Using a QI approach to support timely oral antibiotic switch

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Clinical Excellence Commission

CEC NSW AMS Forum

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QUAH

Quality Use of Antimicrobials in Healthcare

Overview

- Model for Improvement
  - Aim statements
  - Project measures
  - Use of Plan-Do-Study-Act cycles to test changes

- Use of the model to improve timely and appropriate switch from intravenous to oral antibiotics in paediatric inpatients

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Model for Improvement

What are we trying to accomplish?

How will we know that a change is improvement?

What change can we make that will result in improvement?

Institute for Healthcare Improvement, "How to Improve", http://www.ihi.org/resources/Pages/HowtoImprove/default.aspx

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What is the problem?

- How do you know it is a problem?
- Who else thinks it is a problem?

- Beware of jumping to solutions!

Aim statements

- Shared understanding of what it is that you and your team are trying to improve
- Includes the specific population of patients that will be affected and the location/service of the change
- Should be time-specific and measurable:
  - "Within 12 months" rather than "soon"
  - "Increase x by 50%" rather than "improve"

Institute for Healthcare Improvement, "Science of Improvement: Setting Aims", http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementSettingAims.aspx

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What are we trying to accomplish?

- **Primary outcome**
  - Improve the timely switch from intravenous to oral antibiotics, where it is safe and appropriate at Sydney Children's Hospital, Randwick (SCH)
- **Aim statement**
  - Within 6 months, at least 95% of SCH inpatients on the general paediatric and surgical units prescribed IV antibiotic therapy are switched to oral therapy within 24 hours where safe and appropriate

PROJECT SWITCH

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Reason for the effort

- Prevention and management of HAIs
- 25% of all antibiotic prescriptions for NSW hospital inpatients are inappropriate
- Interventions for more timely parenteral-to-oral conversion strongly supported by evidence
- Evidence supports shorter IV antibiotic courses (ANZPID-ASAP guideline)

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Parenteral antibiotics

Advantages	Disadvantages
• Most direct route of administration: - essential for critically ill patients - IV route: rapid distribution of antibiotic to tissues • Useful if nausea and vomiting or compromised GI absorption	• IV: - requires an IV access device - higher risk of complications - ↑ patient discomfort, ↓ mobility - IM: - Pain and local reactions - Limited by volume and not suitable for all antibiotics • More costly (staff time, antibiotic costs, consumables, monitoring) • More likely to have a longer length of stay

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Patient story

- Ruby is a 5yo patient admitted to a general hospital due to high fever, fast breathing, cough and tiredness
- She is diagnosed with CAP and dehydration, and admitted for oxygen, IV antibiotics and IV fluid

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Reason for the effort

- IV antibiotics are associated with:
  - risks of catheter-related infection
  - increased hospital length of stay
  - selection pressure for drug resistance
  - increased staffing costs and time for administration

- Switching to oral antibiotic formulations should occur when safe to do so

- Supports the National Safety and Quality Health Service Standards (Actions 3.14.3, 3.14.4)

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Establishing a project team

- What system are you trying to change? Who will be affected?
- Ideal project teams include members with expertise in:
  - system leadership (clinical leader, executive sponsor)
  - technical expertise
  - day-to-day leadership
  - receiving care (patient rep, consumer advocate)

Institute for Healthcare Improvement, "Science of Improvement: Forming the Team", http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementFormingtheTeam.aspx

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Project Switch team

- SCH Project Lead (SMO): Dr Brendan McMullan
- SCH JMO lead: Dr Michelle Mahony
- SCH Executive Sponsor: Dr Cathy Lovell
- SCH ID Advanced Trainee: Dr Laila Al Yazidi
- SCH AMS Pharmacist: Ms Mona Mostaghim
- SCH General Medicine lead: Dr Michael Plaister
- SCH General Surgeon lead: Dr Camille Wu
- SCH Nursing lead: Ms Erica Wilcox
- SCHN Consumer Engagement lead: Ms Laura Griffin

- CEC AMS Project Lead: Ms Evette Buono
- CEC AMS Project Officer: Ms Lolita Tu

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Model for Improvement

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Establishing measures

- Critical and often overlooked
- Confirms your hypothesis about what changes are needed
- Not the same as measures for research
- Collect “just enough” data

Institute for Healthcare Improvement, “Science of Improvement: Establishing Measures”, http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementEstablishingMeasures.aspx

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Family of measures

- **Process Measures**
  - Are the parts/steps in the system performing as planned?
- **Outcome Measures** (the "And… so what?")
  - Provides evidence that changes are impacting the system
- **Balancing Measures**
  - Are changes causing new problems in other parts of the system?

Institute for Healthcare Improvement, "Science of Improvement: Establishing Measures", http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementEstablishingMeasures.aspx

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Linking project aim to measures

- **Primary outcome:**
  - Improve the timely switch from intravenous to oral antibiotics, where it is safe and appropriate

- **Secondary outcomes (anticipated benefits of timelier switch):**
  - Reduce length of IV antibiotic therapy
  - Reduce hospital length of stay
  - Reduce complications of IV therapy (thrombophlebitis, line-associated infection)

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How will we know that change is improvement?

Process measures	• Median time taken to switch eligible patients* to oral antibiotics • Percentage of eligible patients* in IV antibiotics that are stopped or switched to oral therapy within 24 hours
Balancing measures	• Number of readmissions due to infection within 7 days of discharge in eligible patients* • Number of eligible patients* recommenced on IV antibiotics within 48 hours after oral switch

*Patients that meet criteria for a safe and appropriate to switch to oral antibiotic therapy according to ANZPID-ASAP Guidelines

