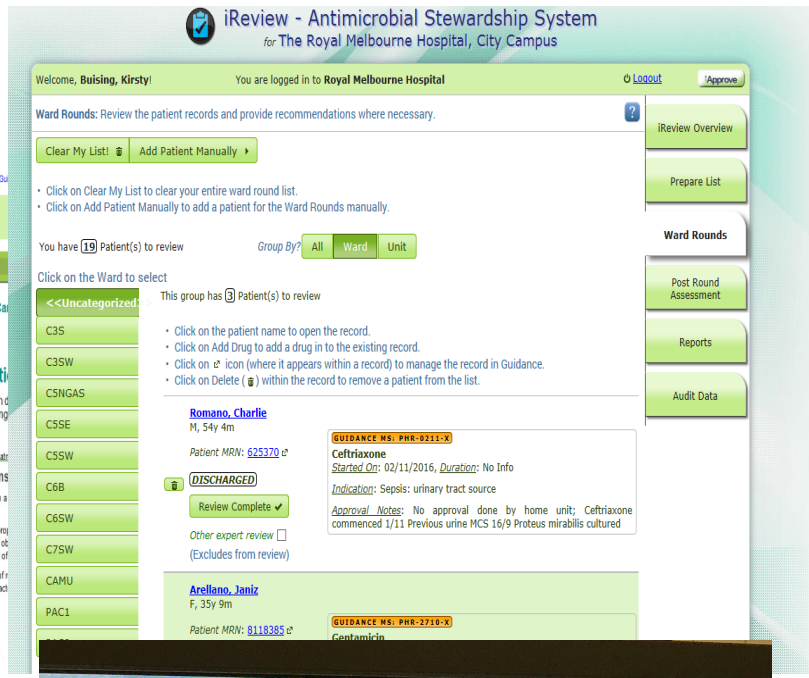
NATIONAL CLINICAL STANDARDS

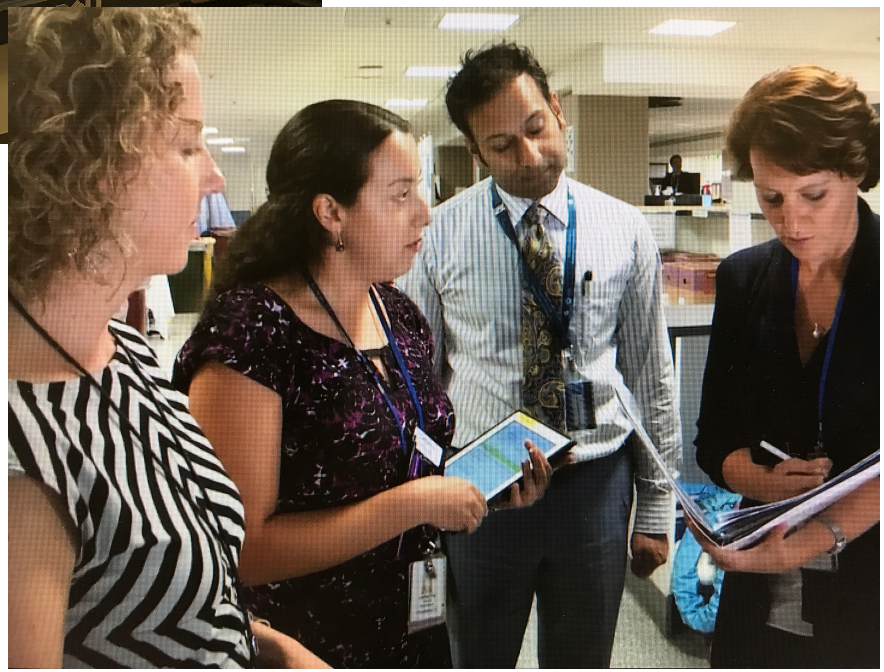


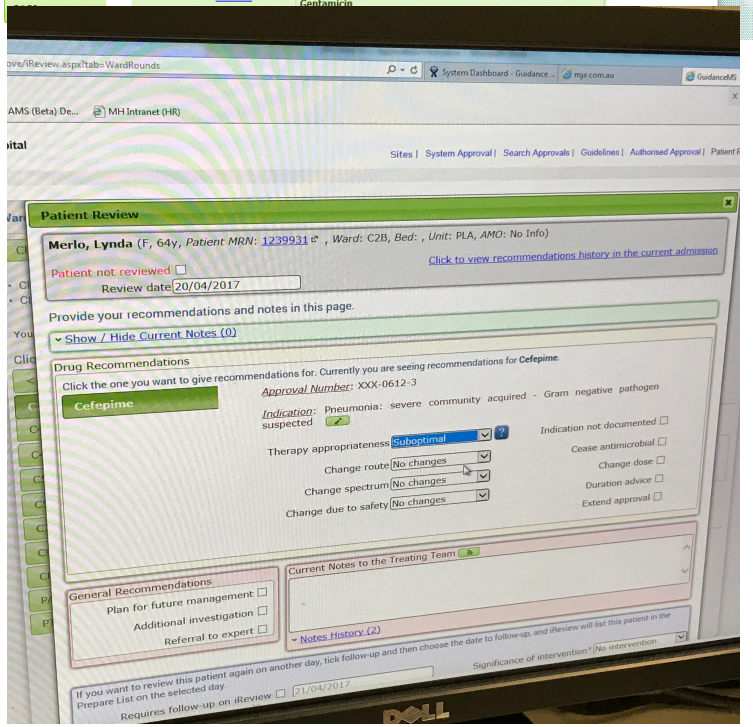
The Guidance Workflow

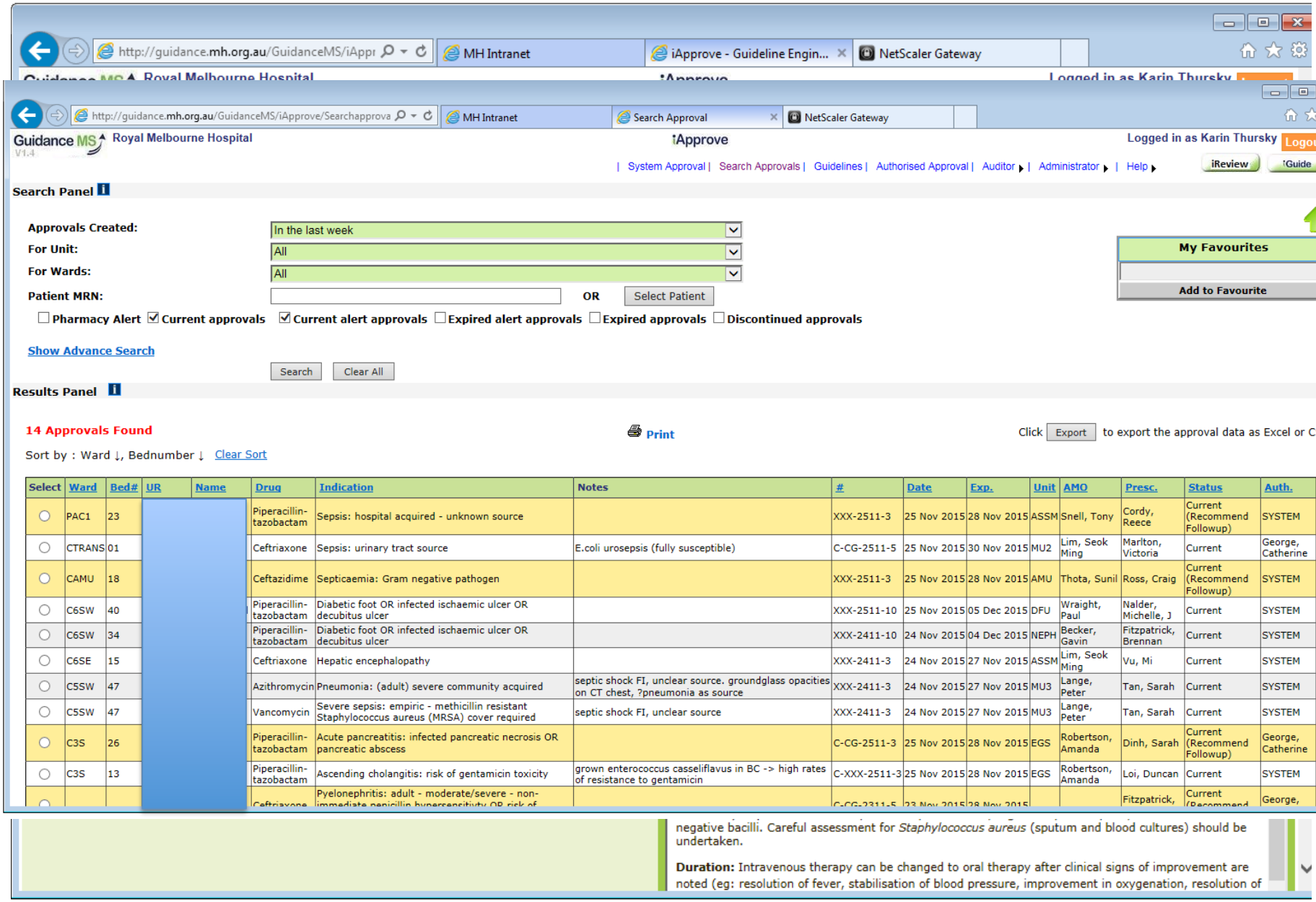

Antimicrobial Stewardship - Summary Report
Therapy Appropriateness
Recommendations Made
Top 10 Drugs Reviewed
Top 10 Units Reviewed


Guidance MS
Royal Melbourne Hospital
Patient Name: Simpson Do Not Use This Pt, Homer, Do Not Use
Drug Guideline: Ceftriaxone
This patient meets the criteria for approval for ceftriaxone for sepsis, according to the hospital sepsis pathway.
The recommended dose is CEFTRIAXONE 1g IV daily. Higher doses are required for some indications, up to 2g IV 12-hourly for meningitis.
Use the link on the right to view this topic in the Therapeutic Guidelines: Antibiotic.
The approval number will be valid for 2 days.
--- END OF GUIDELINE ---


iReview - Antimicrobial Stewardship System
for The Royal Melbourne Hospital, City Campus
Welcome, Buising, Kirsty!
You are logged in to Royal Melbourne Hospital
Ward Rounds: Review the patient records and provide recommendations where necessary.
Clear My List!
Add Patient Manually
iReview Overview
Prepare List
Ward Rounds
Post Round Assessment
Reports
Audit Data
Click on the Ward to select
You have 19 Patient(s) to review
Group By? All Ward Unit
This group has 3 Patient(s) to review
Romano, Charlie
Ceftriaxone
DISCHARGED
Review Complete
Arellano, Janiz
Gentamicin




Patient Review
Merlo, Lynda (F, 64y, Patient MRN: 1239931, Ward: C2B, Bed: , Unit: PLA, AMO: No Info)
Patient not reviewed
Review date 20/04/2017
Provide your recommendations and notes in this page.
Drug Recommendations
Cefepime
Therapy appropriateness: Suboptimal
Change route: No changes
Change spectrum: No changes
Change due to safety: No changes
General Recommendations
Plan for future management
Additional investigation
Referral to expert
Current Notes to the Treating Team



Select	Ward	Bed#	UR	Name	Drug	Indication	Notes	#	Date	Exp.	Unit	AMO	Presc.	Status	Auth.
○	PAC1	23			Piperacillin-tazobactam	Sepsis: hospital acquired - unknown source		XXX-2511-3	25 Nov 2015	28 Nov 2015	ASSM	Snell, Tony	Cordy, Reece	Current (Recommend Followup)	SYSTEM
○	CTRANS	01			Ceftriaxone	Sepsis: urinary tract source	E.coli urosepsis (fully susceptible)	C-CG-2511-5	25 Nov 2015	30 Nov 2015	MU2	Lim, Seok Ming	Marlton, Victoria	Current	George, Catherine
○	CAMU	18			Ceftazidime	Septicaemia: Gram negative pathogen		XXX-2511-3	25 Nov 2015	28 Nov 2015	AMU	Thota, Sunil	Ross, Craig	Current (Recommend Followup)	SYSTEM
