Managing RTIs in children – what is the evidence?

Presented by:
Dr Conor Jamieson, Regional Antimicrobial Stewardship Lead

Overview of this session

- Drivers for healthcare consultations and antibiotic prescribing
- What does the data on antibiotic consumption look like?
- Can antibiotic prescribing safely be reduced in primary care? Does that impact on workload?
- Harms of antibiotics
- Benefits of antibiotics for RTIs
- Two important studies for RTIs in children
- Antibiotic prescribing strategies
- Impact on reconsultation rates
- Useful resources for self-care and safety netting

Drivers for healthcare consultations and antibiotic prescribing

Burden of children's RTI consultations in primary care

- Children have higher consultation rates for RTI than adults, and most children labelled as having URTI or chest infection are prescribed antibiotics[1]
- At least 40% of children are prescribed antibiotics for chest infections – 2 million prescriptions per annum for coughs, costing about £30m[1,2]
- Non-quantifiable costs of medicalising illness in the family and wider social networks, more likely to reconsult in the future[3]

[1]Petersen et al, *BMJ* 2007;**335**:982, [2]Redmond et al, *Br J Gen Pract* 2018;B68B:e682, [3]Little et al, Lancet 2021;**398**:1417

Antibiotic prescribing for children: top-tips

Snippets from the ‘Healthier Together’ website

- Fever in children is extremely common and accounts for over 50% of primary care activity in children under 5 years of age* – driven by parental anxiety
- The absolute risk of a child having a serious bacterial infection has markedly reduced since the introduction of conjugate vaccines against Strep. Pneumococcus, HiB and meningococcus

- Parents generally believe that antibiotics are required to treat ‘severe’ infections, rather than bacterial infections
    - They often believe that high fever, prolonged duration of symptoms and degree of impact on the child (sleep/school) suggest ‘severe’ infection

*Southampton CCG audit data 2016/17

Source: Healthier Together website

Antibiotic prescribing for children: top-tips

Snippets from the ‘Healthier Together’ website

- Trying to differentiate between mild/moderate bacterial and viral infection is unhelpful*, and can negatively impact on the effectiveness of a consultation
- Parents are seeking healthcare professional advice due to concern that their child might be seriously unwell
- Role of the clinician is to try to establish if this is the case – and convey their professional opinion to the family
- **Clinicians should adopt a severity of illness approach when deciding whether to prescribe antibiotics, not rely on differentiating between viral/bacterial infection***
- ***(unless a validated scoring tool is available e.g. Fever-PAIN or Centor)**

Source: Healthier Together website

Why do parents see a healthcare consultation?

It provides a proper ‘health-check’ and removes any perceived ‘health-threat’

- Parents lack confidence to distinguish self-limiting illnesses from serious ones but believe that clinicians can

During a consultation, parents also seek info about:-

- What to look out for / when to seek help
- What they should do to care for their child – including treatment

Parents do not generally seek antibiotics:
but they are anxious!

Low rates of pathology in children (compared to the elderly) but high rates of parental anxiety (resulting in high consultation rates)

Cabral C et al. Social Science & Medicine, 2015; Jul:156; Szymczak J et al, Journal of the Ped Inf Des Soc 2018, **7**:303

Why do clinicians prescribe antibiotics?

- Belief that bacterial infections require treatment with antibiotics
  - Perceive that antibiotics will expedite recovery from illness and/or reduce the risk of suppurative complications
- Medicolegal
  - Risk aversion
    - Culpability if a child becomes ‘septic’ / severely unwell
- Belief that parents are seeking antibiotics
  - Path of least resistance!

Primary care clinician antibiotic prescribing decisions in consultations for children with RTIs:

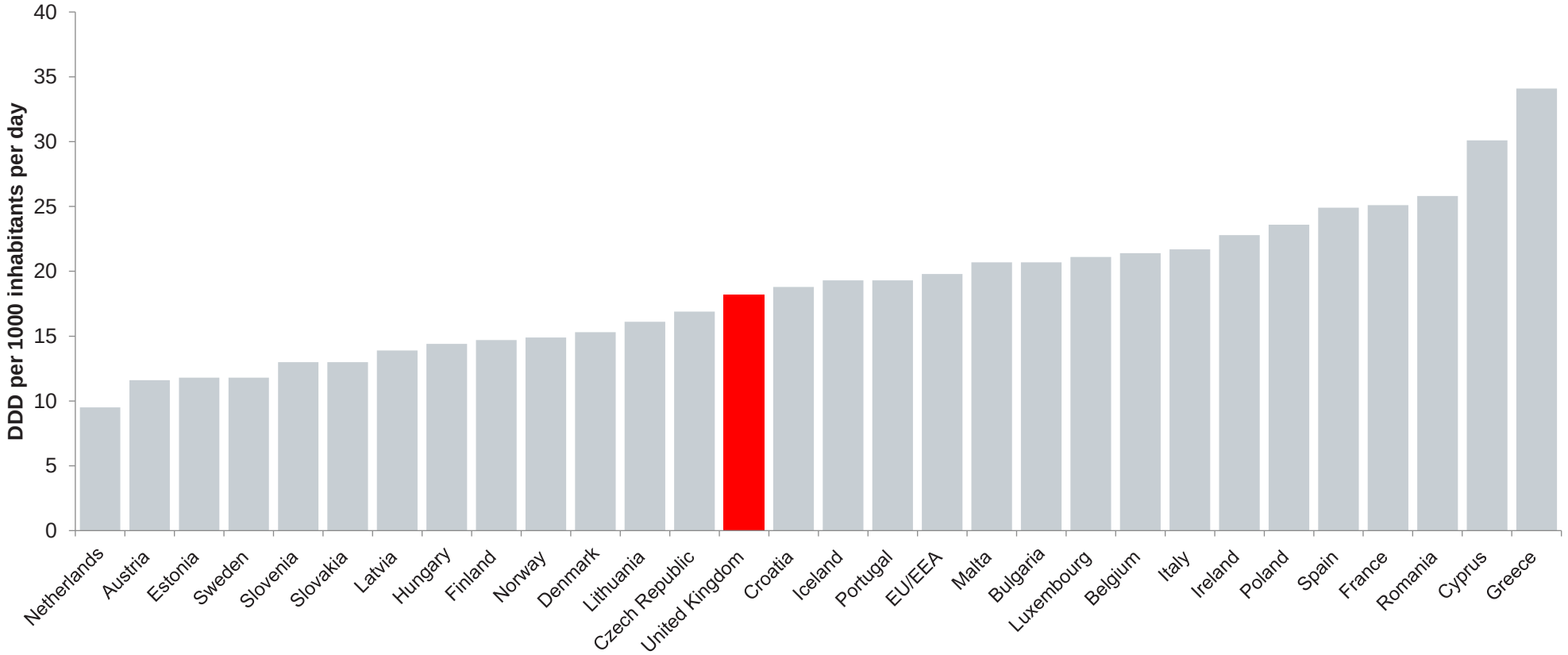
a qualitative interview study

Horwood J at al. *Br J Gen Pract* 2016; **66**:207

Volume of antibiotic prescribing – UK, England and local data

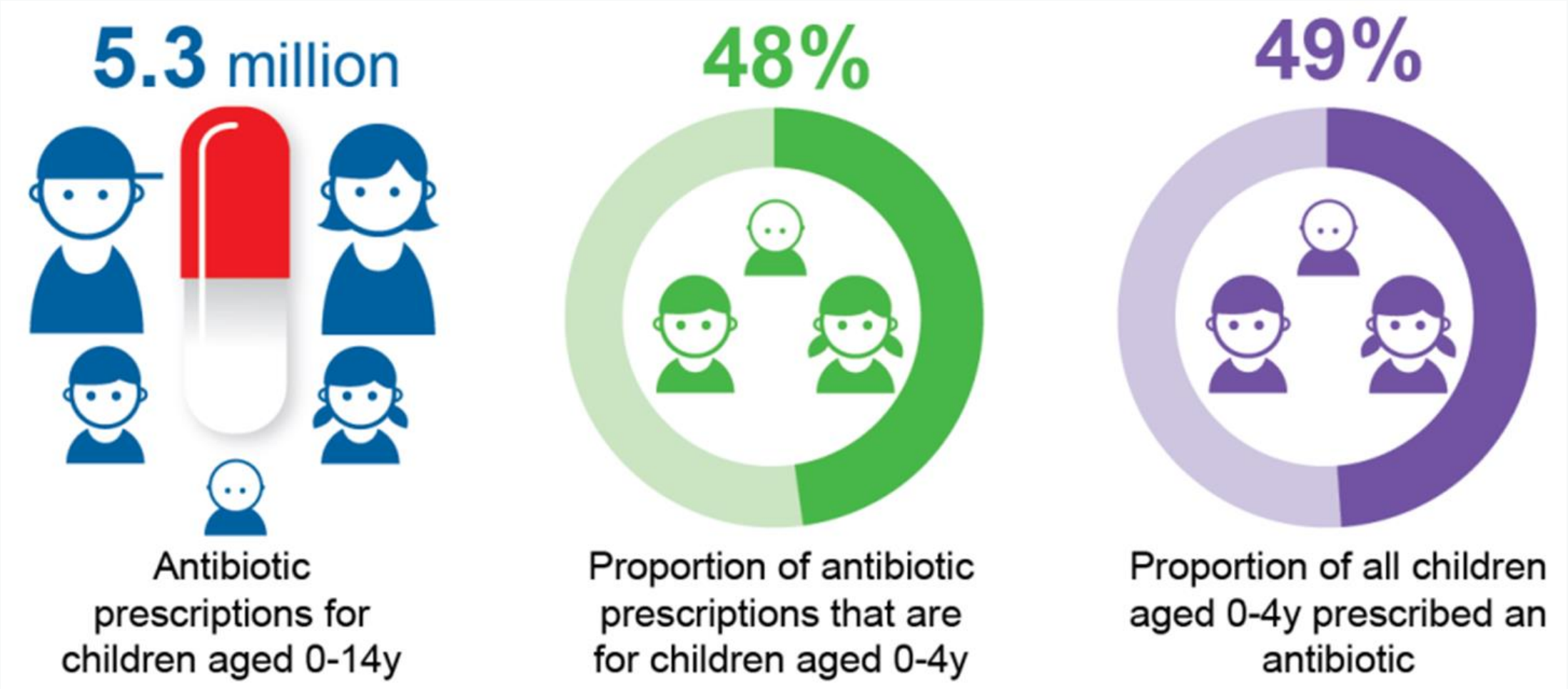
Community antibiotic prescribing across European countries

Total community consumption of antibacterials for systemic use by country, EU/EEA and the United Kingdom in 2019 expressed as DDD/1000 population per day



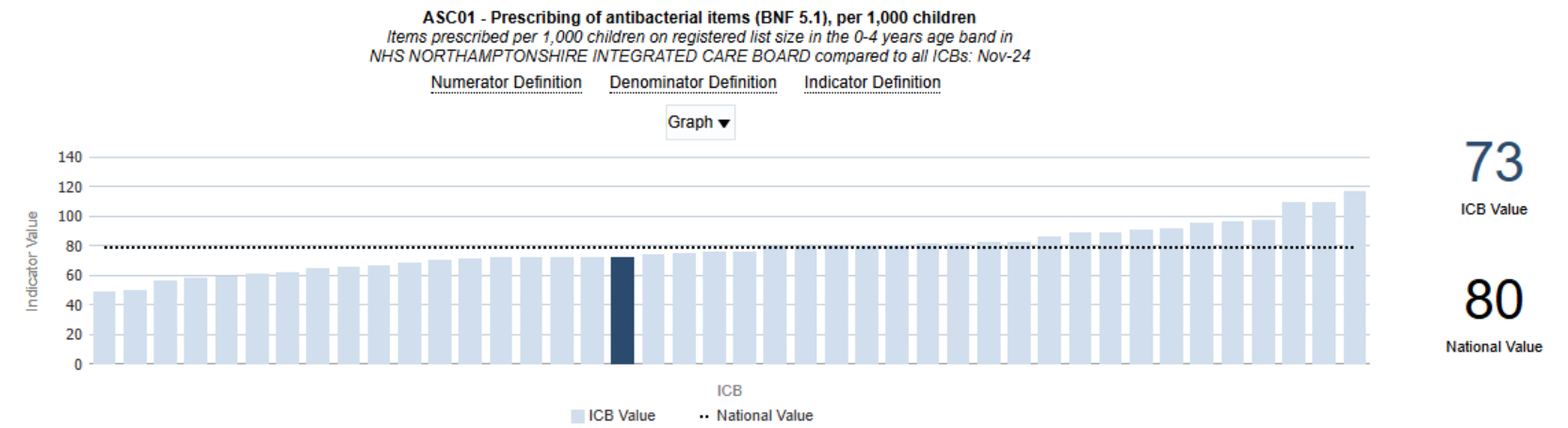
Source: European Centre for Disease Prevention and Control