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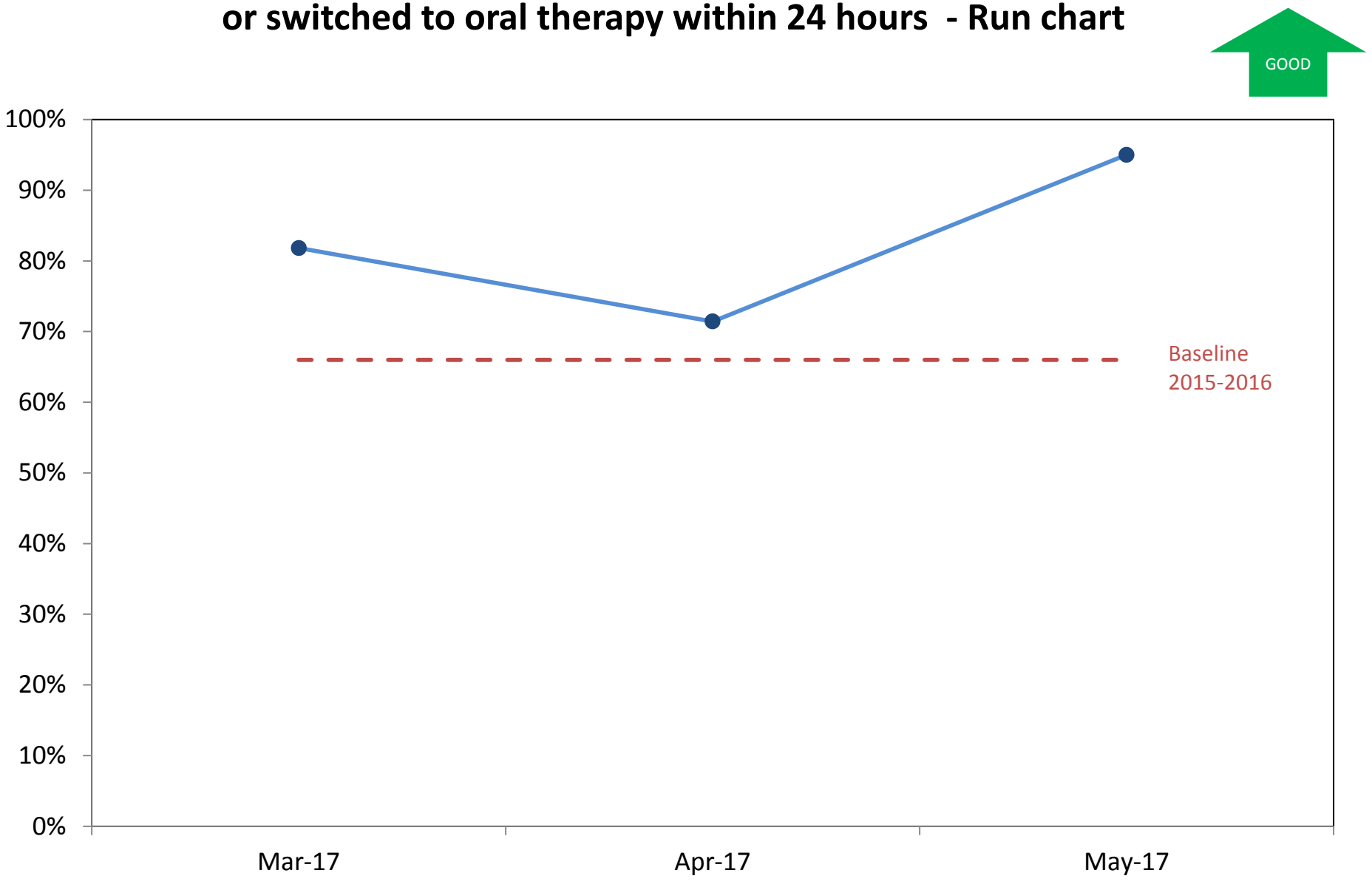
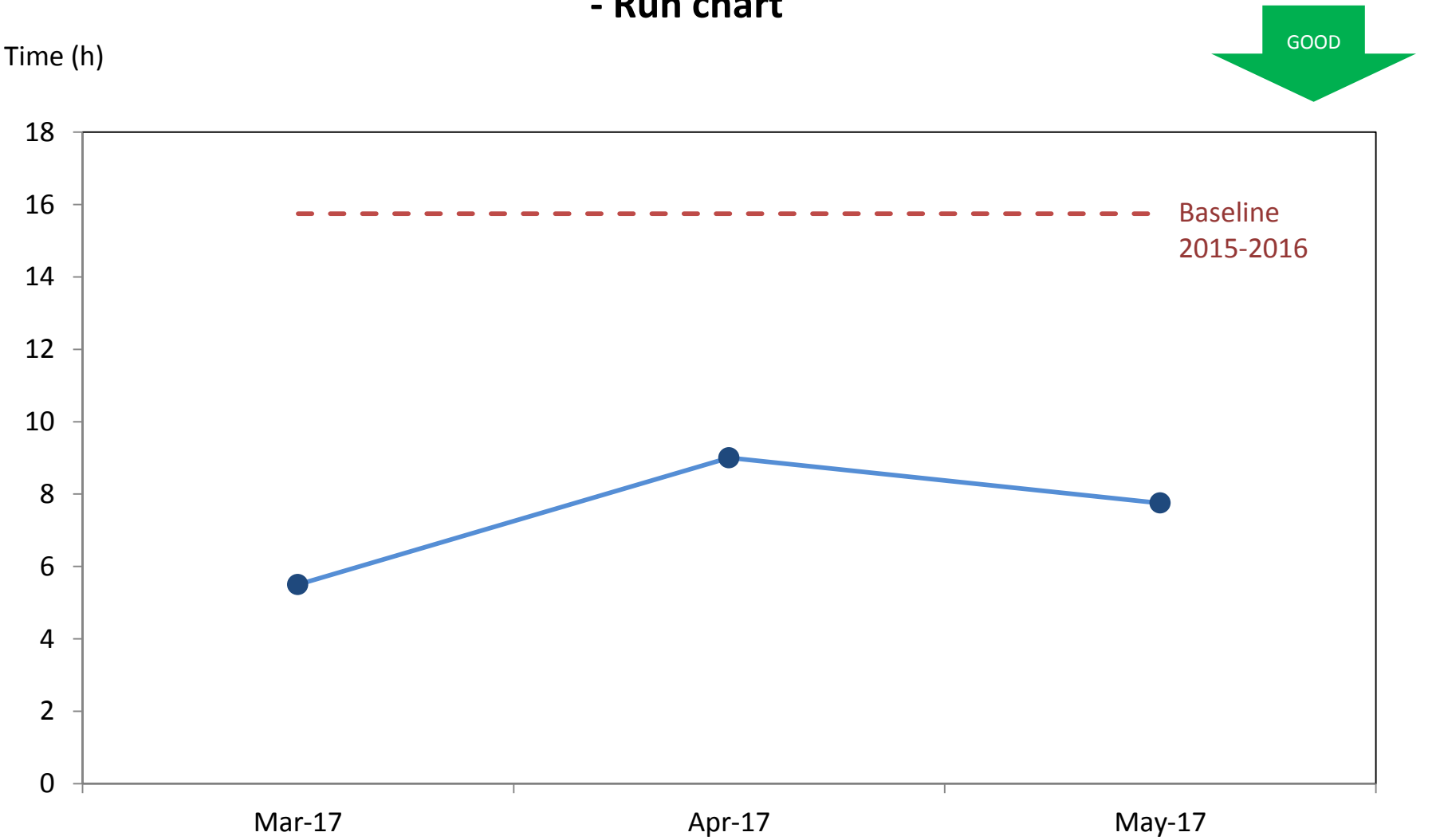
Percentage of eligible patients* on IV antibiotics that are stopped or switched to oral therapy within 24 hours - Run chart