○	C6SW	40			Piperacillin-tazobactam	Diabetic foot OR infected ischaemic ulcer OR decubitus ulcer		XXX-2511-10	25 Nov 2015	05 Dec 2015	DFU	Wraight, Paul	Nalder, Michelle, J	Current	SYSTEM
○	C6SW	34			Piperacillin-tazobactam	Diabetic foot OR infected ischaemic ulcer OR decubitus ulcer		XXX-2411-10	24 Nov 2015	04 Dec 2015	NEPH	Becker, Gavin	Fitzpatrick, Brennan	Current	SYSTEM
○	C6SE	15			Ceftriaxone	Hepatic encephalopathy		XXX-2411-3	24 Nov 2015	27 Nov 2015	ASSM	Lim, Seok Ming	Vu, Mi	Current	SYSTEM
○	C5SW	47			Azithromycin	Pneumonia: (adult) severe community acquired	septic shock FI, unclear source. groundglass opacities on CT chest, ?pneumonia as source	XXX-2411-3	24 Nov 2015	27 Nov 2015	MU3	Lange, Peter	Tan, Sarah	Current	SYSTEM
○	C5SW	47			Vancomycin	Severe sepsis: empiric - methicillin resistant Staphylococcus aureus (MRSA) cover required	septic shock FI, unclear source	XXX-2411-3	24 Nov 2015	27 Nov 2015	MU3	Lange, Peter	Tan, Sarah	Current	SYSTEM
○	C3S	26			Piperacillin-tazobactam	Acute pancreatitis: infected pancreatic necrosis OR pancreatic abscess		C-CG-2511-3	25 Nov 2015	28 Nov 2015	EGS	Robertson, Amanda	Dinh, Sarah	Current (Recommend Followup)	George, Catherine
○	C3S	13			Piperacillin-tazobactam	Ascending cholangitis: risk of gentamicin toxicity	grown enterococcus casseliflavus in BC -> high rates of resistance to gentamicin	C-XXX-2511-3	25 Nov 2015	28 Nov 2015	EGS	Robertson, Amanda	Loi, Duncan	Current	SYSTEM
○					Ceftriaxone	Pyelonephritis: adult - moderate/severe - non-immediate penicillin hypersensitivity OR risk of		C-CG-2511-5	23 Nov 2015	28 Nov 2015			Fitzpatrick,	Current (Recommend	George,

negative bacilli. Careful assessment for *Staphylococcus aureus* (sputum and blood cultures) should be undertaken.

Duration: Intravenous therapy can be changed to oral therapy after clinical signs of improvement are noted (eg: resolution of fever, stabilisation of blood pressure, improvement in oxygenation, resolution of

Outcomes of multisite antimicrobial stewardship programme implementation with a shared clinical decision support system

Stuart E. Bond[1–3]*, Adriana J. Chubaty[4], Suman Adhikari[5,6], Spiros Miyakis[2,3,7], Craig S. Boutlis[7], Wilfred W. Yeo[2,3,8], Marijka J. Batterham[9], Cara Dickson[10], Brendan J. McMullan[11], Mona Mostaghim[12], Samantha Li-Yan Hui[13], Kate R. Clezy[14] and Pamela Konecny[6,15]

JAC 2017

Background: Studies evaluating antimicrobial stewardship programmes (ASPs) supported by computerized clinical decision support systems (CDSSs) have predominantly hospitals.