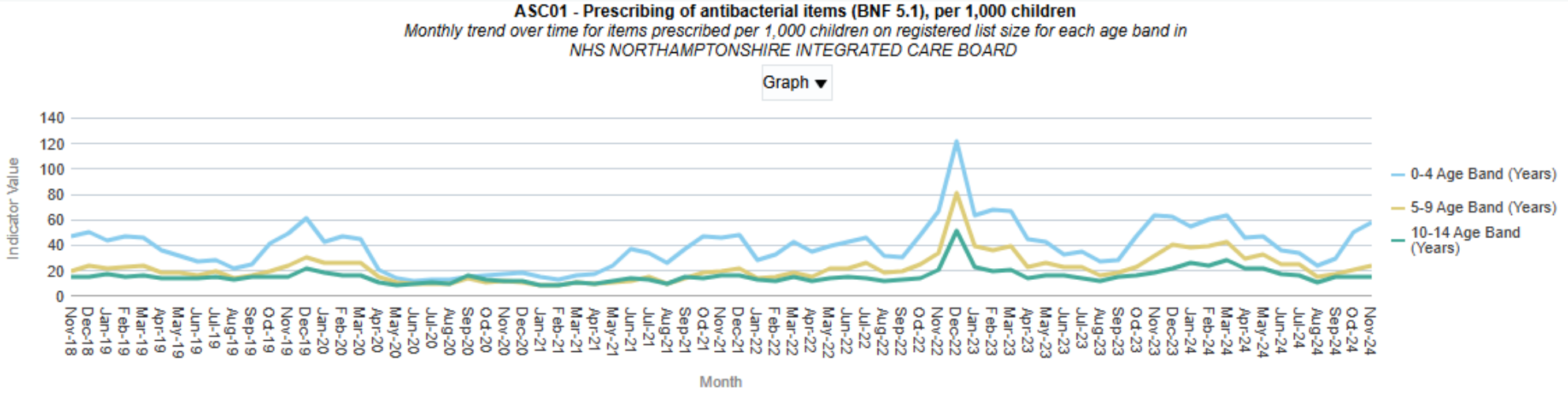
Volume of prescribing of antibiotics to children aged 0-14 in England FY 2022-23



ESPAUR report 2022-23

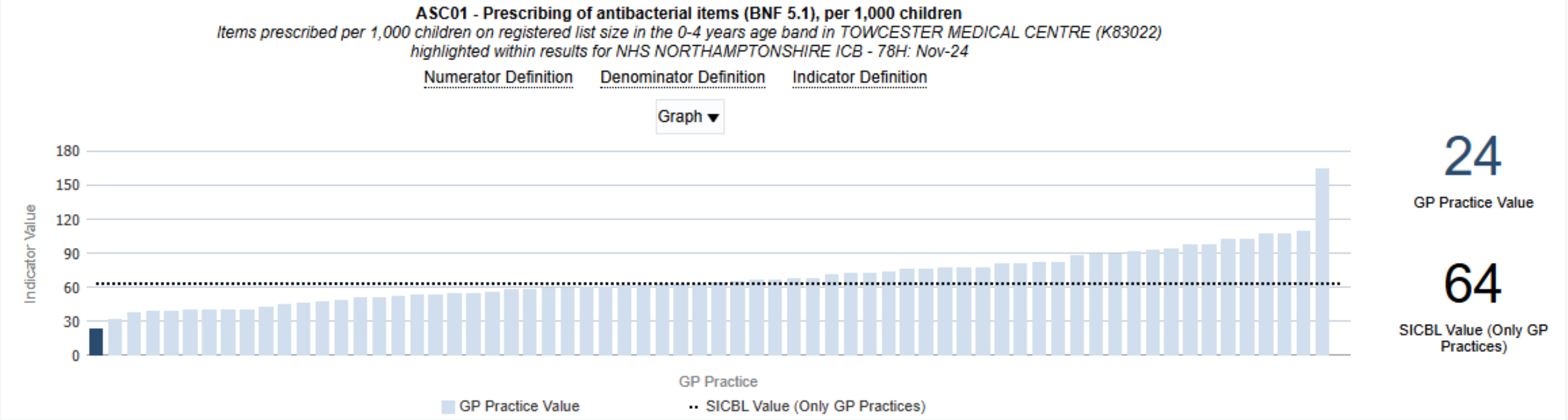
Antibiotic prescribing to children aged 0-4 in Northamptonshire ICB





Prescribing of antibiotic items to children aged 0-4 has increased by 3% in Northamptonshire ICB compared to 2019 levels (12 months to end FY23/24 compared to 12 months to end FY19/20)

Antibiotic prescribing to children aged 0-4 in Northamptonshire ICB – variation between practices



Is reducing antibiotic prescribing in primary care safe? Can it reduce workload?

Antibiotic prescribing for RTI and GP workload

- Patients given antibiotics for sore throat are **40% more likely** to return within 6 weeks and if they have had prior antibiotics are **69% more likely** to consult again for the same condition[1]
- Observational data from 108 GP practices[2]
  - Higher antibiotic prescribing practices – higher rates of consultations
  - Lower antibiotic prescribing practices – lower rates of consultations
- Patients with recent history of antibiotic prescribing were more than **twice as likely** to reconsult in the year following index consultation with acute LRTI[3]

[1]Little et al BMJ 2009;**314**:722; [2]Ashworth et al Br J Gen Pract 2005;**55**:603; [3]Moore et al Br J Gen Pract 2009;**59**:728

Is it safe to reduce antibiotic prescribing in primary care?

- Cohort study of 671,830 patients
- 706 general practices, 66.2m person-years of follow up (2002-2017)
- **Probability of sepsis for patient <25 years old was less than 1 in 10,000 consultations**
- Sepsis: NNT for children aged 0-4 to prevent one episode of sepsis:
  - Boys: 29,773
  - Girls: 27,014
- Probability of sepsis greatest for UTI>Skin infections>RTI

Safety of reducing antibiotic prescribing in primary care: a mixed-methods study

Martin C Gulliford, Judith Charlton, Olga Boiko, Joanne R Winter, Emma Rezel-Potts, Xiaohui Sun, Caroline Burgess, Lisa McDermott, Catey Bunce, James Shearer, Vasa Curcin, Robin Fox, Alastair D Hay, Paul Little, Michael V Moore and Mark Ashworth

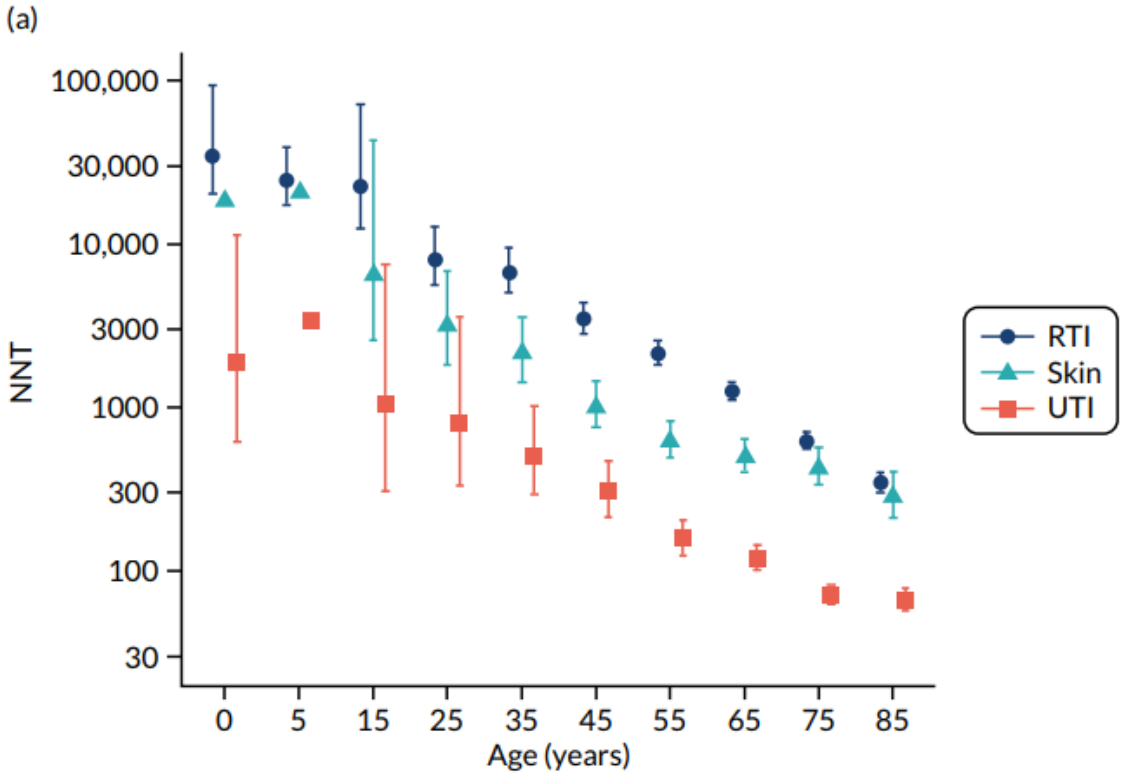


Fig. Number of antibiotic prescriptions required to prevent one sepsis event (i.e. NNT) in male patients

Gulliford et al, *Health Serv Deliv Res* 2021;**9**(9)

Is it safe to reduce antibiotic prescribing in primary care?

- Between 2012-2018, 14.9% reduction in antibiotic prescribing in Scottish primary care
- Practices grouped into quartiles based on prescribing trends
- All quartiles had increased rates of hospitalisation for infection
- Increase was smallest in quartile with greatest reduction in prescribing & significantly different to quartile with no reduction in prescribing
- No association between change in prescribing and patient satisfaction

Associations between declining antibiotic use in primary care in Scotland and hospitalization with infection and patient satisfaction: longitudinal population study

Isobel Guthrie[1], William Malcolm[2], Rita Nogueira[3], Jacqueline Sneddon[4]†, R. Andrew Seaton[4,5] and Charis A. Marwick[6]*

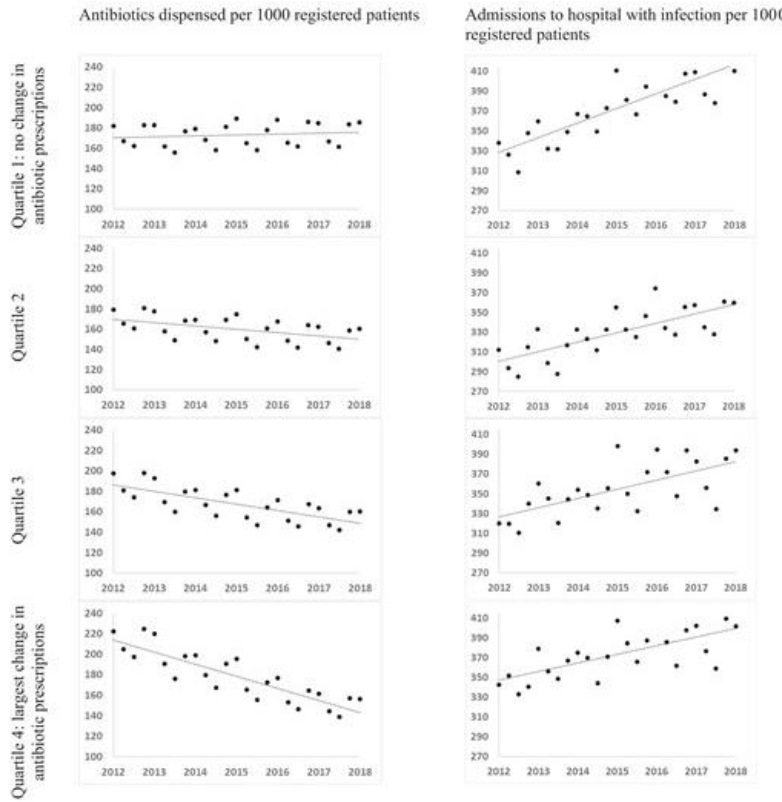


Figure 1. Antibiotic prescriptions and hospital admissions between 2012 and 2018 in each quartile of prescribing change.