Median time taken to switch eligible patients* to oral antibiotics - Run chart



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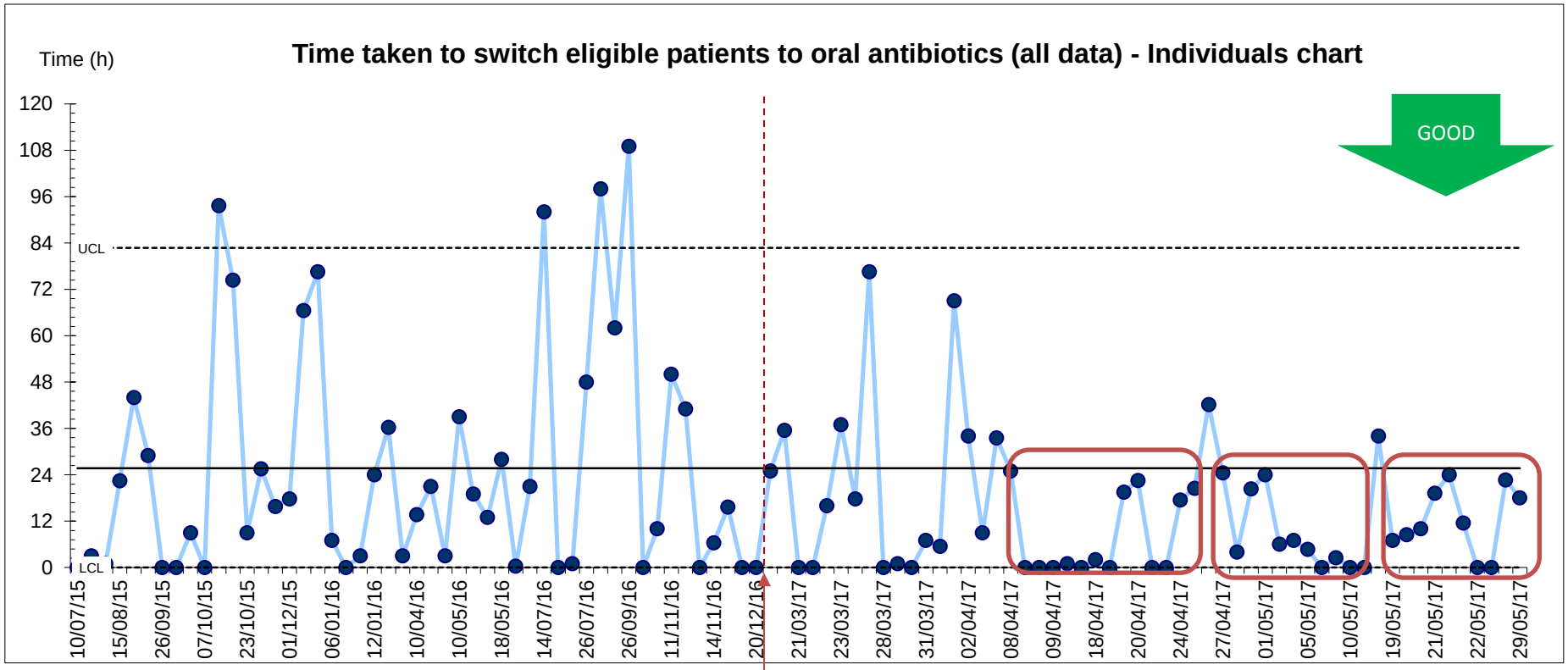
Statistical process control chart – Phase 1 + 2



Phase 1 (baseline data):
Median time to switch: 15h 45m
Average time to switch: 25h 43m

Local guideline published
PDSAs commenced

Phase 2 special cause:
3 runs of 8 or more points in a row below the centre line

- Each data point represents one patient

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Statistical process control chart – Phase 2