Objectives: To examine outcomes of multisite ASP implementati

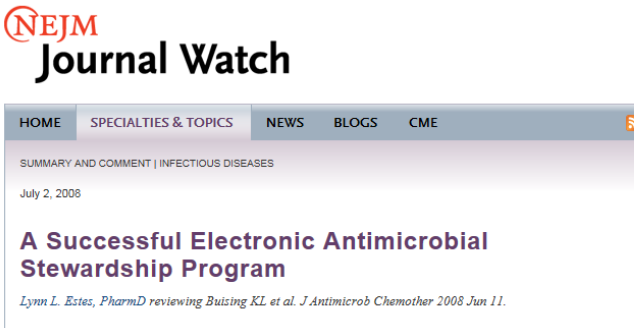
Methods: An interrupted time series study was conducted acros from 2010 to 2014. Outcomes analysed were: effect of the int microbial costs and healthcare-associated *Clostridium difficile* inf of stay (LOS) and standardized mortality ratios (SMRs) were also

Results: Post-intervention, antimicrobials targeted for increased (DDDs)/1000 occupied bed days (OBDs)/month (+32%, $P < 0.01$). use fell from 254 to 196 DDDs/1000 OBDs/month (−23%; Antimicrobial costs decreased initially (−AUD$64551/month; $P < 0.01$). HCA-CDI rates decreased post-intervention (−0.2 cases/ reductions for key infections (respiratory from 4.8 to 4.3 days, $P < 0.01$; septicaemia 6.8 to 6.1 days, $P < 0.01$) were similar to background LOS reductions (2.1 to 1.9 days). Similarly, infection-related SMRs (observed/expected deaths) decreased (respiratory from 1.1 to 0.75; septicaemia 1.25 to 0.8; background rate 1.19 to 0.90.

Conclusions: Implementation of a collaborative multisite ASP supported by a centrally deployed CDSS was associated with changes in targeted antimicrobial use, decreased antimicrobial costs, decreased HCA-CDI rates, and no observable increase in LOS or mortality. Ongoing targeted interventions are suggested to promote sustainability.

A single DSS deployed across 12 hospitals including rural/regional
Shared AMS program management
Hub and spoke model of care
Reduction in target antibiotics with reduction in mortality from respiratory infections and sepsis

Impact of Guidance AMS program


NEJM Journal Watch

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SUMMARY AND COMMENT | INFECTIOUS DISEASES

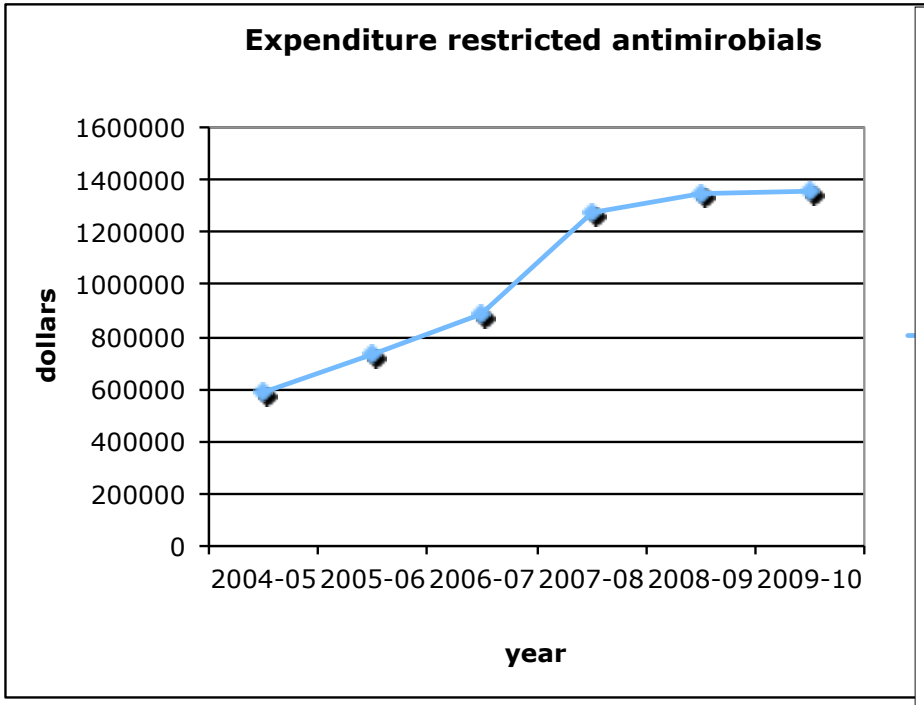
July 2, 2008

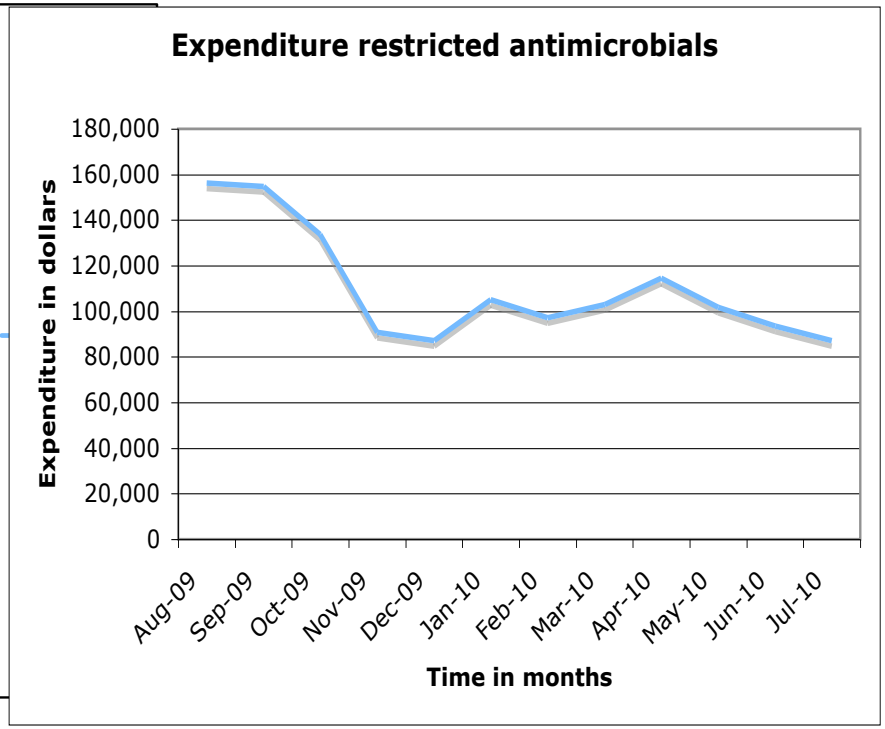
A Successful Electronic Antimicrobial Stewardship Program

Lynn L. Estes, PharmD reviewing Buising KL et al. J Antimicrob Chemother 2008 Jun 11.