Guthrie et al *JAC* 2022;**77**:2561-2568

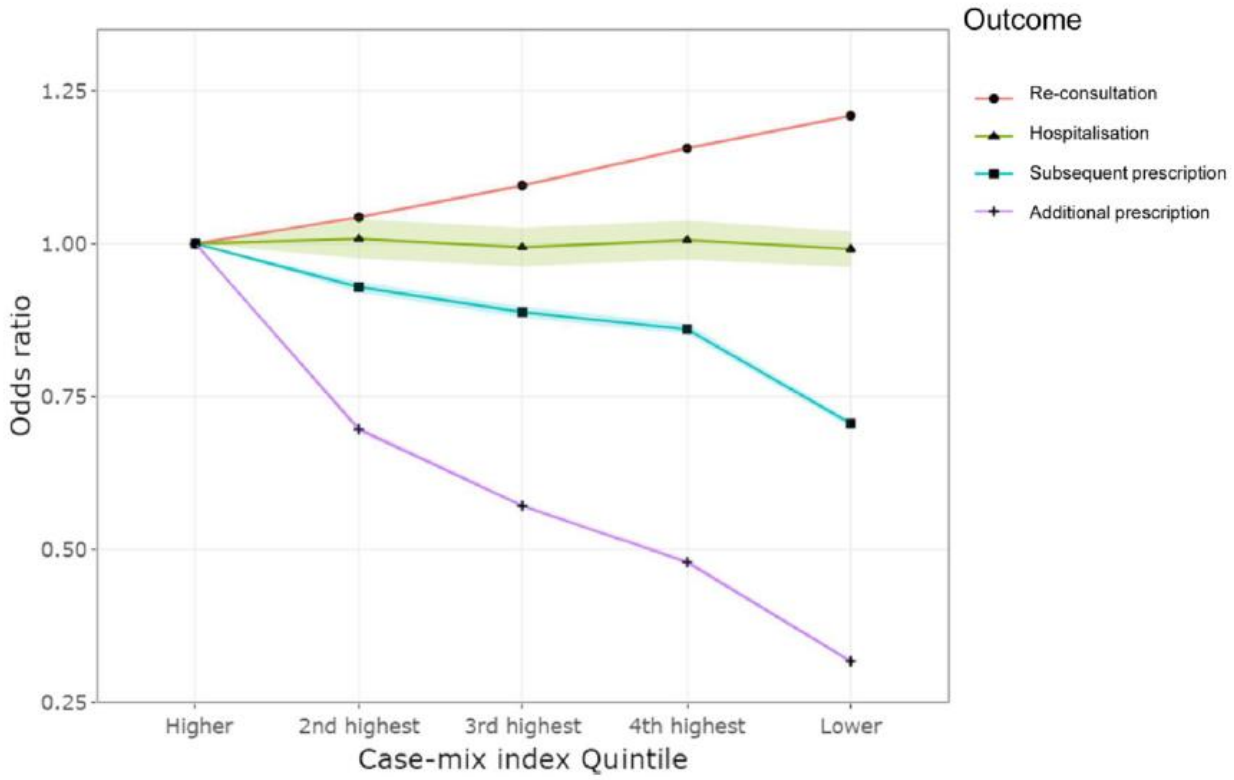
Is it safe to reduce antibiotic prescribing in primary care?

- 1471 General Practices in England, stratified by prescribing quintile per 1000 RTI-consultations
- No higher risk of hospitalisation (aOR 0.99, CI=0.96-1.02) with lowest prescribing quintile
- Re-consultation rates were higher in lowest prescribing quintile
  - For children ≤5 yo, OR 1.13 (CI 1.03-1.25)

Infectious Disease Practice

Risk of unintended consequences from lower antibiotic prescribing for respiratory tract infections in primary care

James Stimson [a,*], Tricia M. McKeever [b,g], Emily Agnew [a], Wei Shen Lim [c,g], Simon Royal [d], Puja Myles [e], Stephanie Evans [a,1], Julie V. Robotham [a,f,1]



Stimson et al, *J Infection* 2024

Antibiotic prescribing in Primary Care vs expert opinion

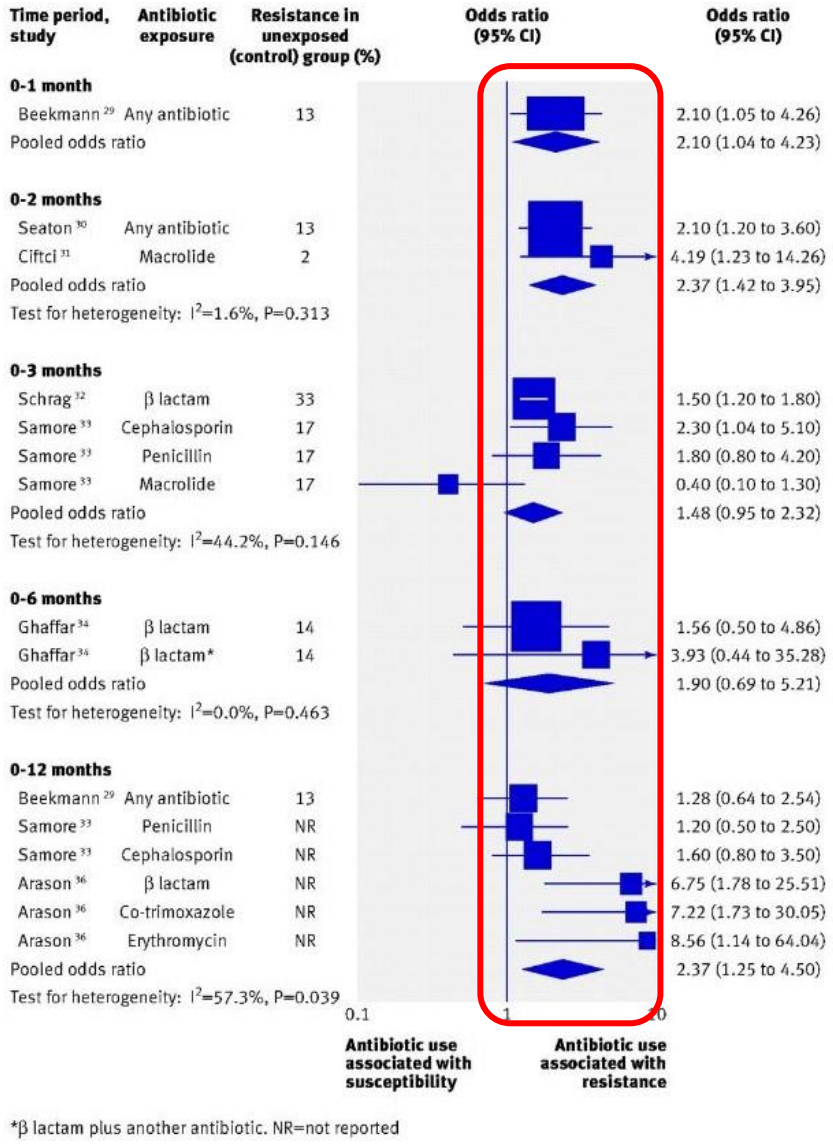
Condition/syndrome	Actual prescription (THIN data)	Ideal prescription: UKHSA EE median (IQ range)	Ideal prescription: ESAC EE acceptable range
Acute cough	40%	10% (6 – 16%)	
Acute bronchitis	92%	13% (6 – 22%)	0 – 30 %
Acute sore throat	60%	13% (7 – 22%)	0 – 20% (tonsillitis)
Acute rhinosinusitis	92%	11% (5 – 18%)	0 – 20%
Acute otitis media 6mo – 2yr 2yr – 18yr	 96% 94%	 19% (9 – 33%) 17% (8 – 30%)	 0 – 20%
URTI	19%		0 – 20%
UTI	94%	75% (61 – 86%)	80 – 100%

Pouwels et al, *JAC* 2018;**73** (suppl_2):19

Antibiotic prescribing: AMR and harms

Prescribing leads to individual patient level resistance

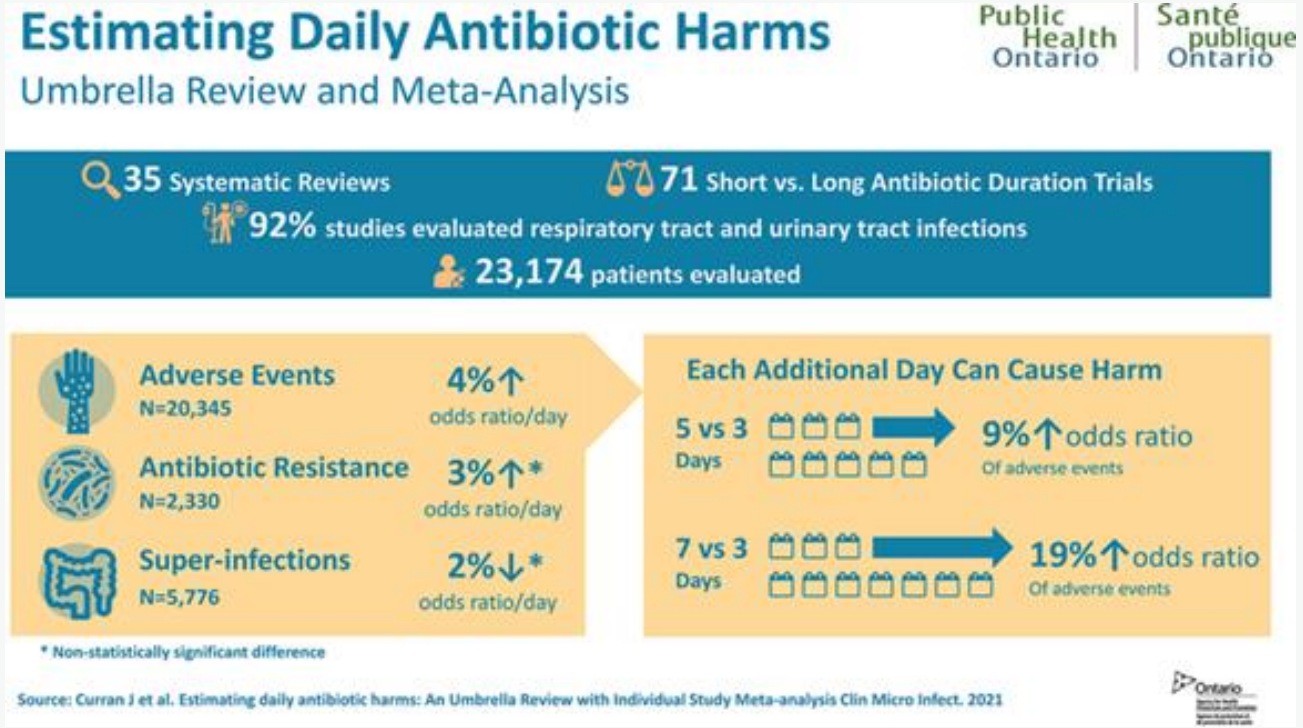
- Two weeks after prescribing amoxicillin to a child in general practice:
  - Less susceptible organism (MIC tripled)
  - Doubled risk of isolating a resistant strain (RR 1.9, 95%CI 1.2-2.9)[1]
- Meta-analysis of 7 studies looking at resistance in respiratory isolates showed that resistance can persist after prescribing for up to 12 months[2]
  - (OR 2.4, 95% CI: 1.3-4.5)



[1]Chung et al, *BMJ* 2007; **35**:429; [2]Costelloe et al, *BMJ* 2010; **340**:c2096

Antibiotics can be harmful - Every extra day of treatment matters

- Umbrella review and meta-analysis of systematic reviews of 71 RCTs comparing short and longer courses of antibiotics
- Adults and children, multiple settings but majority community
- **19.9% of patients experienced an adverse drug event**
- Each day of antibiotic therapy associated with a **4% increased odds** of experiencing an ADR
- AMR developed in 10.6% of patients, risk increased 1.03-fold per additional day of treatment

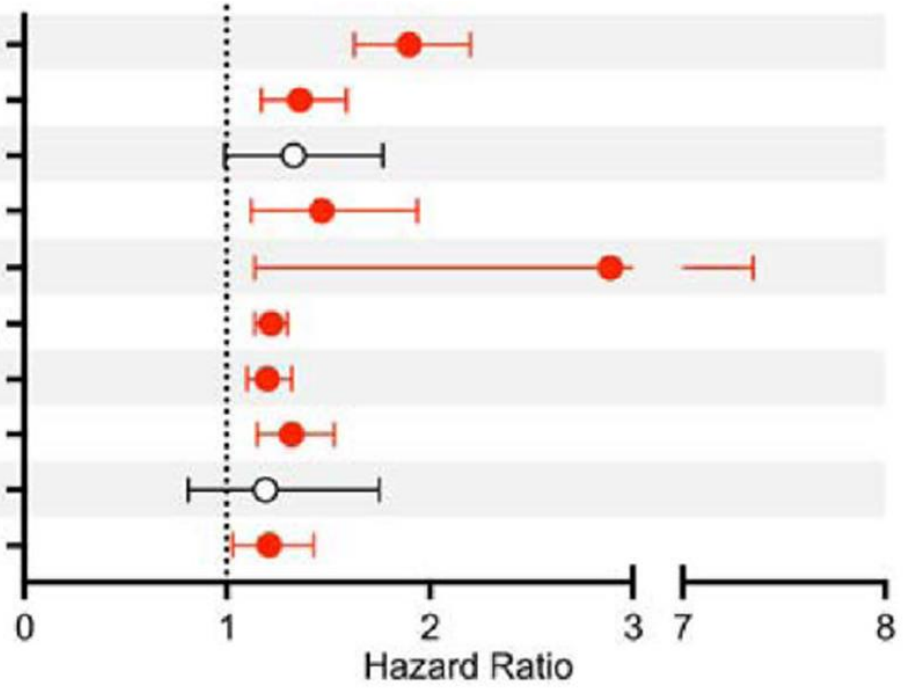


Curran et al, Clin Microbiol Infect 2022; 28:479-490

Association studies – impact of exposure to antibiotics in first 2 years of life

- Population based cohort study of 14,572 children in Minnesota, US
- Received at least 1 antibiotic prescription during first two years of life
- 70% prescribed at least 1 antibiotic
- 31% had received 5+ prescriptions

Condition	No. of subjects	No. of events	HR (95% CI)	p-value
Asthma	14299	1176	1.90 (1.63-2.20)	<.001
Allergic rhinitis	14545	971	1.36 (1.17-1.59)	<.001
Food allergy	14402	261	1.33 (0.99-1.77)	.054
Atopic dermatitis	14166	297	1.47 (1.12-1.94)	.006
Celiac disease	14569	45	2.89 (1.14-7.35)	.025
Overweight	12873	4856	1.22 (1.14-1.30)	<.001
Obesity	13649	2567	1.20 (1.10-1.32)	<.001
ADHD	14572	1085	1.32 (1.15-1.53)	.001
Autism	14571	142	1.19 (0.81-1.75)	.385
Learning disability	14392	751	1.21 (1.03-1.43)	.022