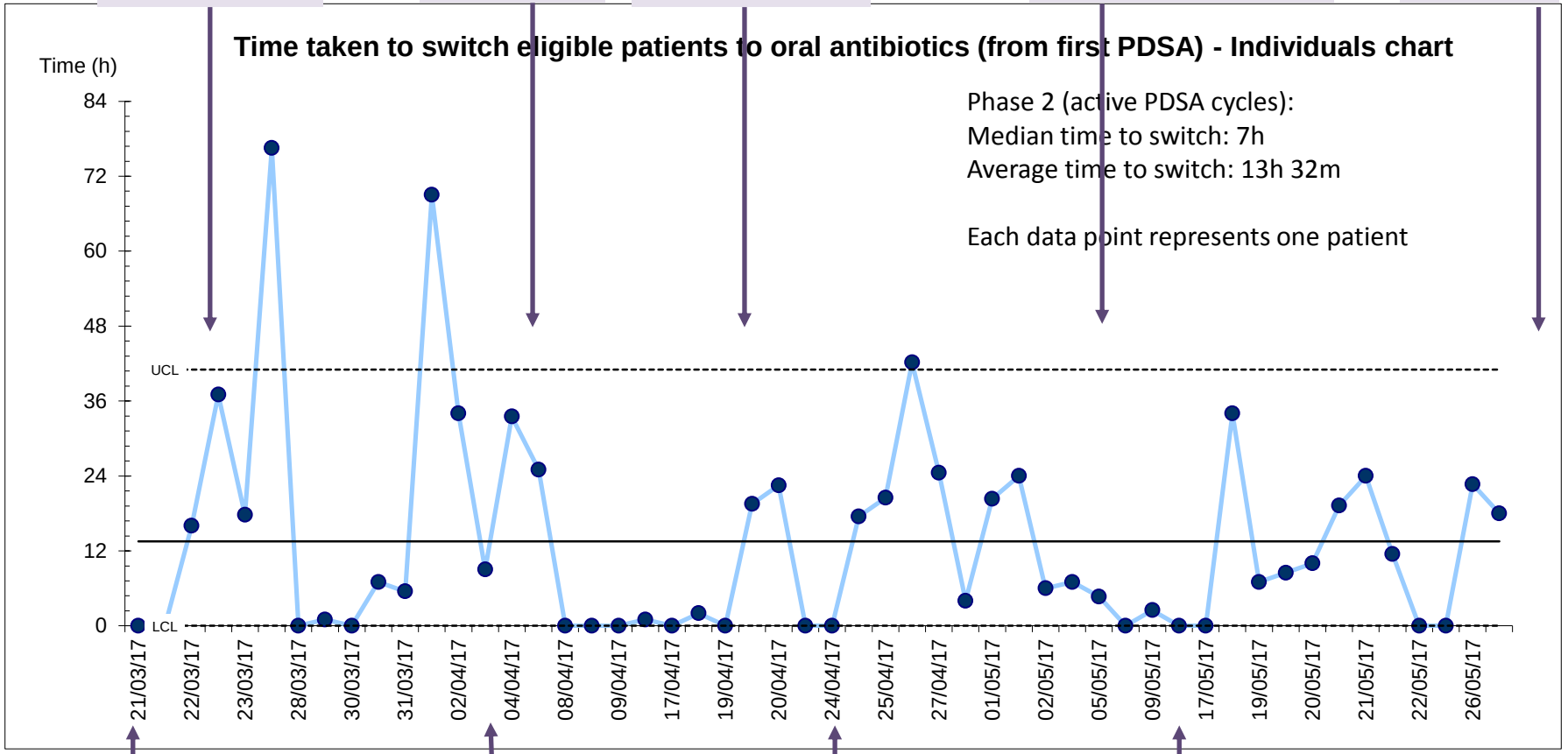
Pharmacist education

Feedback on audit tool

Feedback from consumers received

Consumer suggestions incorporated in publication

Parent publication released



- Paediatrician education
- Audit tool tested

- Developed decision support tool
- Consumer review of publication

Planning for nurse inservices and ward visit

Review of initial audit data

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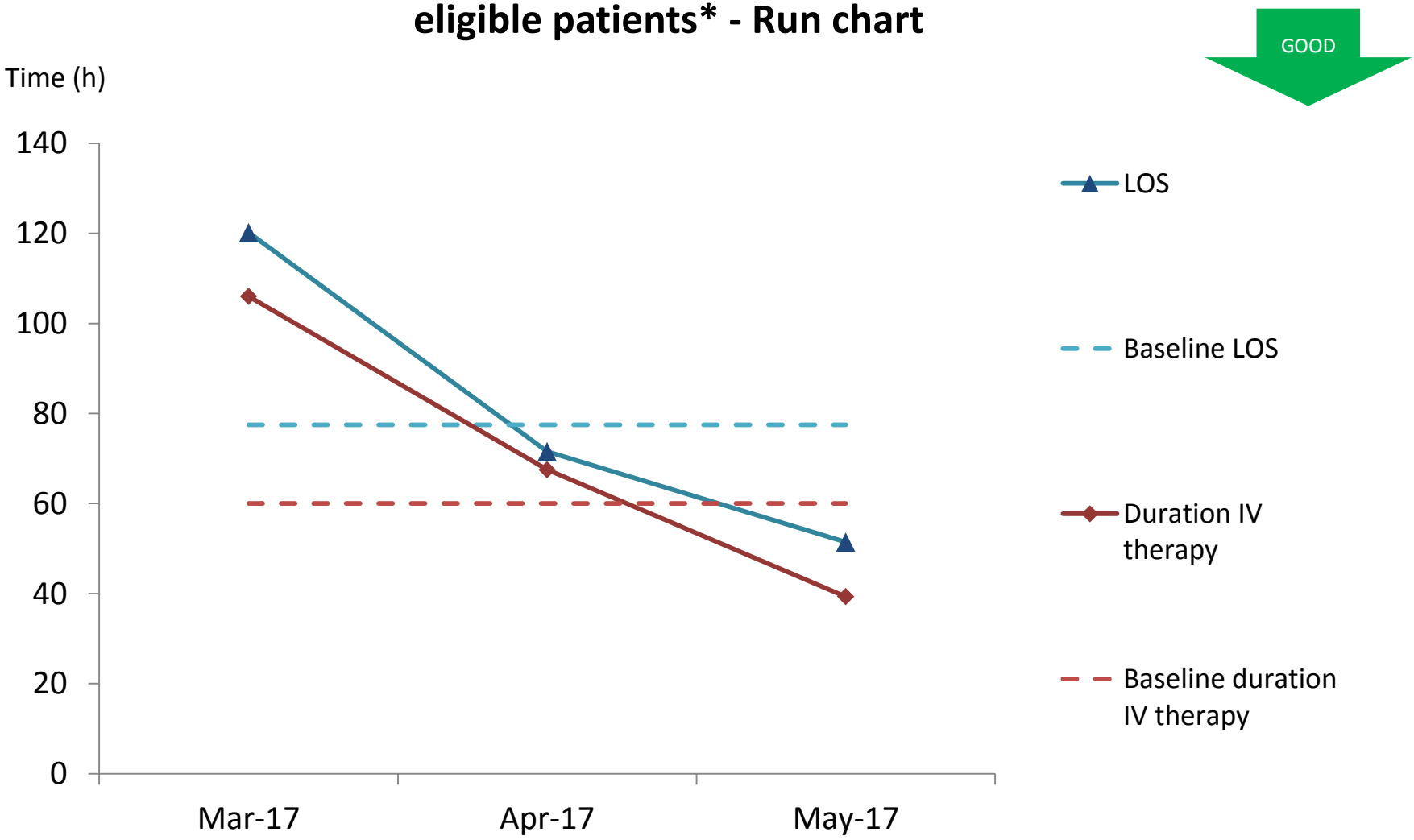
Median duration of IV antibiotic therapy and length of stay in eligible patients* - Run chart



Baseline = data collected in 2015-2016

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Outcome and balancing measures

	Baseline 2015-2016	Mar-17	Apr-17	May-17
Number of patient records audited (n)	51	11	21	20
Number of line-associated complications	0	0	1	1
Number readmitted within 7 days	1	1	0	2
Number recommenced on IV antibiotics within 48h	2	0	0	1

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Change ideas and selecting changes

- All improvement requires change
- Look at the system you are focused on
  - Decision making processes
  - Points of variation
  - Wasted steps/time
  - Where and why errors occur
- Look at the literature and learn from others
- Test changes on a small scale

Institute for Healthcare Improvement, "Science of Improvement: Selecting Changes", http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementSelectingChanges.aspx