- Cost savings in drug expenditure alone (per year)
  - >$1 mil in 6 hospitals within 12 months (Thompson, ASA 2013, Bond JAC 2017)
- Cost-effectiveness of AMS Program using Guidance
  - incremental cost-effectiveness study (Coulter, ASA 2016)
  - 0.26 QALY per patient and reduced costs by $1301 per patient
- Reduction in targeted restricted antibiotics (Buising et al, JAC2008 and Cairns et al MJA 2013, Bond JAC 2017)
- Reduction in Hospital Acquired Infection/ C. Diff (Bond et al 2017)
- No unintended consequences (Buising et al, 2008, Yong et al, 2010, Bond 2017)
- Recognised as an exemplar in hospital accreditation

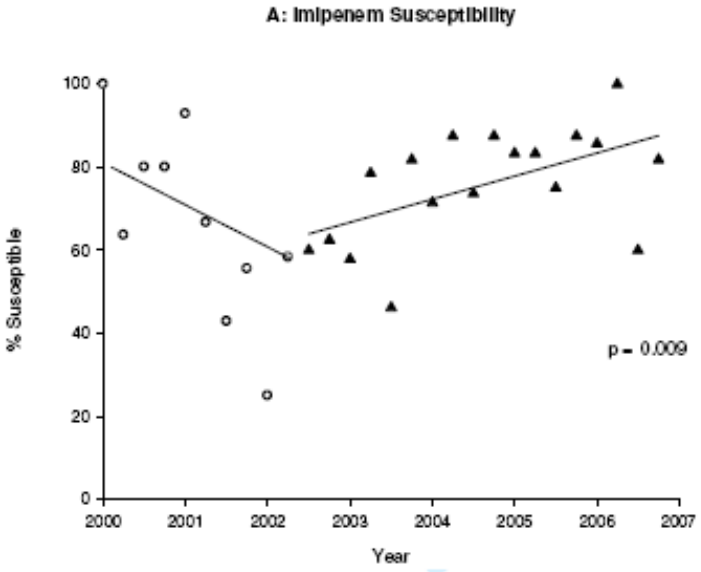
One Melbourne hospital: Antimicrobial expenditure more than doubled in 5 years

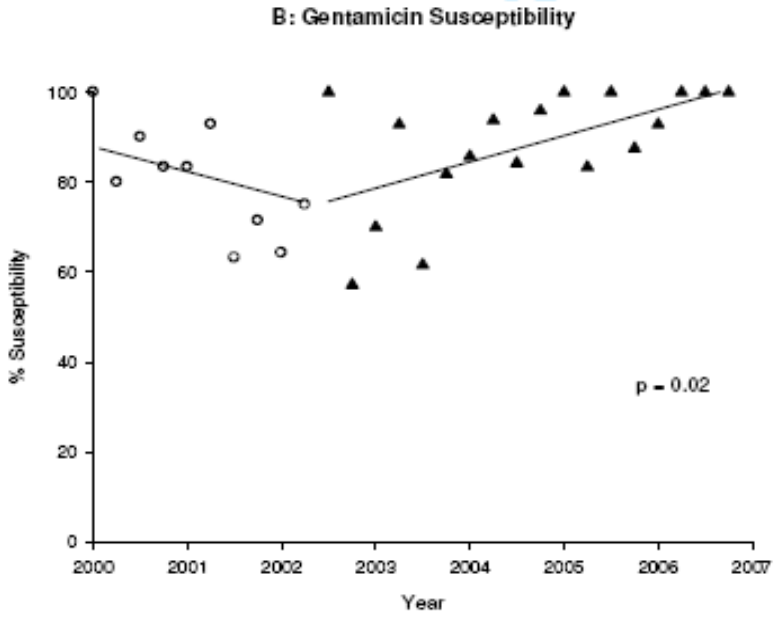




Includes Mero, Vanc, Tic-clav, Pip-Taz, IV Cipro, Cefepime, Ceftaz, Teic, Linezolid, pristinamycin, colistin

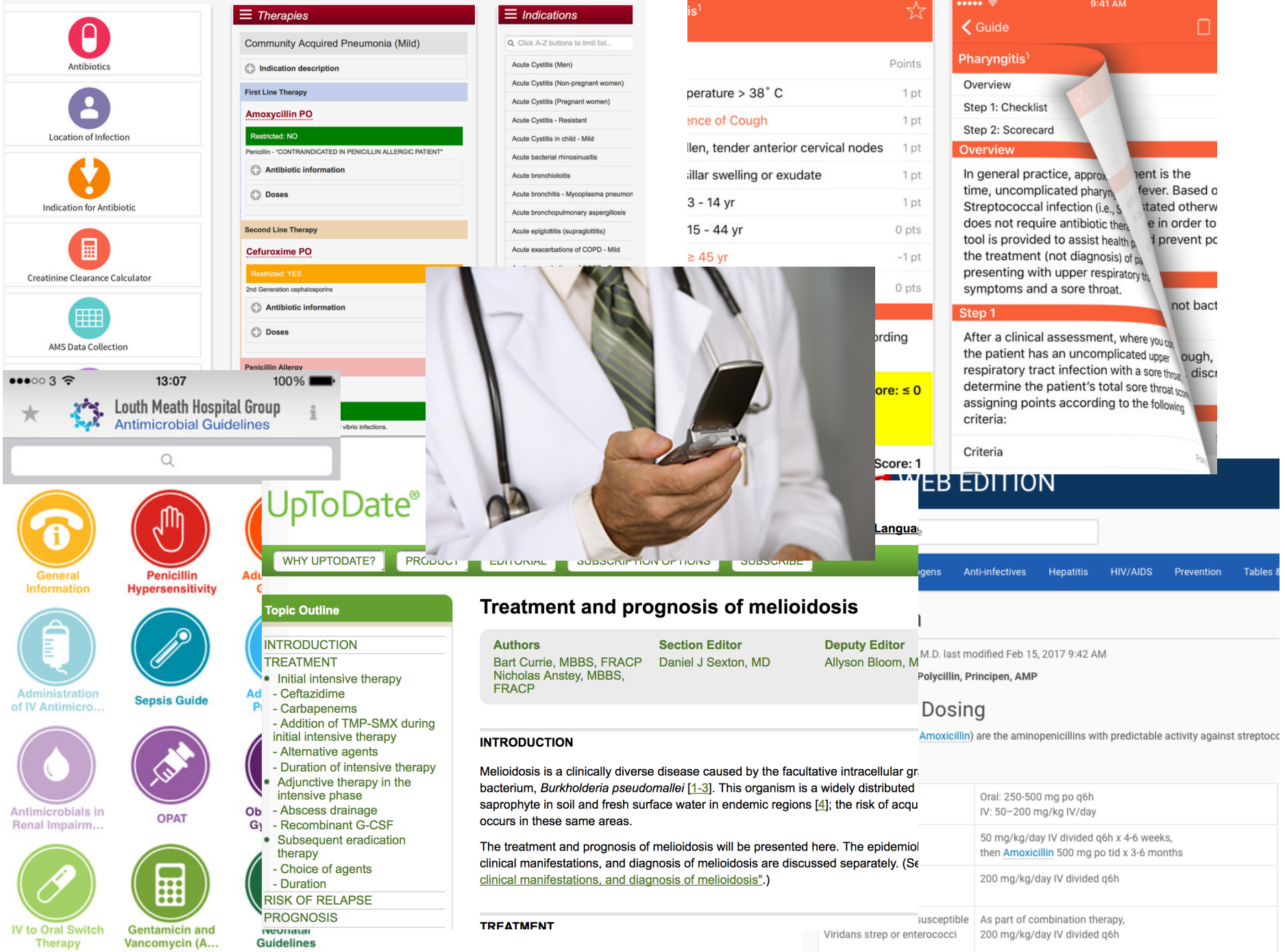
Antibiotic sensitivity changes in the ICU-RMH (2000-2006)





Organism	Antibiotic	Change from pre-intervention trend: Mean % change/year (95% CI)	P value	Change from zero trend: Mean % change/year (95% CI)	P value
Pseudomonas	Imipenem	18.3 (4.9, 31.6)	0.009	9.2 (4, 14.3)	0.001
	Gentamicin	11.6 (1.8, 21.5)	0.023	6.8 (3, 10.6)	0.001
	Ceftazadime	3.2 (-13, 6.6)	0.51	2.7 (-1.1, 6.5)	0.16
	Ciprofloxacin	-4.9 (-14.1, 4.2)	0.28	0.3 (-3.2, 3.8)	0.88

M.Yong et al. Improved susceptibility of Gram negative bacteria in an intensive care unit following implementation of a computerised antibiotic decision support system, JAC 2010