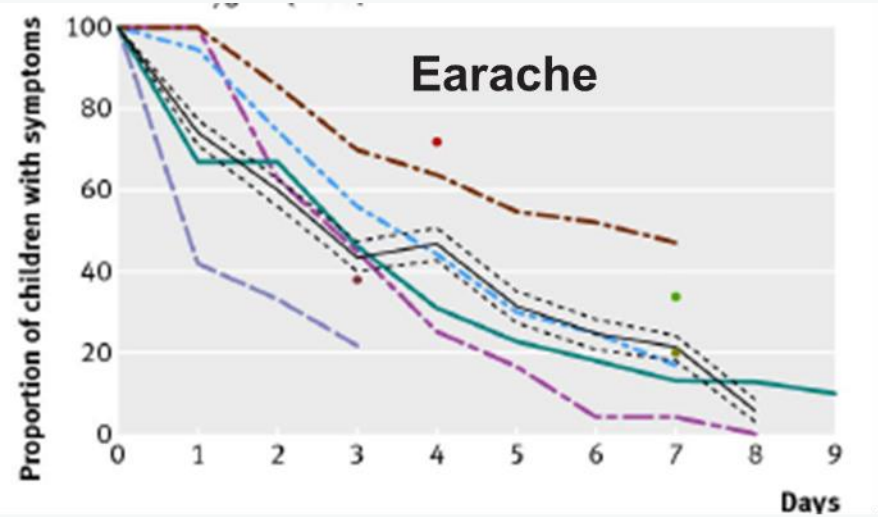


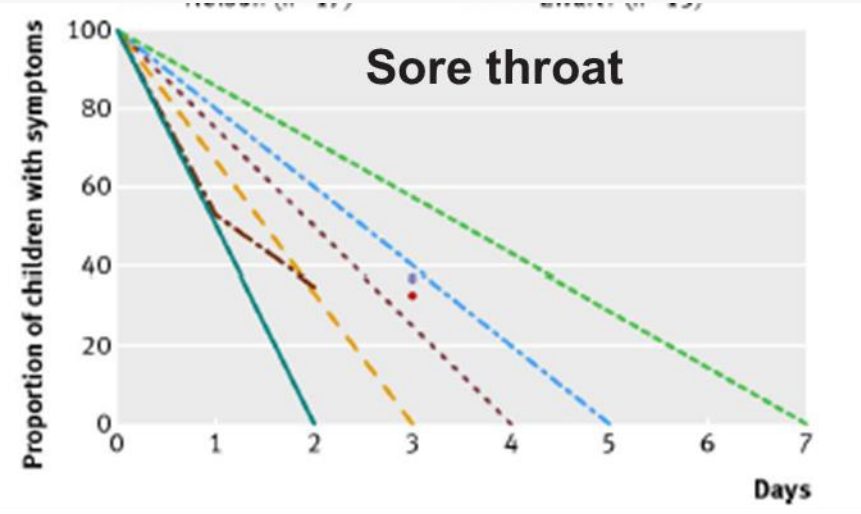
"..early life microbiome composition is a critical health determinant…. perturbations during key developmental periods can have long term consequences"

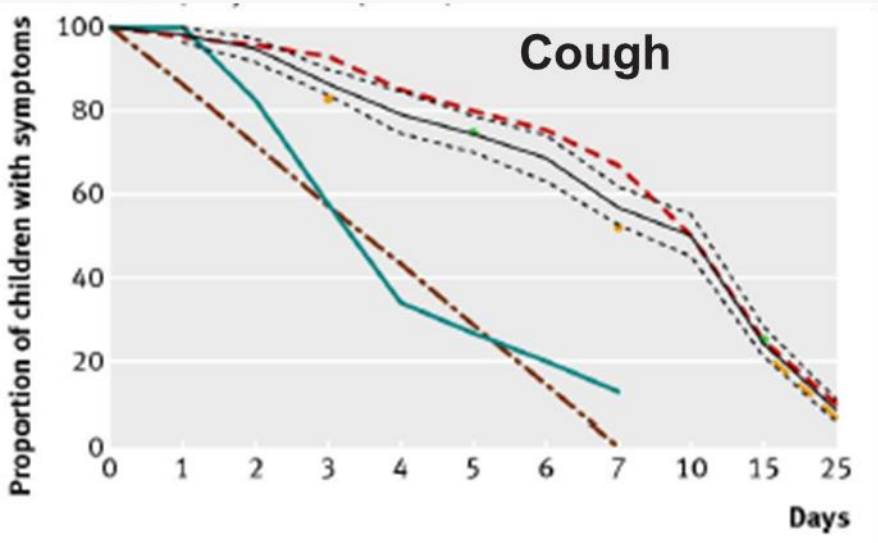
Aversa, Z. et al *Mayo Clinic Proc* 2021; **96**: 66

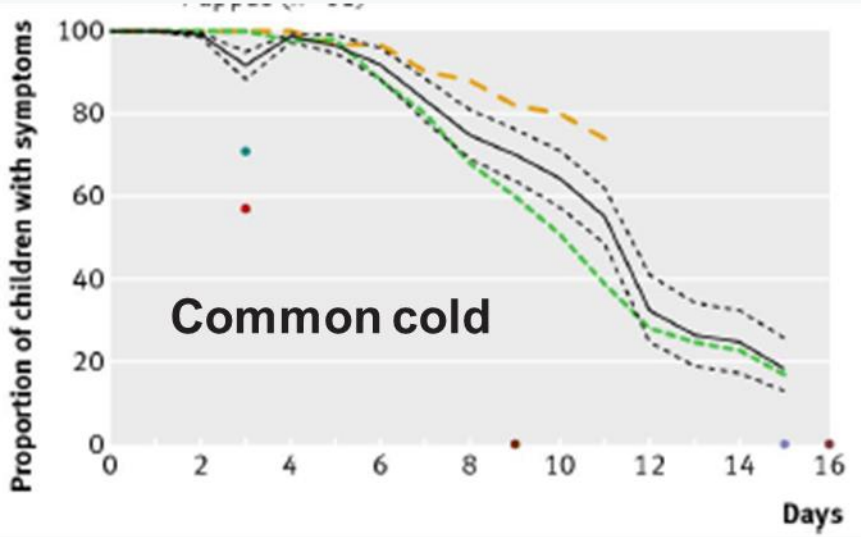
Antibiotics for respiratory tract infections: symptomatic benefit & risk of complications

Duration of symptoms of RTIs in children









Systematic review of 23 trials and 25 observational studies in children with acute RTIs in primary care/ED

In 90% of children, infection was resolved by:

- Earache: 7-8 days
- Sore throat: 2-7 days
- Croup: 2 days
- Bronchiolitis: 21 days
- Acute cough: 25 days
- Common cold: 15 days
- Unspecified RTI symptoms: 16 days

Thompson et al, BMJ 2013; **347**:f7027

How much symptomatic benefit do antibiotics deliver?

	Total Duration untreated	Beneficial effect from antibiotics	NNT for one additional patient to benefit	NNT for one additional adverse effect
Otitis media	4 -12 days	8-12 hours	18	9
Sore throat	8 days	12-18 hours	6-20	15
Sinusitis	12-15 days	24 hours	18	8
Bronchitis	20-22 days	11-24 hours	10-22	24

Slide adapted from TARGET slide deck

Antibiotics and risk of complications

- Retrospective cohort study in 610 UK General Practices – stratified by rate of antibiotic prescriptions for RTI
- 45.5m person-years of follow up between 2005-14
- RTI consultations with antibiotic prescribed
- Outcome: incidence of serious complications
- High prescribing rates not protective against complications
- Reducing prescribing for RTI by 10% for a 7000 patient list size could result in:
  - 1 extra case of pneumonia per year
  - 1 extra case of peritonsillar abscess a decade

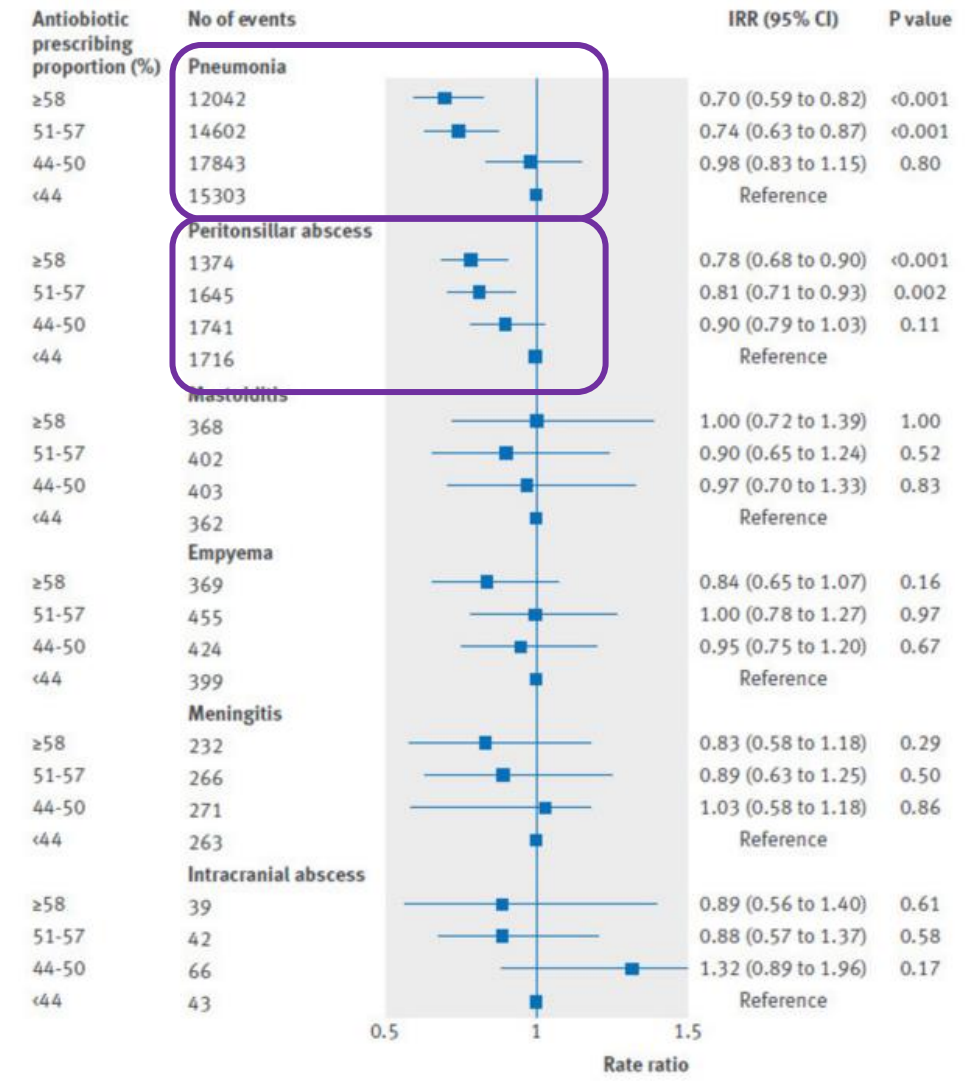
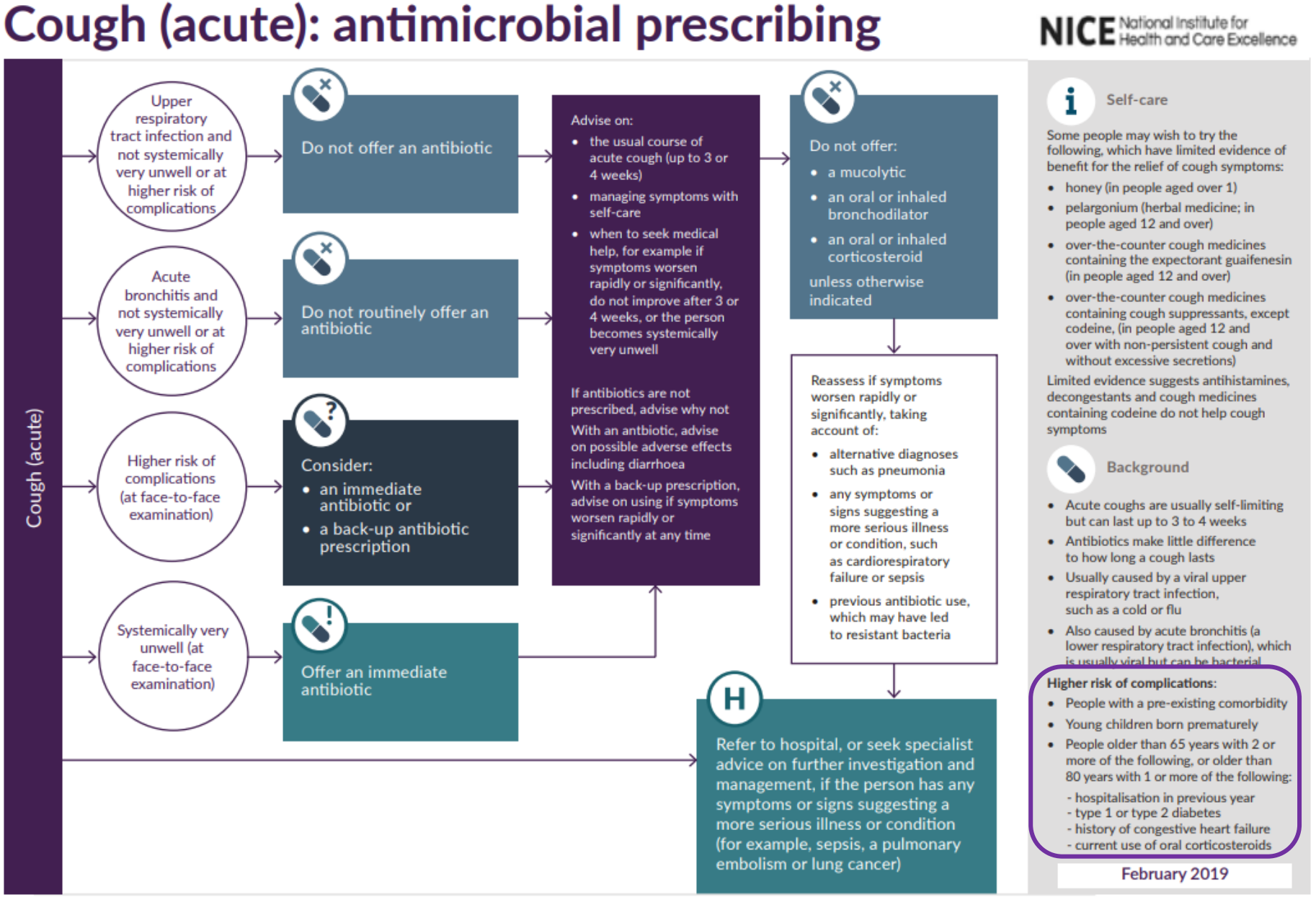