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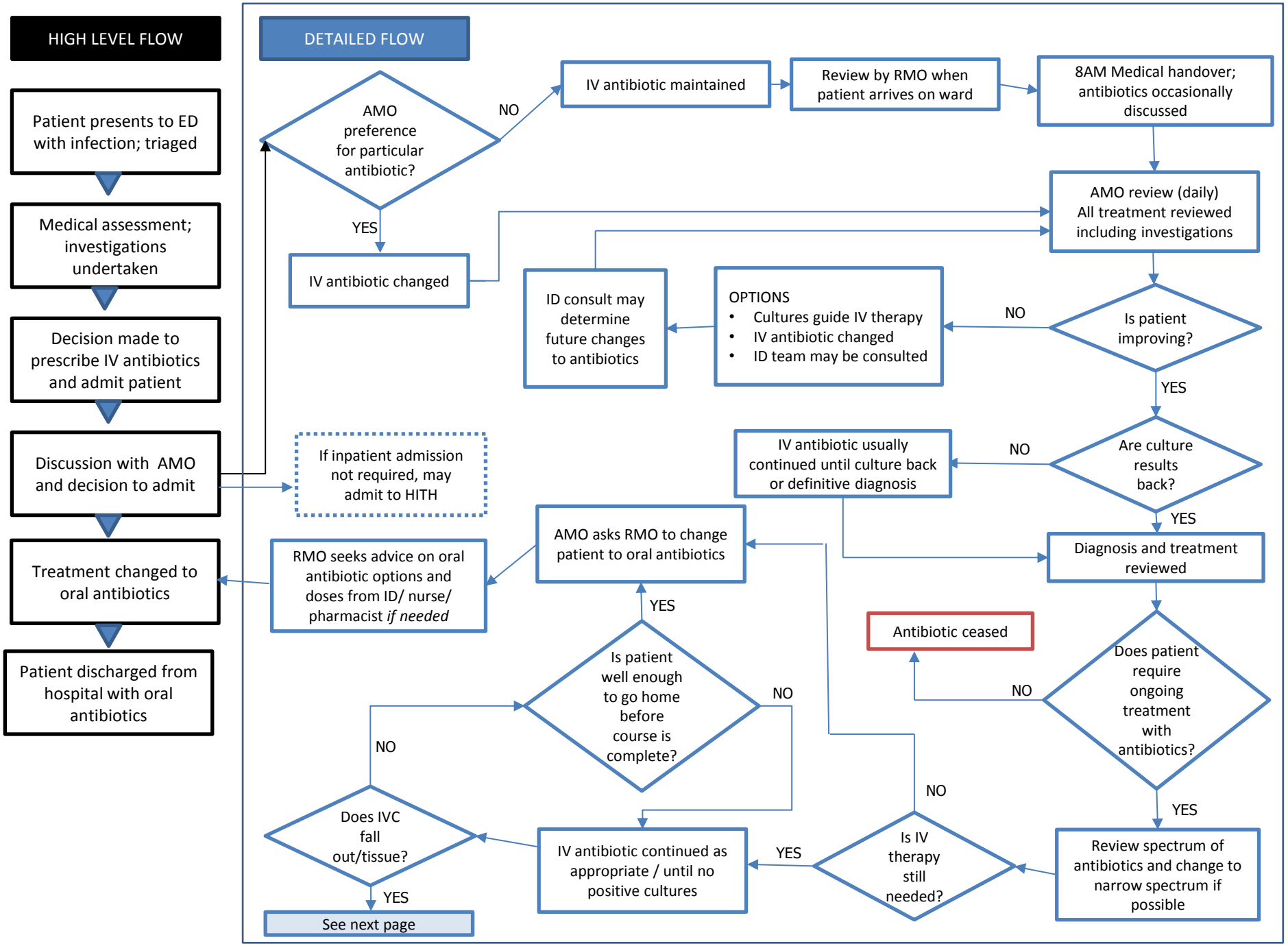
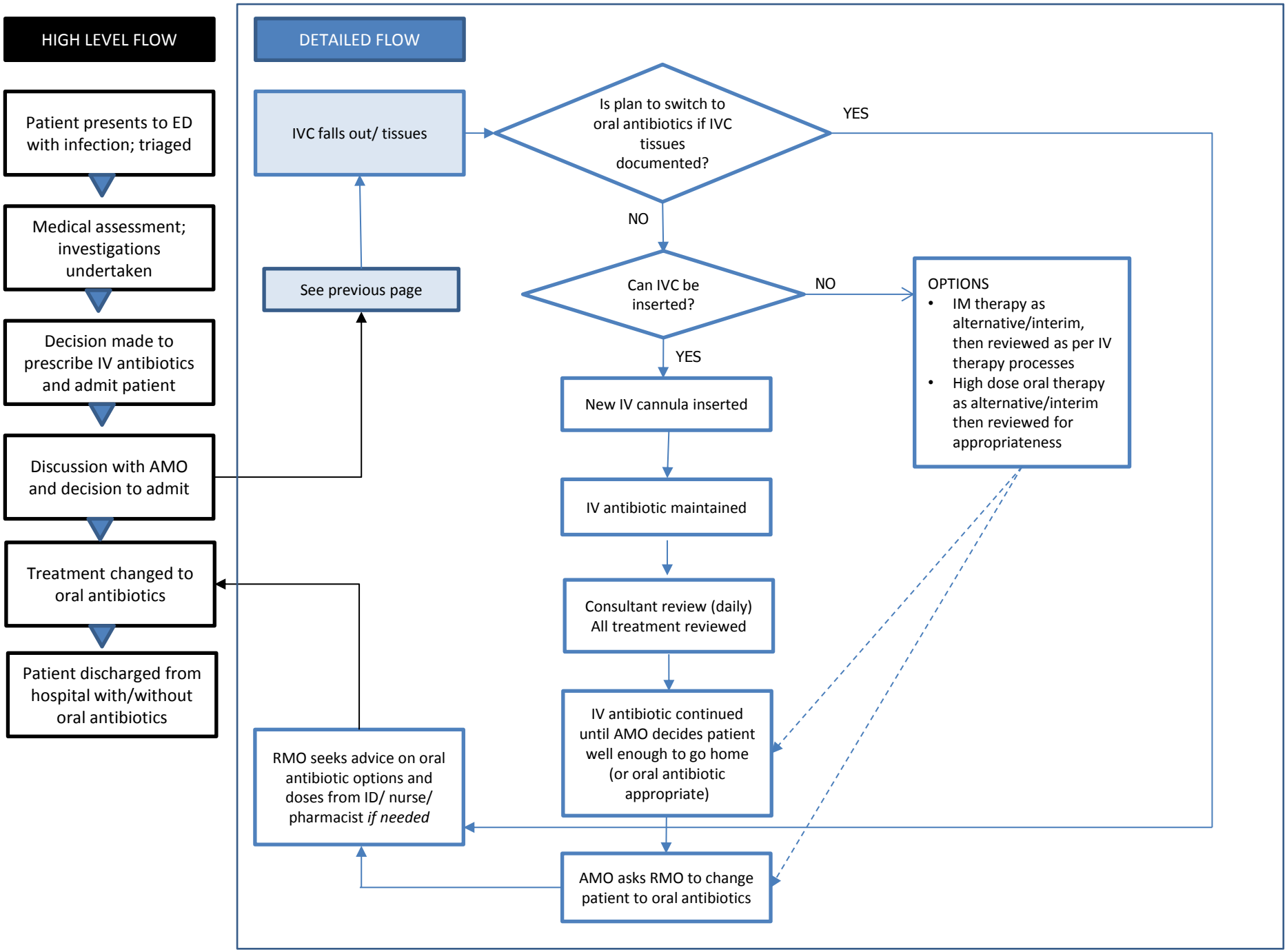