Antibiotics
Location of Infection
Indication for Antibiotic
Creatinine Clearance Calculator
AMS Data Collection
Therapies
Community Acquired Pneumonia (Mild)
Indication description
First Line Therapy
Amoxycillin PO
Restricted: NO
Penicillin - "CONTRAINDICATED IN PENICILLIN ALLERGIC PATIENT"
Antibiotic information
Doses
Second Line Therapy
Cefuroxime PO
Restricted: YES
2nd Generation cephalosporins
Antibiotic information
Doses
Penicillin Allergy
Indications
Click A-Z buttons to limit list...
Acute Cystitis (Men)
Acute Cystitis (Non-pregnant women)
Acute Cystitis (Pregnant women)
Acute Cystitis - Resistant
Acute Cystitis in child - Mild
Acute bacterial rhinosinusitis
Acute bronchiolitis
Acute bronchitis - Mycoplasma pneumon
Acute bronchopulmonary aspergillosis
Acute epiglottitis (supraglottitis)
Acute exacerbations of COPD - Mild
Points
perature > 38° C 1 pt
nce of Cough 1 pt
llen, tender anterior cervical nodes 1 pt
illar swelling or exudate 1 pt
3 - 14 yr 1 pt
15 - 44 yr 0 pts
≥ 45 yr -1 pt
0 pts
ording
ore: ≤ 0
Score: 1
9:41 AM
Guide
Pharyngitis¹
Overview
Step 1: Checklist
Step 2: Scorecard
Overview
In general practice, approx ent is the
time, uncomplicated pharyn fever. Based o
Streptococcal infection (i.e., S tated otherw
does not require antibiotic ther e in order to
tool is provided to assist health p prevent pc
the treatment (not diagnosis) of pa
presenting with upper respiratory tr
symptoms and a sore throat.
not bact
Step 1
After a clinical assessment, where you co
the patient has an uncomplicated upper ough,
respiratory tract infection with a sore throat disc
determine the patient's total sore throat score
assigning points according to the following
criteria:
Criteria
13:07
100%
Louth Meath Hospital Group
Antimicrobial Guidelines
vibrio infections.
UpToDate®
WHY UPTODATE?
PRODUCT
EDITORIAL
SUBSCRIPTION OPTIONS
SUBSCRIBE
Langua
WEB EDITION
gens
Anti-infectives
Hepatitis
HIV/AIDS
Prevention
Tables &
General Information
Penicillin Hypersensitivity
Administration of IV Antimicro...
Sepsis Guide
Antimicrobials in Renal Impairm...
OPAT
IV to Oral Switch Therapy
Gentamicin and Vancomycin (A...
Topic Outline
INTRODUCTION
TREATMENT
• Initial intensive therapy
- Ceftazidime
- Carbapenems
- Addition of TMP-SMX during initial intensive therapy
- Alternative agents
- Duration of intensive therapy
• Adjunctive therapy in the intensive phase
- Abscess drainage
- Recombinant G-CSF
• Subsequent eradication therapy
- Choice of agents
- Duration
RISK OF RELAPSE
PROGNOSIS
Treatment and prognosis of melioidosis
Authors
Bart Currie, MBBS, FRACP
Nicholas Anstey, MBBS, FRACP
Section Editor
Daniel J Sexton, MD
Deputy Editor
Allyson Bloom, M
M.D. last modified Feb 15, 2017 9:42 AM
Polycillin, Principen, AMP
Dosing
Amoxicillin) are the aminopenicillins with predictable activity against streptocc
Oral: 250-500 mg po q6h
IV: 50–200 mg/kg IV/day
50 mg/kg/day IV divided q6h x 4-6 weeks,
then Amoxicillin 500 mg po tid x 3-6 months
200 mg/kg/day IV divided q6h
susceptible
Viridans strep or enterococci
As part of combination therapy,
200 mg/kg/day IV divided q6h
Listeria meningitis
200 mg/kg/day IV divided q4h ± Gentamicin
INTRODUCTION
Melioidosis is a clinically diverse disease caused by the facultative intracellular gr
bacterium, Burkholderia pseudomallei [1-3]. This organism is a widely distributed
saprophyte in soil and fresh surface water in endemic regions [4]; the risk of acqu
occurs in these same areas.
The treatment and prognosis of melioidosis will be presented here. The epidemiol
clinical manifestations, and diagnosis of melioidosis are discussed separately. (Se
clinical manifestations, and diagnosis of melioidosis".)
TREATMENT

Mobile access preferred by prescribers
Supports bedside access to guidelines
Calculators
Antibiograms
Mobile device compatible EMR
May be developed by the institution
Some are customisable

Recommendations may not be institution relevant
(e.g use of US guidelines with levofloxacin)
Version control
Reliable wireless access
Decision making on ward rounds by senior staff
Increase knowledge but may not influence prescribing behaviour

Charani, JAC 2013
Goff, Pharmacotherapy 2013

Doctors pull plug on paperless system

California's Cedars-Sinai turns off its computeri
physicians revolt, demonstrating that implemen
done.

By TYLER CHIN, amednews staff. Feb. 17, 2003.

PRINT | E-MAIL | RESPOND | REPRINTS | SHARE

Information technology is often touted as
of quality medicine, but some physicians
disease.

Cedars-Sinai Medical Center in Los Angel
physician order entry system in January, a
complained that rather than speeding up a
slowed down the process of filling their or
get lost in the system.

- Links
- See related content
- Region: West

"I'm not opposed to c
and better," said Dud
surgeon who helped
"This was new but ce

Cedars-Sinai's decision was extraordinary but
of First Consulting Group, says he knows of at
have pulled paperless systems in the face of ph
problems.

Successful implementations of computerized order entry involve physicians in all phases.

The issue, Dr.
one of the qua
success of pap
medical record
they're implem
used, experts say.

In Cedars-Sinai's case, the hospital believed

In 2000, US healthcare organization failure rate for new IT systems 50%

Kaplan, B. Evaluating informatics applications--clinical decision support systems literature review. *Int J Med Inform* **64**, 15-37 (2001)

HEALTH Department staff fear Victoria's $360 million health technology program is being shut down after being told that no contracts will be renewed for people working on it.

The news delivered to staff late last week follows an admission last month by Health Minister David Davis that he was considering abandoning the HealthSMART program, which is five years late and $35 million over budget.

He described HealthSMART - which is supposed to link computer systems in hospitals and give medical staff immediate access to patient records - as "the myki of the health system".

Computerised physician order entry

- Very slow introduction in Europe (highest 20% Netherlands) and 15% US hospital. ? Higher rates in Asia
- Major costs – $US10,000 per bed
- Driver: 1 in 10 patients have preventable adverse event without CPOE
  - Are very effective in reducing procedural error rates (~60%) (e.g illegible orders)
  - Much less effective in reducing clinical error rates (wrong dose, wrong drugs
- Increased errors without decision support ‘e-iatrogenesis” (Weiner 2007)
- Alert fatigue, limitations of drug interaction database

EMR/CPOE

- Default values, routes of administration, doses and frequencies
- Alerts (allergy, dosing, drug-drug interactions)
- Pre-prescription restriction rules
- Automated stop orders (e.g surgical prophylaxis)

100%

DISCERN ALERT

NAME: test, borchers

DATE: March 13, 2013 11:44:25 PDT

MRN: 001500705

BIRTH DATE: February 09, 1945

AGE: 68

LOCATION: Acute; E5M4 E540-E547 ;

This patient has met the criteria for severe sepsis. Please consider using the Sepsis Confirmation Powerform to confirm if the patient is septic.

Click here to access the Sepsis Confirmation form.