Fig 4 | Fig 4 Association of incidence of infective complications with fourth of antibiotic prescribing proportion. Incidence rate ratios (IRRs) were adjusted for consultation rate for respiratory tract infections, sex, age group, region, deprivation fifth, and clustering by general practice

Gulliford et al, BMJ 2016;**354**:i3419

NICE guidance on risk of complications



Relevant clinical trials for RTIs in children

STARWAVe trial in brief

- A tool to predict risk of hospitalisation within 30 days for children presenting with acute cough & RTI
- 7 characteristics were independently associated with hospital admission
- Distinguishes between three hospital admission risk strata –
  - very low,
  - normal or
  - high risk


Development and internal validation of a clinical rule to improve antibiotic use in children presenting to primary care with acute respiratory tract infection and cough: a prognostic cohort study

Alastair D Hay, Niamh M Redmond, Sophie Turnbull, Hannah Christensen, Hannah Thornton, Paul Little, Matthew Thompson, Brendan Delaney, Andrew M Lovering, Peter Muir, John P Leeming, Barry Vipond, Beth Stuart, Tim J Peters, Peter S Blair

"Clinical characteristics can distinguish children at very low risk, normal and high risk of future hospital admission for respiratory tract infection and *could be used to reduce antibiotic prescriptions in primary care* for children at very low risk"

Hay et al, Lancet Respir Med 2016; **4**:902

STARWAVe – predicting future hospitalisation among children who have presented in-hours to primary care with acute cough (<28d) and respiratory tract infection

Seven symptoms and signs:	
S	**Short** duration of illness (≤3 days)
T	Parent reported fever in previous 24 hours or **temperature** ≥37.8°C at presentation
A	**Age** <2 years
R	Clinician reported inter/subcostal **recession**
W	Clinician reported **wheeze** on auscultation
A	Current diagnosis of **asthma**
V	Parent reported moderate/severe **vomiting** in the previous 24 hours

STARWAVe – predicting future hospitalisation among children who have presented in-hours to primary care with acute cough (<28d) and respiratory tract infection

Score	Risk category	Risk of future admission and suggestion approach to management
0-1	Very low risk (67% of all children)	1:320 risk of future admission – no antibiotic strategy should be considered
2-3	Normal risk (30%)	1:70 risk of future admission – no or back-up antibiotic strategy should be considered
≥4	High risk (~3%)	1:9 risk of future admission – immediate antibiotic + same/next-day follow up

ARTIC-PC trial in brief

Antibiotics for lower respiratory tract infection in children presenting in primary care in England (ARTIC PC): a double-blind, randomised, placebo-controlled trial

Paul Little, Nick A Francis, Beth Stuart, Gilly O'Reilly, Natalie Thompson, Taeko Becque, Alastair D Hay, Kay Wang, Michael Sharland, Anthony Harnden, Guiqing Yao, James Raftery, Shihua Zhu, Joseph Little, Charlotte Hookham, Kate Rowley, Joanne Euden, Kim Harman, Samuel Coenen, Robert C Read, Catherine Woods, Christopher C Butler, Saul N Faust, Geraldine Leydon, Mandy Wan, Kerenza Hood, Jane Whitehurst, Samantha Richards-Hall, Peter Smith, Michael Thomas, Michael Moore, Theo Verheij

- Children aged 6mo-12yrs with uncomplicated (non-pneumonic) LRTI, randomised to receive amoxicillin or placebo for 7 days
- No difference in outcome for 5 pre-specified clinical subgroups – pts with chest signs, fever, physician rating of unwell, sputum or chest rattle, short of breath

Amoxicillin for uncomplicated chest infections is **unlikely to be clinically effective** overall or for key subgroups in whom antibiotics are commonly prescribed

Unless pneumonia is suspected, **clinicians should provide safety-netting advice but not prescribe antibiotics** for most children presenting with chest infections

Little et al, *Lancet* 2021;**398**:1417

So what do we know now?

- Antibiotics are associated with quite a lot of harms
- RTI symptoms can last for quite a while – important to communicate this to parents/carers
- The majority of children with acute RTI and cough are very low risk for deterioration – using STARWAVe could help to identify this cohort
- Antibiotics make little difference to uncomplicated chest infections – unless pneumonia is suspected, consider a no-antibiotic strategy with safety netting advice

- In the next section, we will look at the impact of communication and ways to have a successful consultation that supports no-antibiotic and back-up antibiotic strategies

No antibiotic strategy – is it safe?

Conclusion from systematic review of immediate vs delayed vs no antibiotics for respiratory infections

No antibiotic strategy with safety netting:

- Results in lowest amount of antibiotic use (compared to delayed or immediate antibiotics)
- Maintains similar levels of patient satisfaction
- Similar clinical outcomes to delayed antibiotic prescribing

[1]Spurling et al, *Cochrane Database Syst Rev* 2023;**10**:CD004417

What can aid a ‘No antibiotic’ strategy?

- Having a satisfactory consultation
- Promoting self care & safety netting with patient information leaflets & resources (
  - e.g. TARGET leaflets, CHICO leaflet, Healthier Together website)
- Coding provision of self care & safety netting advice (e.g. leaflet)

Having satisfactory consultations

Evidence shows that effective communication skills

- Increase patient satisfaction & understanding of prescribing decisions
- Reduce consultations
- Reduce antibiotic prescribing

Evidence for impact of communication in acute cough in general practice in brief

- Communication skills training and use of patient information leaflet halved antibiotic prescribing compared to usual care for LRTI
- Using the enhanced communications skills did not increase consultation time

Effect of point of care testing for C reactive protein and training in communication skills on antibiotic use in lower respiratory tract infections: cluster randomised trial

Jochen W L Cals, general practitioner trainee and researcher,[1] Christopher C Butler, professor of primary care medicine,[2] Rogier M Hopstaken, general practitioner and researcher,[1,3] Kerenza Hood, reader in statistics,[2,4] Geert-Jan Dinant, professor of general practice[1]

Care for LRTI	Antibiotics prescribed
Usual care	67%
Communication skills and leaflet	33%
CRP to aid diagnosis	39%
Both CRP & communication	23%

Cals et al, *BMJ* 2009;**338**:b1374

Satisfactory consultations: How?

Key elements of effective consultations (CHESTSSS)

C: Ask specifically about **concerns**	**'What are the things you are most worried about?'**
H: Discuss **history and exam**	While doing an examination provide 'no problem' commentary 'Your heart rate is normal, your temperature isn't raised'
E: Ask specifically about **expectations**	**How do you think I could most help you today?' or 'How do you feel about antibiotics?'**
S: Provide non-serious explanation for **symptoms**	'Your body produces phlegm as a **normal reaction** to inflammation in your airways. The phlegm catches particles and helps keep your lungs clear.'
T: Be specific about illness **timeline**/usual course	**'A typical cough can take 3-4 weeks to clear completely.'**
S: Explain **shortcomings** of antibiotics	Antibiotics **don't help with pain** but **side effects**, such as diarrhoea, nausea and rash, can be **experienced by up to 1 in 10 people**.'
S: **Self-care** advice	'Pain in the chest or throat is normal due to inflammation, **you can take paracetamol, and/or ibuprofen, which will help the pain and soothe the inflammation**.'
S: **Safety-netting** advice	Provide patients with specific **information on red-flag symptoms** and when they should seek further help

Resources available at: www.rcgp.org.uk/TARGETantibiotics

Promoting self care & safety netting using patient information leaflets and resources

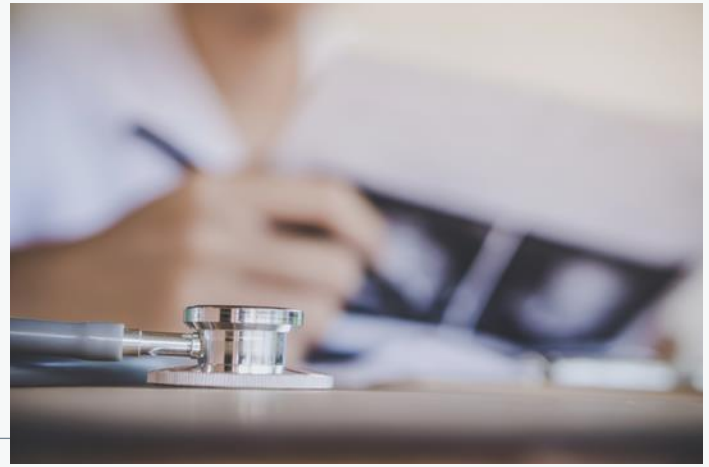
- Supports your verbal advice & helps patients remember it
- Addresses patient concerns
- Empowers patients to self-manage
- Improves patient recall
- Improves patient satisfaction
- Standardises advice given by different prescribers

Printed leaflets:

- Use patient leaflets **interactively** – not as a parting gift
- **Personalise** leaflet by drawing attention to the parts relevant to the patient

Electronic leaflets/resources:

- Send via AccuRx or from within EMIS (email/text)
- Available in multiple languages



I’m not sure… what about a back-up antibiotic strategy?

Conclusion from systematic review of immediate vs delayed vs no antibiotics for respiratory infections

Delayed antibiotic prescribing may be an acceptable compromise (if not confident with ‘no antibiotic’ strategy)

- Still reduces antibiotic use
- Maintains patient safety and satisfaction levels

[1]Spurling et al, *Cochrane Database Syst Rev* 2023;**10**:CD004417

I'm not sure if the patient needs antibiotics!