HIGH LEVEL FLOW
Patient presents to ED with infection; triaged
Medical assessment; investigations undertaken
Decision made to prescribe IV antibiotics and admit patient
Discussion with AMO and decision to admit
Treatment changed to oral antibiotics
Patient discharged from hospital with oral antibiotics
DETAILED FLOW
AMO preference for particular antibiotic?
NO
YES
IV antibiotic maintained
Review by RMO when patient arrives on ward
8AM Medical handover; antibiotics occasionally discussed
AMO review (daily) All treatment reviewed including investigations
IV antibiotic changed
ID consult may determine future changes to antibiotics
OPTIONS
• Cultures guide IV therapy
• IV antibiotic changed
• ID team may be consulted
Is patient improving?
NO
YES
If inpatient admission not required, may admit to HITH
IV antibiotic usually continued until culture back or definitive diagnosis
Are culture results back?
NO
YES
AMO asks RMO to change patient to oral antibiotics
RMO seeks advice on oral antibiotic options and doses from ID/ nurse/ pharmacist *if needed*
Diagnosis and treatment reviewed
Antibiotic ceased
Does patient require ongoing treatment with antibiotics?
NO
YES
Is patient well enough to go home before course is complete?
YES
NO
Does IVC fall out/tissue?
NO
YES
See next page
IV antibiotic continued as appropriate / until no positive cultures
Is IV therapy still needed?
YES
NO
Review spectrum of antibiotics and change to narrow spectrum if possible


HIGH LEVEL FLOW
Patient presents to ED with infection; triaged
Medical assessment; investigations undertaken
Decision made to prescribe IV antibiotics and admit patient
Discussion with AMO and decision to admit
Treatment changed to oral antibiotics
Patient discharged from hospital with/without oral antibiotics
DETAILED FLOW
IVC falls out/ tissues
Is plan to switch to oral antibiotics if IVC tissues documented?
YES
NO
See previous page
Can IVC be inserted?
NO
YES
OPTIONS
• IM therapy as alternative/interim, then reviewed as per IV therapy processes
• High dose oral therapy as alternative/interim then reviewed for appropriateness
New IV cannula inserted
IV antibiotic maintained
Consultant review (daily) All treatment reviewed
IV antibiotic continued until AMO decides patient well enough to go home (or oral antibiotic appropriate)
RMO seeks advice on oral antibiotic options and doses from ID/ nurse/ pharmacist *if needed*
AMO asks RMO to change patient to oral antibiotics

What prevents the intravenous to oral antibiotic switch?

Prescribing decisions influenced by three key issues:

- **Consumerism** – concern about risk of litigation or complaints if patient expectations were not met
- **Hierarchy** of medical team structure, **limited opportunities for de-escalation** of antibiotics
- IV antibiotics **perceived as more potent** and having significant mythical qualities – acknowledged as not necessarily evidence based

Broom J, Broom A, Adams K, Plage S. *J Antimicrob Chemother*. 2016 Aug; 71(8): 2295-2299

What changes can we make that will lead to improvement?

- **Education** about the benefits and risks associated with different routes of antimicrobial therapy
- **Guidelines** for antimicrobial prescribing for common infections that can be treated with oral agents

Dellit TH, Owens RC, McGowan JE Jr, et al. Clin Infect Dis. 2007 Jan 15;44(2):159-77.
Mertz D, Koller M, Haller P, et al. J Antimicrob Chemother. 2009 Jul;64(1):188-99.
Wong-Beringer A, Nguyen KH, Razeghi J. Am J Health Syst Pharm. 2001 Jun 15;58(12):1146-9.

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What changes can we make that will lead to improvement?

- **Clinical criteria** outlining when a switch to an oral agent is safe and appropriate
- **Prompts** by nursing staff and pharmacy staff to highlight review of IV therapy
- **Shared decision making** with patients and carers about IV to oral switch of therapy

Dellit TH, Owens RC, McGowan JE Jr, et al. Clin Infect Dis. 2007 Jan 15;44(2):159-77.
Mertz D, Koller M, Haller P, et al. J Antimicrob Chemother. 2009 Jul;64(1):188-99.
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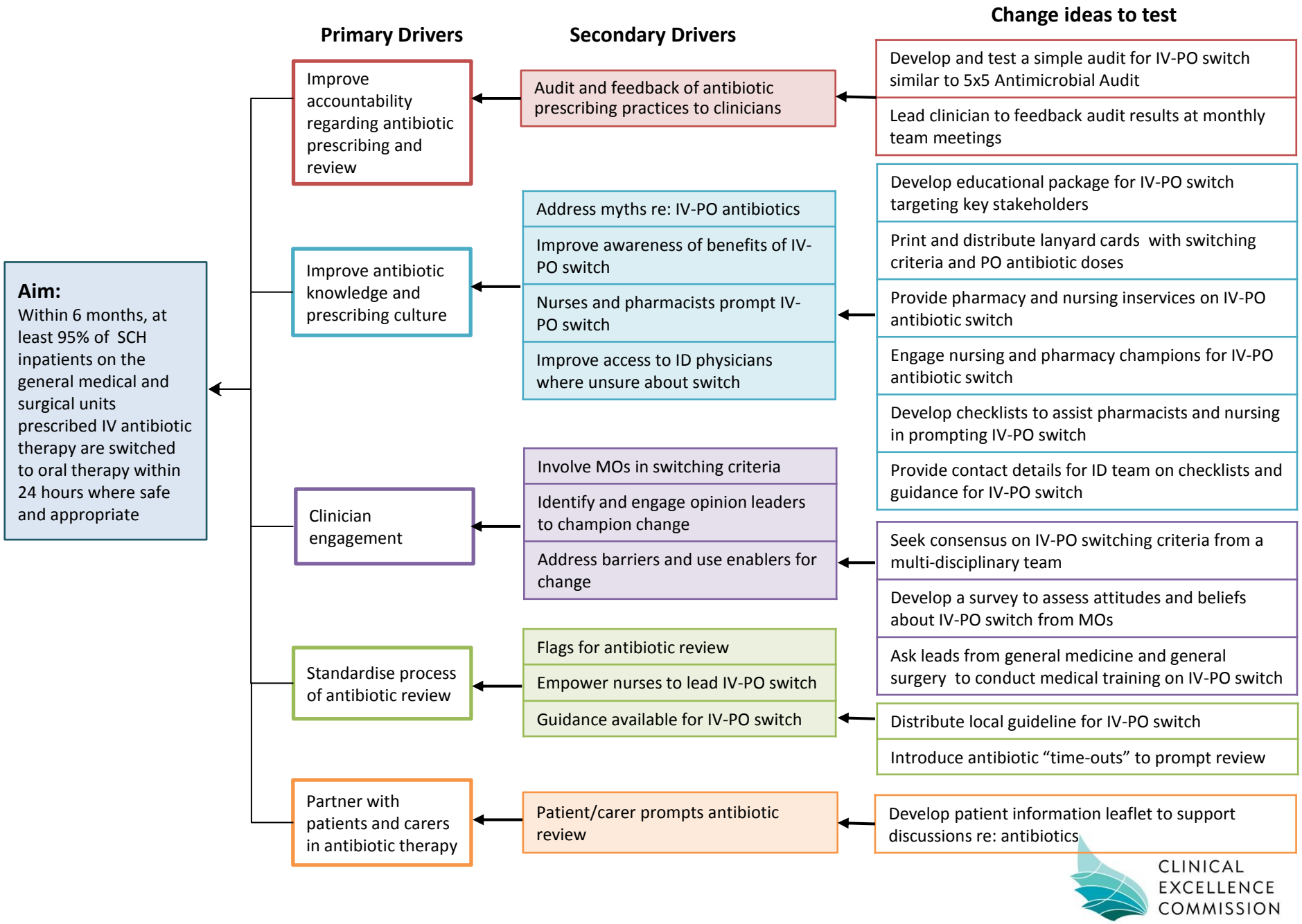