SIRS Criteria

03/13/13 1143 Temperature Rectal = 30 C (L) [less than 36]
03/13/13 1143 Peripheral Pulse Rate = 99 bpm (H) [greater than 95]

Organ Dysfunction

03/13/13 1143 Systolic Blood Pressure = 45 mmHg (L) [less than 90]

Syndrome monitoring

Tall Man Lettering Examples:

AlprazOLam
LorazEPam
BuPROPion
BusPIRone
ClomiPHENE
ClomiPRAMine

Standardisation

MEDICATIONS

Non-Purulent/Diffuse erythema - suspicion for streptococcus species (Select One)

- penicillin G potassium IVPB 3 million units/50 mL D5W
  3 Million Units, intraVENOUS, EVERY 4 HOURS, for 10
- If beta-lactam allergy: clindamycin (CLEOCIN) IVPB 600
  600 mg, intraVENOUS, EVERY 8 HOURS for 10 days
- If tolerating PO: amoxicillin (AMOXIL) capsule 500 mg
  500 mg, Oral, THREE TIMES DAILY, for 10 days
- If tolerating PO and beta-lactam allergy: clindamycin (CLEOCIN) capsule 600 mg
  600 mg, Oral, THREE TIMES DAILY, for 10 days

Order sets

Localized Purulence/Abcess/Known MRSA Colonization or history of MRSA infection (Select one)

- Vancomycin 25 mg/kg loading dose then 15 mg/kg with pharmacy consult
- If tolerating PO: sulfamethoxazole-trimethoprim (BACTRIM DS) tablet 800 mg-160 mg
  2 Tab, Oral, TWICE DAILY, for 10 days
- If tolerating PO: doxycycline (VIBRA-TABS) 100 mg tablet
  100 mg, Oral, TWICE DAILY, for 10 days

Infected Ulcer (No Previous ABX)/ASO or DNaseB or MRSA (+)/Unable to determine staphylococcus or streptococcus by physical exam (Select One)

- Vancomycin 25 mg/kg loading dose then 15 mg/kg with pharmacy consult
- If tolerating PO: Bactrim DS + Amoxicillin 500 mg
- If tolerating PO: Doxycycline 100 mg + Amoxicillin 500 mg

Bite Wound/Periorbital cellulitis (Select One)

ID consult recommended.

- Unasyn 3 gm + Vancomycin 25 mg/kg loading dose then 15 mg/kg with pharmacy consult
- If beta-lactam allergy: Doxycycline 100 MG IV + Clindamycin 600 mg IV
- If beta-lactam allergy: Sulfamethoxazole-trimethoprim 160 mg IV + Clindamycin 600 mg IV
- If tolerating PO: Augmentin 875 mg + Doxycycline 100 mg tab
- If tolerating PO and beta-lactam allergy: Doxycycline 100 mg PO + Clindamycin 600 mg PO

Previous antibiotic exposure/Non-healing or chronic wound/Soaking or macerated ulcer/Osteomyelitis (Select One)

- Zosyn 3.375 mg extended infusion + Vancomycin 25 mg/kg loading dose then 15 mg/kg with pharmacy consult
- If beta-lactam allergy: Levofloxacin 750 mg IV and Clindamycin 600 mg IV

Extensive Necrosis/Gangrene/Malodorous (Select One) 0 of 2 selected

Miscellaneous Medications 0 of 2 selected

Add Orders Add Order

- Chart abstraction tools to screen and identify patients at risk for sepsis, or collate information for AMS (medicines, results)
- Record AMS recommendations and interventions
- Support order sets for syndromes (e.g community-acquired pneumonia)
- Alerts and triggers to identify patients suitable for intravenous-to-oral switch, or AMS review
- Care protocols (templates or phased order sets)

AMS in EMR/CPOE integration

- Patient centred NOT system based
- Require substantial institutional investment up front
- Require significant hospital IT time to create the tools
- Templates must be incorporated into electronic medical records at each site
- ***Local adaptation still required for each build***
- Less responsive to change

Will reduce transcription errors, but not incorrect choice or indication *(unless combined with decision support or approvals that trigger post prescription review)*

Surveillance tools to support AMS

Hermsen ICHE April 2012

- Evaluation of TheradoC in Nebraska Medical Centre , 624 beds
- Pre-post intervention using historical controls
- *CDSS triggered prospective alerts (classified as actionable by the ASP or decentralised pharmacist*
  - Influenza/pneumonia vaccine
  - Polyantimicrobials (>=3)
  - Drug-bug mismatch
  - Redundant anaerobic coverage
  - Vancomycin use and BC pos for CNS or MSSA
  - No positive cultures in prior 7 days
- **8,571 alerts in 791 patients over 5 months. 284 interventions made.**
- **Only 30% of alerts actionable , 2-3 hrs per day reviewing and 1-2 hrs intervention and documentation**
- High number of non-actionable alerts (alert fatigue)

Doctor: COX, Oliver (Dr) - logged in @ 13-43-2009 02:43:14 Settings | Help | Logout

Name JOHNSON, Linda (Ms) *SSN* 012 345 6789 *Born* 08-jul-1941 (68y) *Gender* Female