- Consider a back-up prescription…
- Why?
  - Patients are **still satisfied** – no difference to immediate antibiotics (86% vs 91% immediate)[1]
  - Reduce use of antibiotics (30% vs 93% immediate)[1]
  - Useful if unsure whether immediate antibiotic is needed
  - **No difference in adverse events** compared to immediate antibiotics
  - **No difference in re-consultation rates** compared to immediate antibiotics

[1] Spurling et al, *Cochrane Database Syst Rev* 2023;**10**:CD004417

Reconsultation rates – backup vs immediate

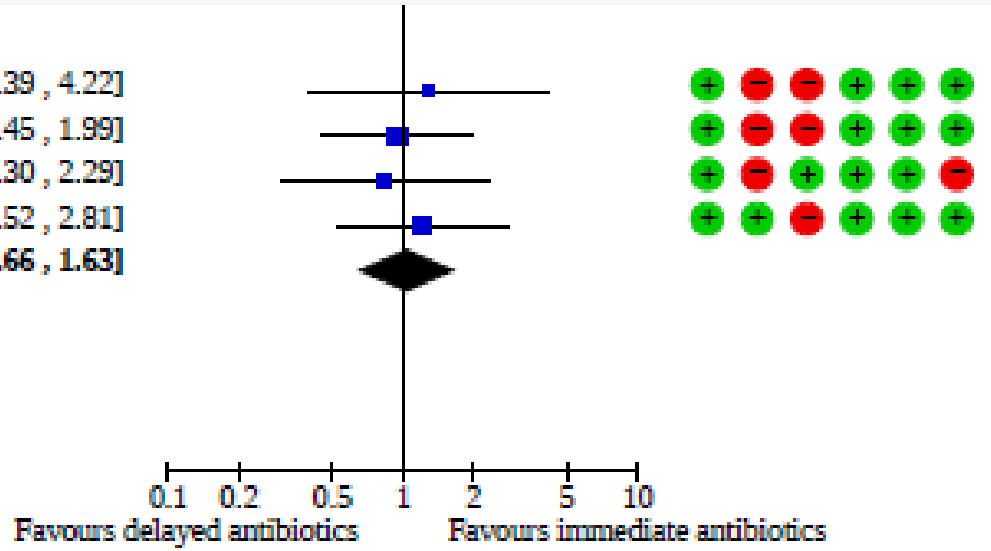
7.1.3 Reconsultation rate: delayed (all strategies) versus immediate antibiotics

De la Poza Abad 2016	10	198	4	101	14.5%	1.29 [0.39 , 4.22]
Mas-Dalmau 2021	15	146	16	148	36.8%	0.94 [0.45 , 1.99]
Pichichero 1987	8	55	10	59	19.9%	0.83 [0.30 , 2.29]
Spiro 2006	13	132	11	133	28.8%	1.21 [0.52 , 2.81]
Subtotal (95% CI)		**531**		**441**	**100.0%**	**1.04 [0.66 , 1.63]**
Total events:	46		41			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.50$, df = 3 ($P = 0.92$); $I^2 = 0\%$

Test for overall effect: $Z = 0.15$ ($P = 0.88$)

Test for subgroup differences: $Chi^2 = 0.00$, df = 2 ($P < 0.00001$), $I^2 = 0\%$



Remember to code your use of backup antibiotic prescriptions

SNOMED code	Definition
2549788011	Deferred antibiotic therapy
406111000000113	Patient advised to delay filling of prescription
246283100000113	Provision of TARGET Managing Your Common Infection (Self-Care) Leaflet with back-up antibiotic prescription issued

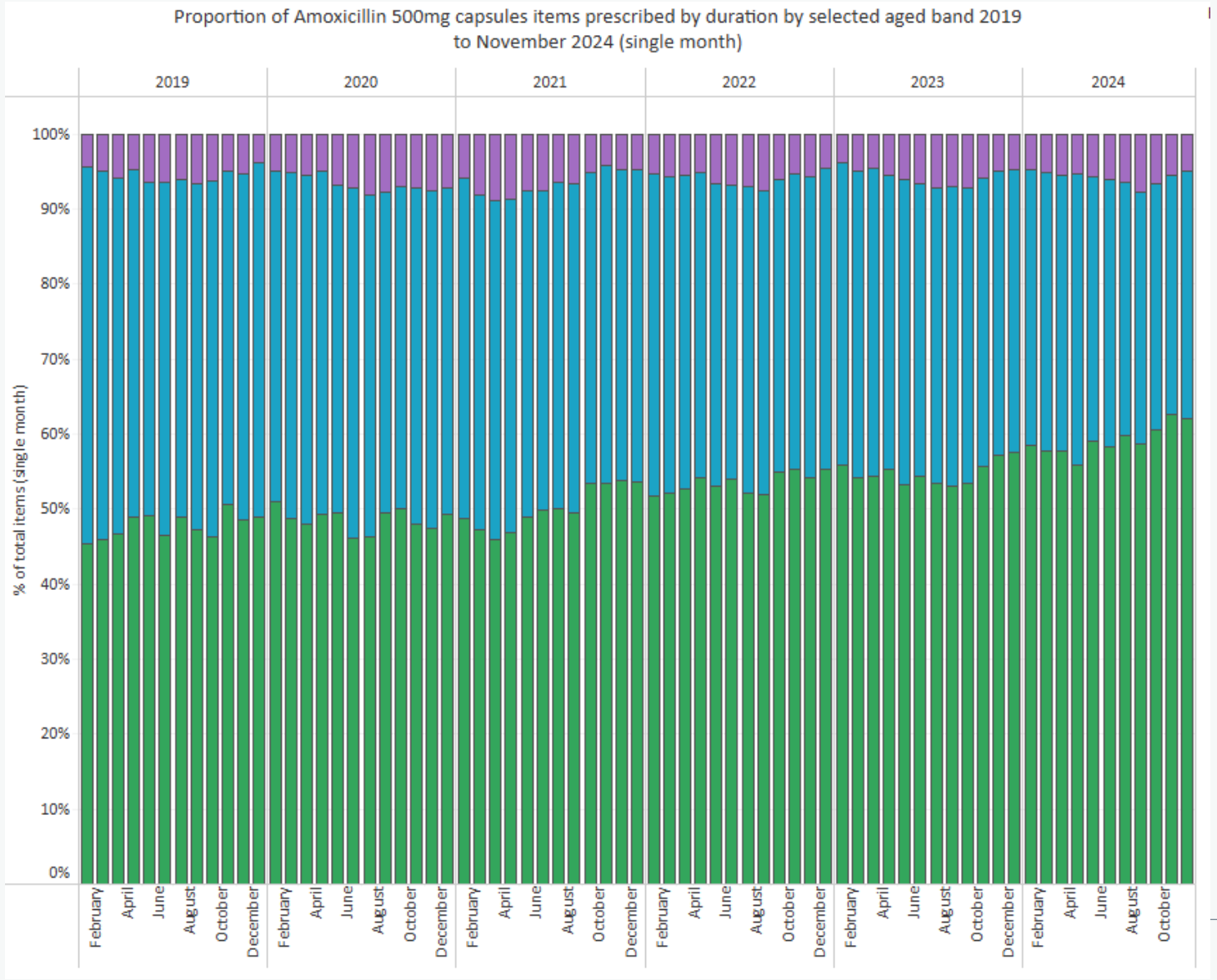
Spurling et al, *Cochrane Database Syst Rev* 2023;**10**:CD004417

Nope, my patient needs immediate antibiotics…

My patient needs immediate antibiotics!

Ensure the right choice and duration…

5-day duration of amoxicillin 500 mg capsules



Proportion of 5-day amoxicillin courses was 62% in November 2024

NICE guidelines for RTI recommend **5 days treatment** with amoxicillin

5 days for RTIs? My patients need longer….

Community acquired pneumonia – evidence for short courses

- No difference in risk of clinical failure or mortality between short course (7 days or less) and long course (>7 days) in meta-analysis of trials of moderate-low severity CAP conducted between 1980-2006 (15 trials, 2 included beta-lactams) Li et al, *Am J Med* 2007
- 3 days amoxicillin not inferior to 8 days (clinical success, symptom resolution, radiological success) in adults admitted to hospital with mild to moderate severity CAP, if they substantially improved after 3 days treatment (Moussaoui et al *BMJ* 2006)
- 5 days antibiotics not inferior to physician determined duration (median 10 days) for clinical success or symptom scores in hospitalised patients with CAP (including severe CAP) Uranga et al JAMA Intern Med, 2016
- Multiple studies in children show non-inferiority of 3-5 days of treatment (SCOUT-CAP trial, CAP-IT trial, MASCOT trial, Greenberg et al 2014, SAFER trial

(No) Antibiotic prescribing & reconsultation rates

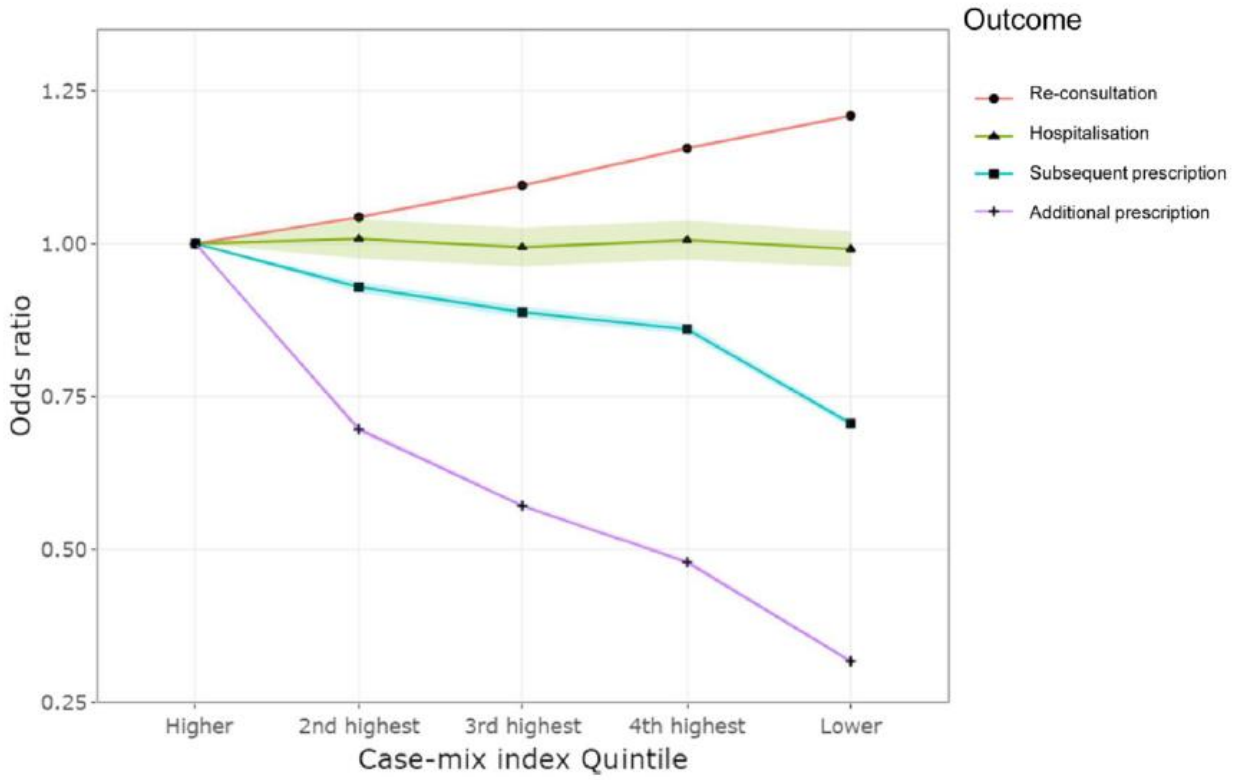
Is it safe to reduce antibiotic prescribing in primary care?

- 1471 General Practices in England, stratified by prescribing quintile per 1000 RTI-consultations
- No higher risk of hospitalisation (aOR 0.99, CI=0.96-1.02) with lowest prescribing quintile
- Re-consultation rates were higher in lowest prescribing quintile
  - For children ≤5 yo, OR 1.13 (CI 1.03-1.25)

Infectious Disease Practice

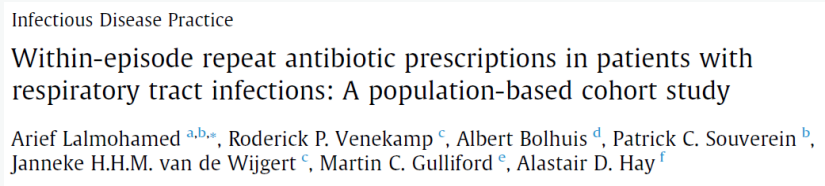
Risk of unintended consequences from lower antibiotic prescribing for respiratory tract infections in primary care

James Stimson [a,*], Tricia M. McKeever [b,g], Emily Agnew [a], Wei Shen Lim [c,g], Simon Royal [d], Puja Myles [e], Stephanie Evans [a,1], Julie V. Robotham [a,f,1]



Stimson et al, *J Infection* 2024

Within-episode repeat antibiotic prescriptions (WERP) for RTI in brief


Infectious Disease Practice

Within-episode repeat antibiotic prescriptions in patients with respiratory tract infections: A population-based cohort study