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Point of care prompt: Lanyard card

IV to Oral Conversion

Can your patient be converted to oral antimicrobials?

Inclusion criteria

- ✓ *Clinically stable*
- ✓ *Able to tolerate oral medication*
- ✓ *Suitable oral alternative available in palatable paediatric formulation*
- ✓ *Patient likely to be adherent with oral therapy*
- ✓ *Family agrees with the plan*

Exclusion Criteria:

- × *Septic*
- × *Endocarditis*
- × *Meningitis*
- × *Malabsorption*
- × *Severe diarrhoea*
- × *Uncontrolled nausea and vomiting*
- × *Neonate (not an absolute contraindication, discuss with AMO)*

Full guideline available on the intranet
Policy Number 2017-044
Sydney Children's Hospital Randwick
May 2017

SYDNEY CHILDREN'S HOSPITAL RANDWICK
The Sydney children's Hospitals Network

Check MICROBIOLOGY results at 24 hours and CHOOSE ORAL THERAPY according to susceptibilities.
Do NOT use suggested doses below for NEONATES.
Do NOT exceed ADULT DOSE.

If on: **IV antibiotic and dose**	**Suggested PO conversion**
Ampicillin/Amoxicillin 25-50 mg/kg/dose 6-hourly	Amoxicillin 15-25 mg/kg/dose 8-hourly
Benzylpenicillin 30-60 mg/kg/dose 6-hourly	Amoxicillin (dose as above) OR Phenoxymethylpenicillin 10-12.5 mg/kg/dose 6-hourly
Cefotaxime *(restricted)* 25-50 mg/kg/dose 6-to-8-hourly	Amoxicillin-Clavulanic acid (*Augmentin Duo400®*) 22.5 mg/kg/dose (amoxicillin component) 12-hourly If treating a Pseudomonas or resistant Gram negative infection, seek ID advice
Ceftriaxone *(restricted)* 50-100 mg/kg/dose 24-hourly	
Piperacillin-Tazobactam *(restricted)* 100 mg/kg/dose (piperacillin component) 6-to-8-hourly	
Ampicillin 25-50mg/kg/dose 6-hourly PLUS Gentamicin 7.5mg/kg/dose 24-hourly PLUS Metronidazole 12.5 mg/kg/dose 12-hourly	
Clindamycin *(restricted)* 10-15 mg/kg/dose 8-hourly	Clindamycin *(restricted)* 7.5-10mg/kg/dose 8-hourly
Flucloxacillin 25-50 mg/kg/dose 6-hourly	Flucloxacillin 12.5-25 mg/kg/dose 6-hourly OR Cefalexin 12.5-25 mg/kg/dose 6-hourly

- Designed to be used at the bedside
- Lists key inclusion and exclusion criteria for oral switch
- Guides conversion of antibiotic and dose from IV to oral, listing those agents most commonly used

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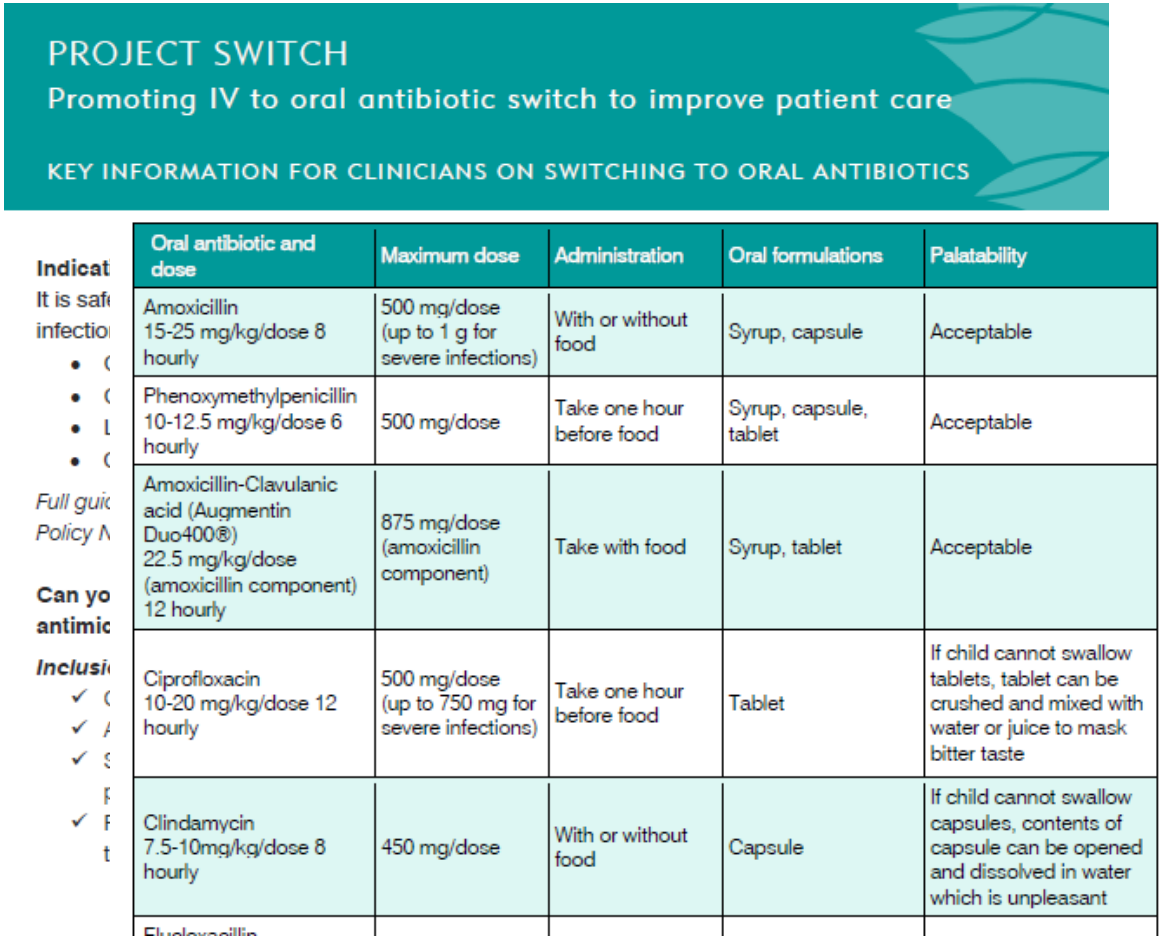
Improving knowledge: Oral antibiotics fact sheet