Episode 1 of 1 *Encounter* 2 of 2 *Type* 2'nd Encounter

Advanced decision support

Advice summary

Recommended treatment

Change patient data

Select treatment

Search

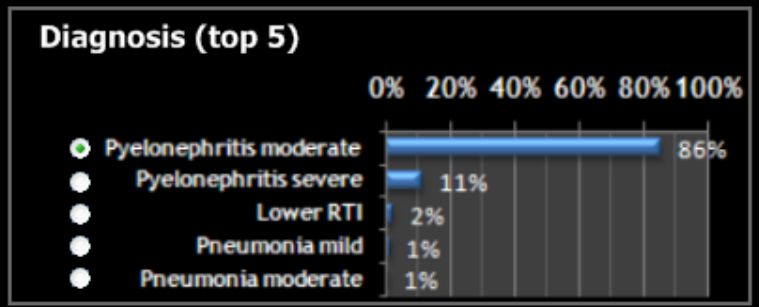
Patient

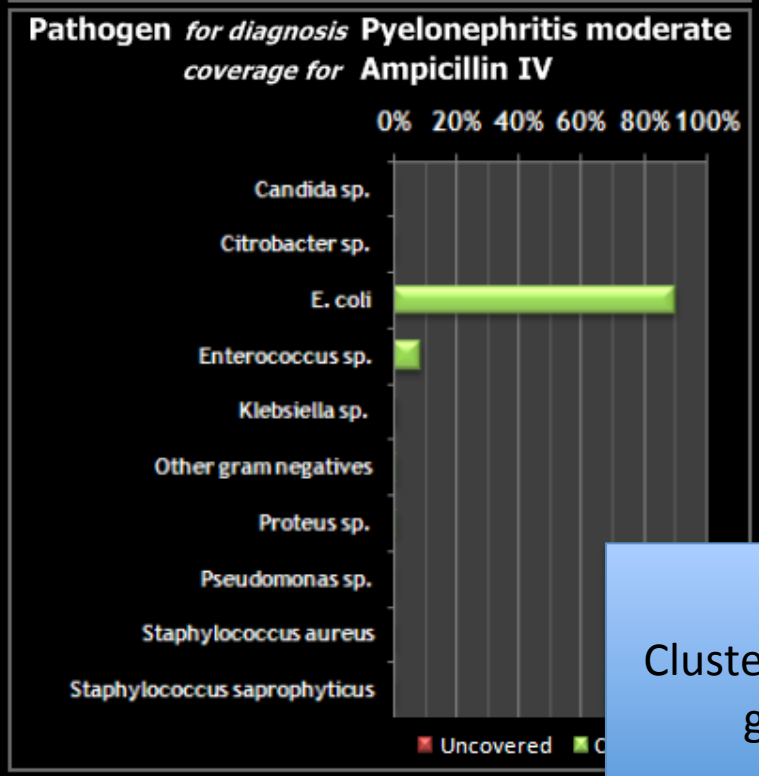
Advices

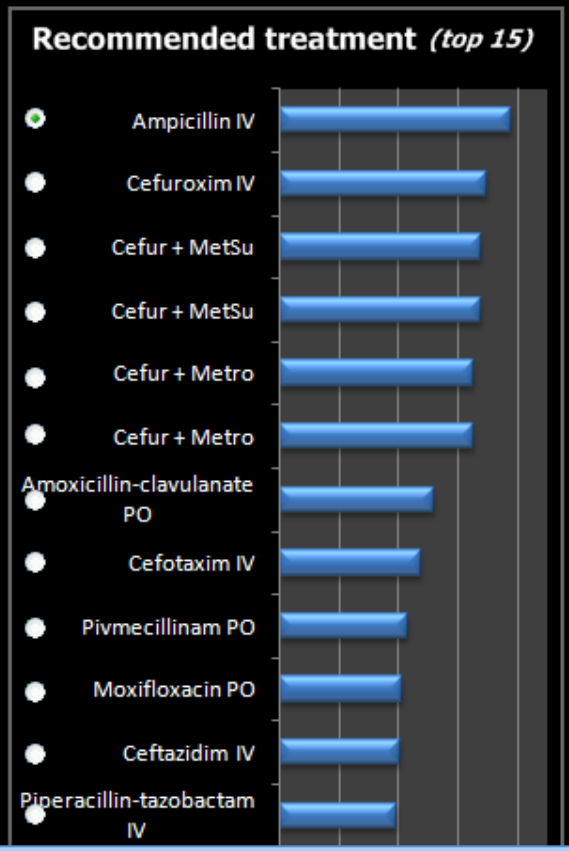
Treatment

Outcome

Page Advice summary



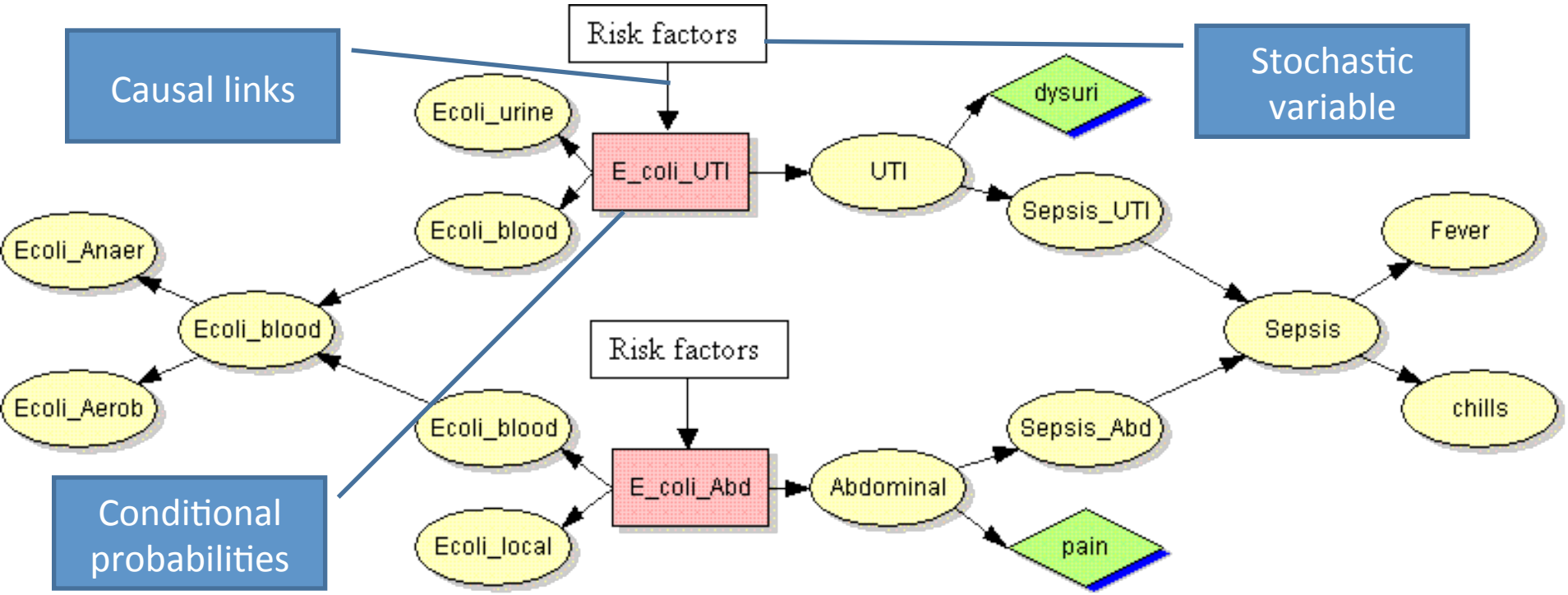




Improved empiric therapy
Cluster randomised trial. TREAT study group (Paul et al. JAC 2006)

TREAT: the model

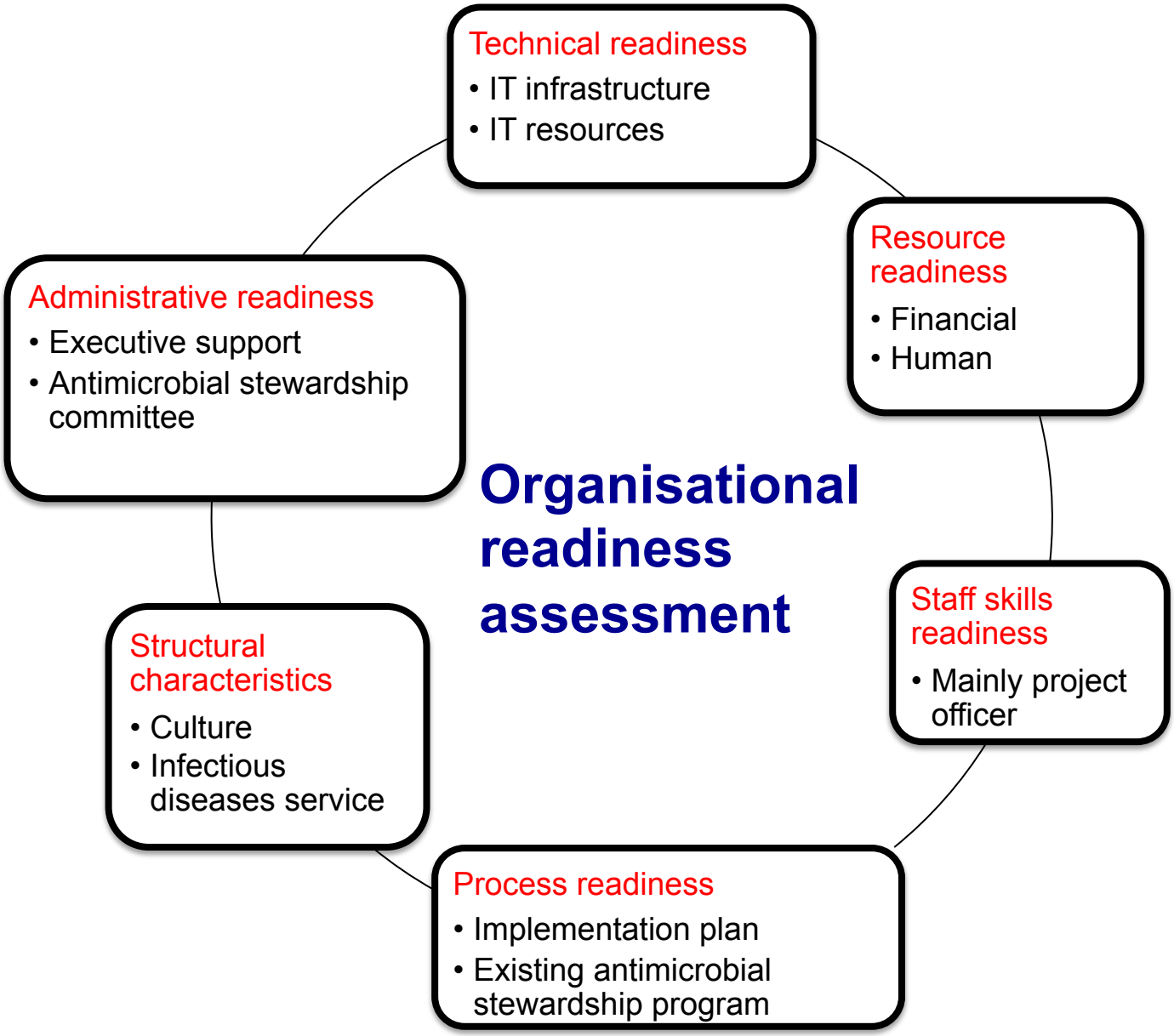
catheter_ecoli_uti	no						
sex_ecoli_uti	Female						
hosp_uti_ecoli_uti	Community	Nursing home	ICU	Medical 2-7d	Medical >7d	Surg 2-7 d	Surg >7d
No	0.9715	0.945389	0.998241	0.911901	0.927994	0.914124	0.92972
Asymptomatic	0.0268016	0.0498305	0.00100502	0.0781778	0.0556016	0.0804386	0.0525905
Mild	0.00168995	0.00421643	0.000268004	0.00596995	0.00556016	0.00371254	0.00884477
Moderate	5.97115e-006	0.000383311	0.000335004	0.00277176	0.00778422	0.00123752	0.00621526
Severe+critical	2.54049e-006	0.000181074	0.000151036	0.00117987	0.00305998	0.000487066	0.00262921