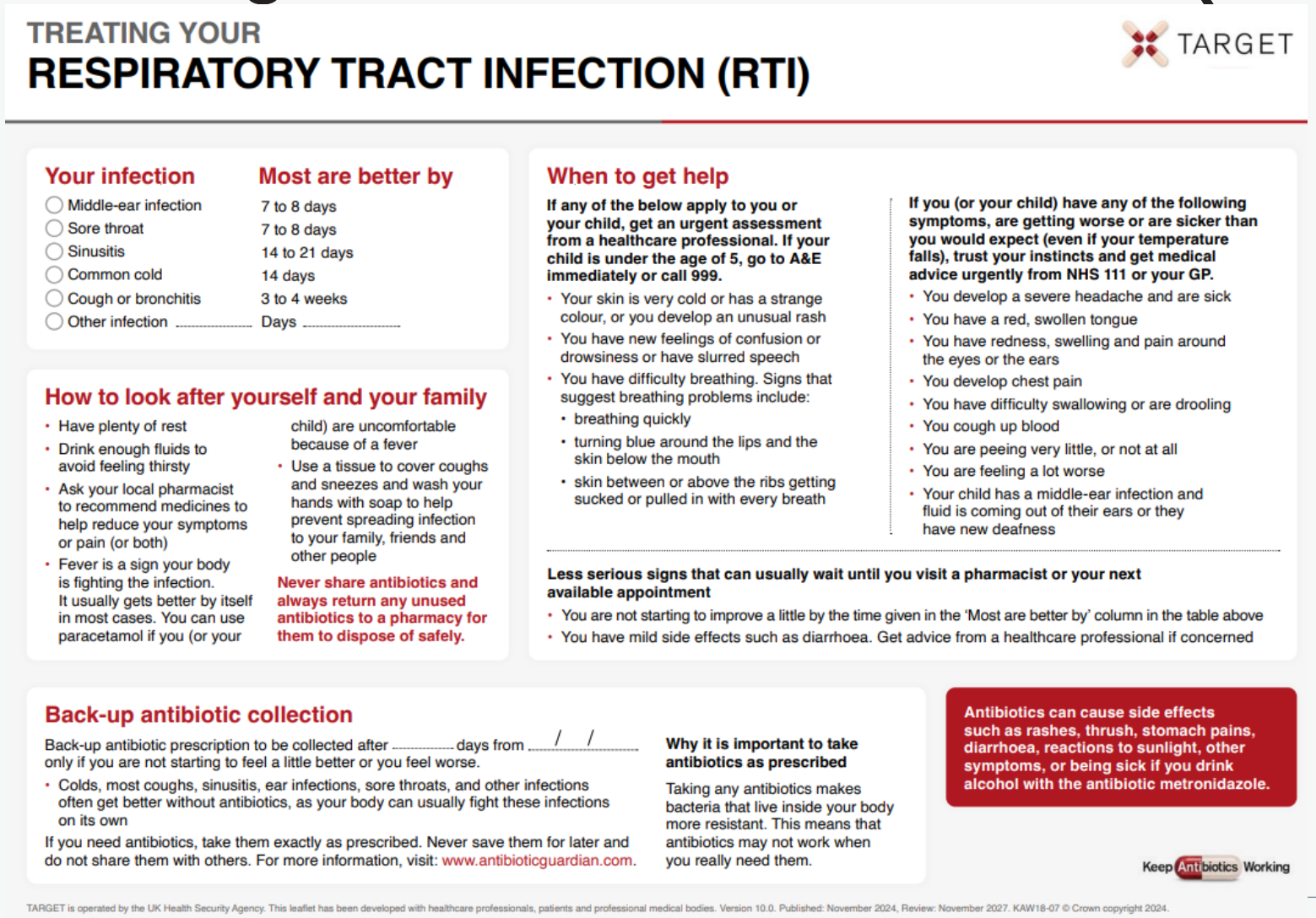
Arief Lalmohamed [a,b,*], Roderick P. Venekamp [c], Albert Bolhuis [d], Patrick C. Souverein [b], Janneke H.H.M. van de Wijgert [c], Martin C. Gulliford [e], Alastair D. Hay [f]

- In this trial, almost 10% of children who had consulted for LRTI (upper or lower) and were prescribed antibiotics, reconsulted and received a second course within 28 days
- Median was 10 days after initial prescription
- **Take home messages**:
  - when abx prescribed, clinicians should emphasise a single treatment course is likely to be microbiologically adequate
  - Remind parents/carers of the natural history of RTI longer than abx course, persisting symptoms unlikely to require WERP in the absence of deterioration

Lalmohamed et al, *Journal of Infection*, 2024;**88** 106135

Useful resources for self care & safety netting

TARGET: Patient Information Leaflets
Treating Your Infection RTI Leaflet (suitable for children)



TREATING YOUR
RESPIRATORY TRACT INFECTION (RTI)

TARGET

Your infection / **Most are better by**

◯ Middle-ear infection	7 to 8 days
◯ Sore throat	7 to 8 days
◯ Sinusitis	14 to 21 days
◯ Common cold	14 days
◯ Cough or bronchitis	3 to 4 weeks
◯ Other infection	Days .....

How to look after yourself and your family

- Have plenty of rest
- Drink enough fluids to avoid feeling thirsty
- Ask your local pharmacist to recommend medicines to help reduce your symptoms or pain (or both)
- Fever is a sign your body is fighting the infection. It usually gets better by itself in most cases. You can use paracetamol if you (or your child) are uncomfortable because of a fever
- Use a tissue to cover coughs and sneezes and wash your hands with soap to help prevent spreading infection to your family, friends and other people

Never share antibiotics and always return any unused antibiotics to a pharmacy for them to dispose of safely.

When to get help

If any of the below apply to you or your child, get an urgent assessment from a healthcare professional. If your child is under the age of 5, go to A&E immediately or call 999.

- Your skin is very cold or has a strange colour, or you develop an unusual rash
- You have new feelings of confusion or drowsiness or have slurred speech
- You have difficulty breathing. Signs that suggest breathing problems include:
  - breathing quickly
  - turning blue around the lips and the skin below the mouth
  - skin between or above the ribs getting sucked or pulled in with every breath

If you (or your child) have any of the following symptoms, are getting worse or are sicker than you would expect (even if your temperature falls), trust your instincts and get medical advice urgently from NHS 111 or your GP.

- You develop a severe headache and are sick
- You have a red, swollen tongue
- You have redness, swelling and pain around the eyes or the ears
- You develop chest pain
- You have difficulty swallowing or are drooling
- You cough up blood
- You are peeing very little, or not at all
- You are feeling a lot worse
- Your child has a middle-ear infection and fluid is coming out of their ears or they have new deafness

Less serious signs that can usually wait until you visit a pharmacist or your next available appointment

- You are not starting to improve a little by the time given in the 'Most are better by' column in the table above
- You have mild side effects such as diarrhoea. Get advice from a healthcare professional if concerned

Back-up antibiotic collection

Back-up antibiotic prescription to be collected after ..... days from ..../..../.....
only if you are not starting to feel a little better or you feel worse.

- Colds, most coughs, sinusitis, ear infections, sore throats, and other infections often get better without antibiotics, as your body can usually fight these infections on its own

If you need antibiotics, take them exactly as prescribed. Never save them for later and do not share them with others. For more information, visit: www.antibioticguardian.com.

Why it is important to take antibiotics as prescribed

Taking any antibiotics makes bacteria that live inside your body more resistant. This means that antibiotics may not work when you really need them.

Antibiotics can cause side effects such as rashes, thrush, stomach pains, diarrhoea, reactions to sunlight, other symptoms, or being sick if you drink alcohol with the antibiotic metronidazole.

Keep Antibiotics Working

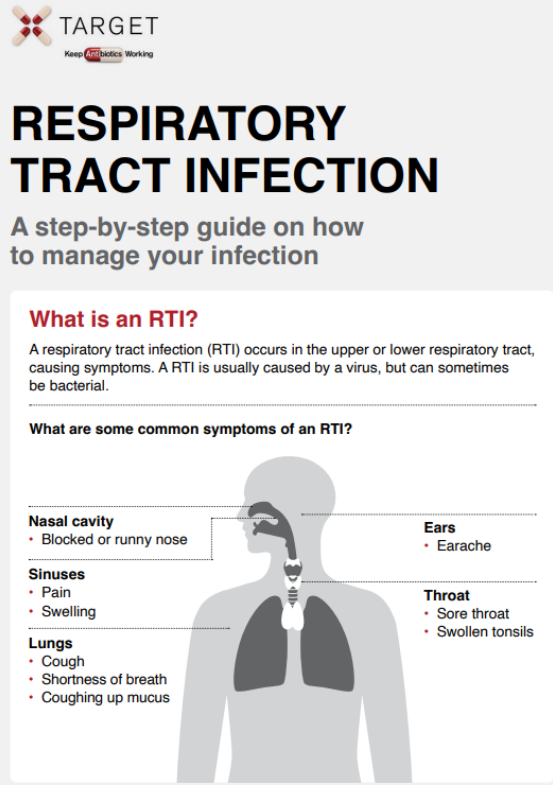
TARGET is operated by the UK Health Security Agency. This leaflet has been developed with healthcare professionals, patients and professional medical bodies. Version 10.0. Published: November 2024, Review: November 2027. KAW18-07 © Crown copyright 2024.

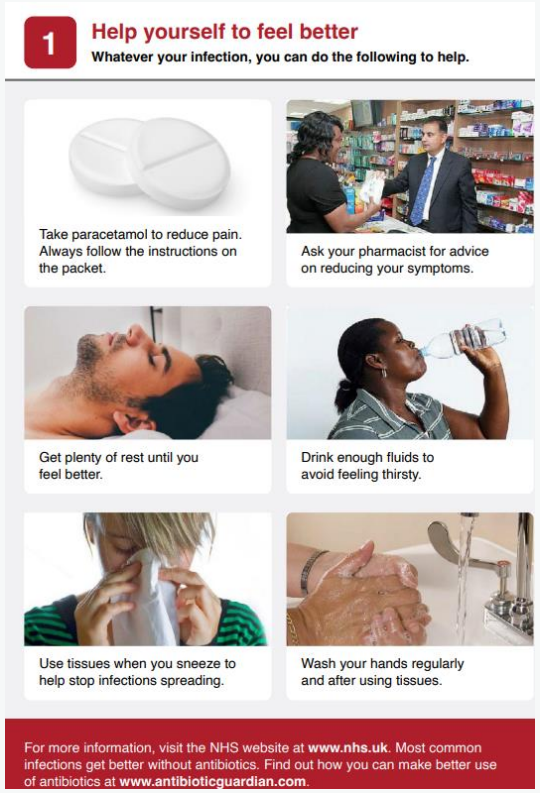
Includes information on the usual duration of illness

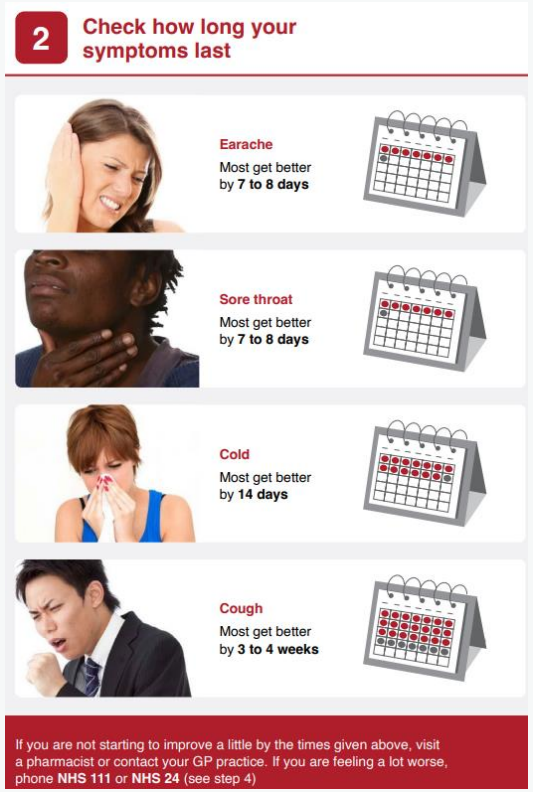
- How to self-care
- Safety netting information
- Back up antibiotic prescription
- Antimicrobial resistance
- COVID-19