PROJECT SWITCH

Promoting IV to oral antibiotic switch to improve patient care

KEY INFORMATION FOR CLINICIANS ON SWITCHING TO ORAL ANTIBIOTICS

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Oral antibiotic and dose	Maximum dose	Administration	Oral formulations	Palatability
Amoxicillin 15-25 mg/kg/dose 8 hourly	500 mg/dose (up to 1 g for severe infections)	With or without food	Syrup, capsule	Acceptable
Phenoxymethylpenicillin 10-12.5 mg/kg/dose 6 hourly	500 mg/dose	Take one hour before food	Syrup, capsule, tablet	Acceptable
Amoxicillin-Clavulanic acid (Augmentin Duo400®) 22.5 mg/kg/dose (amoxicillin component) 12 hourly	875 mg/dose (amoxicillin component)	Take with food	Syrup, tablet	Acceptable
Ciprofloxacin 10-20 mg/kg/dose 12 hourly	500 mg/dose (up to 750 mg for severe infections)	Take one hour before food	Tablet	If child cannot swallow tablets, tablet can be crushed and mixed with water or juice to mask bitter taste
Clindamycin 7.5-10mg/kg/dose 8 hourly	450 mg/dose	With or without food	Capsule	If child cannot swallow capsules, contents of capsule can be opened and dissolved in water which is unpleasant
Flucloxacillin				

Supplements lanyard card

Includes additional information on oral antibiotics:

- Maximum dose
- Administration in relation to food
- Syrup or tablet
- Comments on the taste

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Prompts for antibiotic review: Poster for handover/MDT discussions

- Designed to prompt discussion about the possibility of oral switch at Team Talk or Handover meetings
- Lists key considerations for the team when deciding whether the patient is eligible for switch
- Highlights the advantages of oral switch

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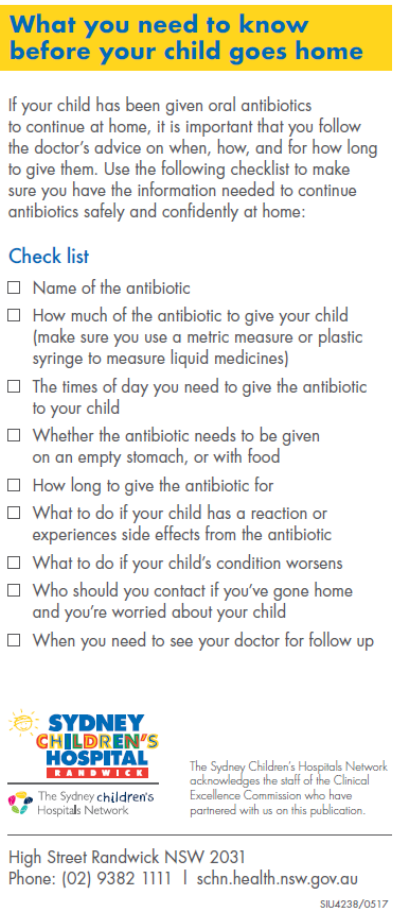
Shared decision making: Parent and family publication



What you need to know before your child goes home

If your child has been given oral antibiotics to continue at home, it is important that you follow the doctor's advice on when, how, and for how long to give them. Use the following checklist to make sure you have the information needed to continue antibiotics safely and confidently at home:

Check list

- ☐ Name of the antibiotic
- ☐ How much of the antibiotic to give your child (make sure you use a metric measure or plastic syringe to measure liquid medicines)
- ☐ The times of day you need to give the antibiotic to your child
- ☐ Whether the antibiotic needs to be given on an empty stomach, or with food
- ☐ How long to give the antibiotic for
- ☐ What to do if your child has a reaction or experiences side effects from the antibiotic
- ☐ What to do if your child's condition worsens
- ☐ Who should you contact if you've gone home and you're worried about your child
- ☐ When you need to see your doctor for follow up

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The Sydney children's Hospitals Network

The Sydney Children's Hospitals Network acknowledges the staff of the Clinical Excellence Commission who have partnered with us on this publication.

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SIU4238/0517

- Supports discussion and shared decision making between healthcare teams and parents and families about switching to oral antibiotics
- Outlines risks and benefits to patients
- Includes a handy check list for discharge

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Steps in Plan-Do-Study-Act cycles

- Can be used to develop, test, or implement a change

Plan	Do	Study	Act
• Decide what question(s) the team want to answer on this PDSA cycle • Who, what, when, where • Make predictions	• Carry out the test • Collect data, begin analysis • Note unexpected observations	• Complete analysis of data • Compare results to predictions • Summarise results and reflect	• Are you ready to make a change? • What is the next PDSA?

Institute for Healthcare Improvement, "Science of Improvement: Testing Changes", http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementTestingChanges.aspx

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Next steps

- Implementing changes
  - After testing confirms a high degree of belief in the change
  - Becomes the new way of working
  - Affects a broader group; consider training, resources required and risk

- Spreading changes
  - Requires planning and leadership

Langley GJ, Moen RD, Nolan KM, Nolan TW, Norman CL, Provost LP. "The Improvement Guide: A Practical Approach to Enhancing Organizational Performance, 2nd Edition". March 2009, Jossey-Bass.

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Acknowledgements

- Project Switch Team:
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  - Dr Camille Wu
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  - Dr Harvey Lander
  - Ms Nina Muscillo
  - Mr Malcolm Green
  - Mr Paul Hudson
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Questions?

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