Organisational readiness

Extent to which an organization is and prepared to invest in adapting the software to the organization, developing policies and procedures and training staff

The implementation cost of an electronic record is estimated to be 1.5 times the cost of the system


Technical readiness
• IT infrastructure
• IT resources
Resource readiness
• Financial
• Human
Staff skills readiness
• Mainly project officer
Process readiness
• Implementation plan
• Existing antimicrobial stewardship program
Structural characteristics
• Culture
• Infectious diseases service
Administrative readiness
• Executive support
• Antimicrobial stewardship committee
Organisational readiness assessment

NCAS

Features of CDSS that are likely to increase clinician uptake

Journal of the American Medical Informatics Association Volume 10 Number 6 Nov / Dec 2003

Synthesis of Research Paper ■

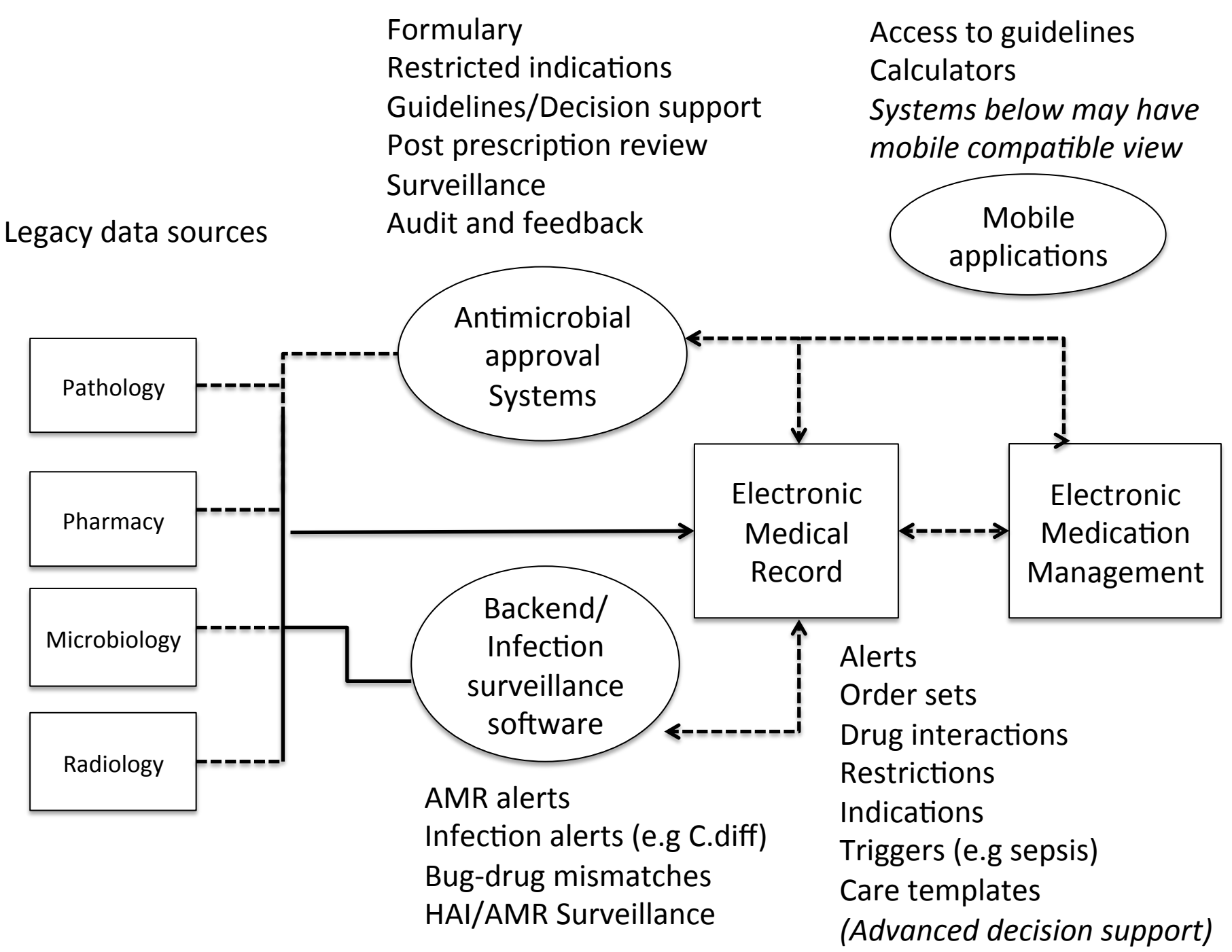
Ten Commandments for Effective Clinical Decision Support: Making the Practice of Evidence-based Medicine a Reality

David W. Bates, MD, MSc, Gilad J. Kuperman, MD, PhD, Samuel Wang, MD, PhD, Tejal Gandhi, MD, MPH, Anne Kittler, BA, Lynn Volk, MHS, Cynthia Spurr, RN, MBA, Ramin Khorasani, MD, Milenko Tanasijevic, MD, Blackford Middleton, MD, MSc, MPH

Features of CDSS that are likely to increase clinician uptake

- Speed
- Usability (ease of use, usefulness)
- Integration into workflow
- Promote action rather than inaction (i.e provide alternatives)
- Simple interventions work best
- Evidence/justification should be provided
- Impact should be monitored and feedback given to clinicians
- Incentives for use (printouts, calculations etc)
- Local adaptation of guidelines and local development

(Bates 2003, Kawamoto 2005, Moxey 2010)


Formulary
Restricted indications
Guidelines/Decision support
Post prescription review
Surveillance
Audit and feedback
Access to guidelines
Calculators
Systems below may have mobile compatible view
Legacy data sources
Mobile applications
Antimicrobial approval Systems
Pathology
Pharmacy
Microbiology
Radiology
Electronic Medical Record
Electronic Medication Management
Backend/ Infection surveillance software
AMR alerts
Infection alerts (e.g C.diff)
Bug-drug mismatches
HAI/AMR Surveillance
Alerts
Order sets
Drug interactions
Restrictions
Indications
Triggers (e.g sepsis)
Care templates
(Advanced decision support)

Summary

- Organisational, social and cultural issues relating to prescribing behaviour are the key factors that determine the effectiveness of CDSS, and resources should be directed towards addressing these issues during implementation.
- The AMS team should consider existing and planned IT systems when considering adoption of CDSS.
- CDSS must be integrated into the clinical workflow to be effective in a complex clinical domain such as AMS.
- CDSS are most likely to be successful as part of a multidisciplinary AMS program.
- A range of CDSS options are available, including mobile applications, approval systems, surveillance programs and electronic medication management.