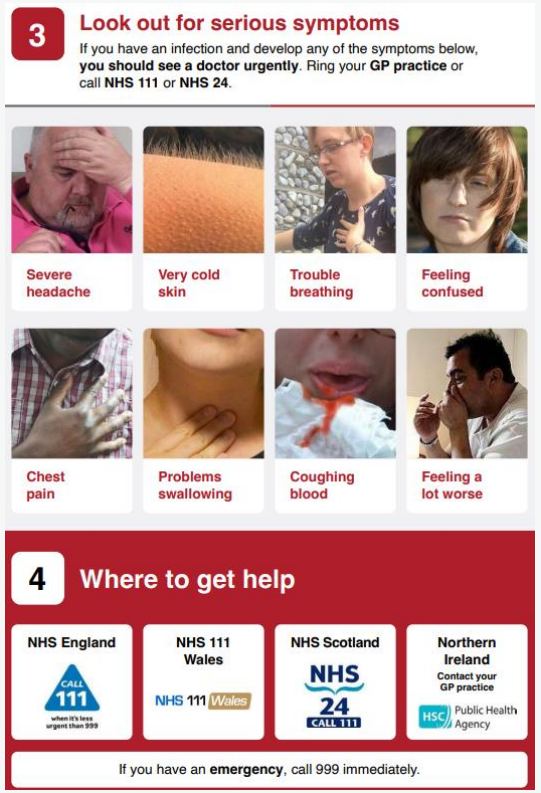
Available at TARGET website

TARGET: Patient Information Leaflets
Pictorial leaflets





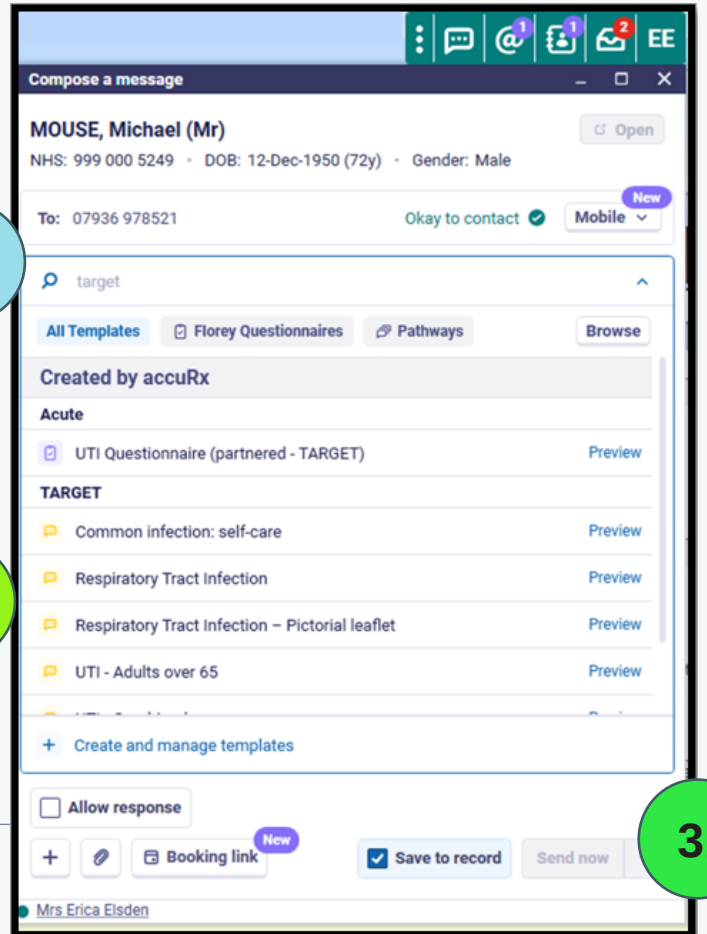


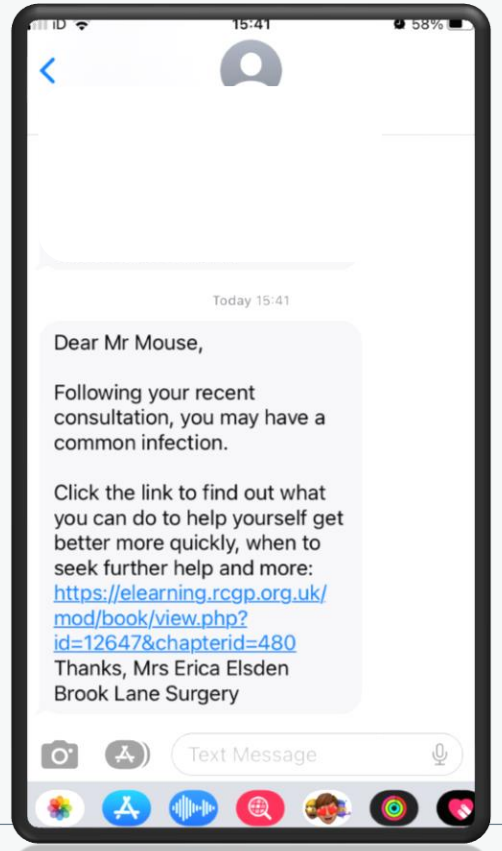


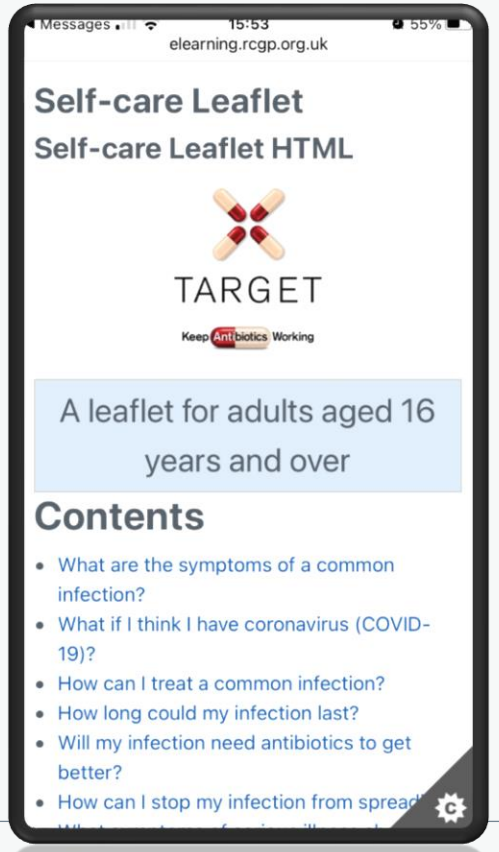
Available at TARGET website

Sending TARGET Information Leaflets via AccuRx

1. In the accuRx message template search bar, type “target”
2. Click on the desired TARGET patient leaflet
3. Press ‘Send Now’
4. The patient will receive a link to the chosen patient leaflet
5. The link will bring the patient to the leaflet on the TARGET website







Slide courtesy of Erica Elsden, HIOW ICB

Children with coughs (Polar bear) leaflet

Caring for children with COUGHS

University of BRISTOL

This leaflet contains information about how to look after a child who has a cough (not due to asthma).
For more detail see www.bristol.ac.uk/child-cough

COUGH

Coughs can last for 3-4 weeks and make your child feel quite unwell but will still get better by themselves.

'Noisy chests' or 'chesty coughs' are quite common when young children catch a cold and are not necessarily a sign of a 'chest infection'.

Healthy children typically get a cough 7-10 times a year and this is not a sign that there is anything wrong with their immune system.

DISTURBED SLEEP

Coughs will often wake your child in the night. When the child lies down, more of the mucus from the nose and throat runs downwards and your child coughs more to clear it.

Coughing is part of the body's defence system which helps keep the lungs clear and fight the illness. Unfortunately this can wake the child in the night but does not mean the illness is more severe.

For children over 1 year, a spoon of honey (perhaps in a warm drink) half an hour before bed may help them to wake less often.

For children over 2 years, vapour rubs (containing camphor, menthol and/or eucalyptus) may help children sleep better.

FEVER/HIGH TEMPERATURE

In children, a temperature of over 37.5°C is considered a fever.

Fever is a normal response to illness and does not harm children. It may even help to fight illness.

Children with a high temperature may be more likely to have a more severe illness, although most do not. Occasionally a child may have a fit. This shouldn't cause harm and treating the fever doesn't prevent it.

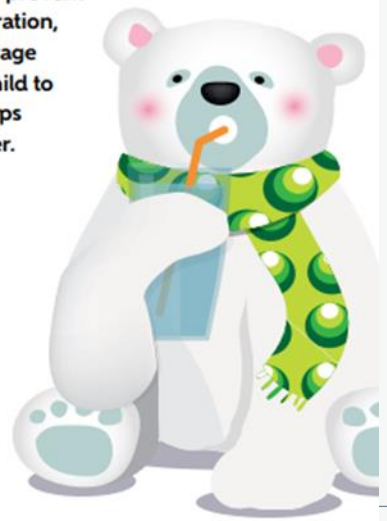
It is safe to use child paracetamol and ibuprofen to manage children's fever (and pain) for as long as needed. Follow the dosage on the bottle.

DRINKING/EATING LESS

Children often eat and drink less when they have normal childhood illnesses. Most children can go a few days without eating much and this will not affect their longer term growth and development.

All children need to drink regularly to avoid becoming dehydrated, especially if they are vomiting.

To help prevent dehydration, encourage your child to have sips of water.



Available at: bristol.ac.uk/child-cough

‘When should I worry?’ booklet

Effect of using an interactive booklet about childhood respiratory tract infections in primary care consultations on reconsulting and antibiotic prescribing: a cluster randomised controlled trial

Nick A Francis, medical research council health services fellow,[1,2] Christopher C Butler, professor of primary care medicine, head of department of primary care and public health,[1] Kerenza Hood, reader in statistics, director of south east Wales trials unit,[1,2] Sharon Simpson, senior research fellow,[1,2] Fiona Wood, lecturer,[1] Jacqueline Nuttall, senior trial manager[1,2]

Use of booklet during consultations led to a 21% absolute risk reduction for antibiotic prescribing (19 vs 40%)

Odds ratio of 0.34 for reconsulting for similar illness in the future

Francis et al, BMJ 2009;339:b2885; Booklet available here

Healthier Together website

Integrated website for parents/carers & young people as well as healthcare professionals

Resources for HCPs
Safety netting & parent information sheets
Education and training resources

Healthier Together website: www.what0-18.nhs.uk

Safety netting advice

Systematic review & network meta-analysis

- Compared to usual care:
    - Leaflets may reduce antibiotic prescribing, antibiotic consumption and return visits
    - Effect greater if combined with verbal safety netting advice

- Videos & websites offering safety netting advice may increase parental knowledge and parental satisfaction

Burvenich et al, Br J Gen Prac 2024

Midlands & SE Paediatric AMS project

Aiming to achieve a 5% reduction in antibiotic prescribing to 0-4 year olds

- Pragmatic paediatric prescribing guidelines for primary care
- Point of prescribing alert templates
- Guidance on back up antibiotic prescribing & ‘how to’ videos
- Patient/parent/carer facing information about the gut microbiome
- Links to other useful resources including ‘Superbodies campaign’
- Training offer to PCNs & practices

Take home messages

- The demand for antibiotics for RTIs seems unrelenting – we need to get better at managing that
- Key actions:
  - Effective/successful consultations that address parent/carer concerns and expectations
  - Communicate and be explicit about the expected duration of symptoms (how long it will take 90% of children to feel better)
  - Provide verbal and written safety netting advice
  - Signpost to Healthier Together website for additional support
  - Make sure the whole team is taking the same approach
- **If you prescribe antibiotics, advise parents/carers that the symptoms will likely last longer than the antibiotic course**

Thank You

@nhsengland

company/nhsengland

england.nhs.uk

Why do clinicians prescribe antibiotics?

- Abx prescribed for a range of medical & non-medical reasons:
  - children seen as vulnerable[1]
  - clinical state can change rapidly; abx prescribed just in case[2]
  - to mitigate a perceived risk of future hospital admission and complications [3,4]
  - Failure to provide a prescription for a child who subsequently becomes seriously unwell is professionally unacceptable[5]

[1]Cabral et al, *Soc Sci Med* 2015;**136-137**:156, [2]Lucas et al, *Scand J Prim Health Care* 2015;**33**:11, [3]Kumar et al *BMJ* 2003;**326**:138, [4]Horwood et al *Br J Gen Pract* 2016;**66**:e207

Additional evidence slides – use as required

STARWAVe trial

- 247 General Practices in England
- Prognostic cohort study of 8,394 children aged 3mo-16 years presenting with acute cough & RTI
- Outcome: hospital admission for RTI within 30 days
- 7 characteristics were independently associated with hospital admission
- A points based rule distinguished between three hospital admission risk strata – very low, normal or high risk

Development and internal validation of a clinical rule to improve antibiotic use in children presenting to primary care with acute respiratory tract infection and cough: a prognostic cohort study

Alastair D Hay, Niamh M Redmond, Sophie Turnbull, Hannah Christensen, Hannah Thornton, Paul Little, Matthew Thompson, Brendan Delaney, Andrew M Lovering, Peter Muir, John P Leeming, Barry Vipond, Beth Stuart, Tim J Peters, Peter S Blair

	Number of predictors	Hospitalised children	Non-hospitalised children	Risk of hospital admission*†	
				Risk percentage	95% CI
Very low risk	0 to 1	17 (22%)	5576 (68%)	0·3% (1 in 328)	0·2%–0·4%
Normal risk	2 to 3	37 (47%)	2483 (30%)	1·5% (1 in 68)	1·0%–1·9%
High risk	4 or more	24 (31%)	180 (2%)	11·8% (1 in 8·5)	7·3%–16·2%
Total		78 (100%)	8239 (100%)	0·9% (1 in 106)	0·7%–1·2%

*Risk of hospital admission using Wald estimates were 0·2% (or 1 in 449) for the very low risk group, 1·0% (or 1 in 104) for the normal risk group, and 4·3% (or 1 in 23) for the high risk group. †The sensitivity and specificity using the cutoff of (normal or high risk) versus (very low risk) were 78·2% and 67·7%. The sensitivity and specificity using the cutoff (high risk) versus (normal or very low risk) were 30·8% and 97·8%.

Table 3: Risk of hospital admission: simple scoring system

"Clinical characteristics can distinguish children at very low risk, normal and high risk of future hospital admission for respiratory tract infection and could be used to reduce antibiotic prescriptions in primary care for children at very low risk"

Hay et al, Lancet Respir Med 2016; **4**:902

!Checkpoint for presenter!

Depending on the audience and the time available for the talk, you could show the evidence slide for the CHICO study next – it demonstrates that using STARWAVe is safe (no increase in hospitalisation) but didn’t impact on overall antibiotic consumption – most likely because of the pandemic and the shift to remote consultations.

The slide is available at the end of the slide deck and can be moved to the evidence section if you want

CHICO trial

- 294 GP practices randomised to intervention (prognostic algorithm in EMIS template & leaflet) or control groups (usual clinical practice) for children consulting with RTI
- Outcome: rate of dispensed amoxicillin & macrolide antibiotics; hospital admissions for RTI for children aged 0-9 years over 12-month period
- No difference in prescribing rates or hospital admissions
- Confounded by Covid-19 and remote consultations?
- Intervention was feasible but did not integrate well within the consultation flow
- Clinicians liked the intervention & used it as a supportive aid, especially with borderline cases

Multi-faceted intervention to improve management of antibiotics for children presenting to primary care with acute cough and respiratory tract infection (CHICO): efficient cluster randomised controlled trial

Peter S Blair,[1] Grace Young,[2] Clare Clement,[2] P Dixon,[3] Penny Seume,[4] Jenny Ingram,[1] Jodi Taylor,[2] Christie Cabral,[4] Patricia J Lucas,[5] Elizabeth Beech,[6] Jeremy Horwood,[4] Martin Gulliford,[7] Nick A Francis, Sam Creavin,[4] Janet A Lane,[2] Scott Bevan,[2] Alistair D Hay[4]

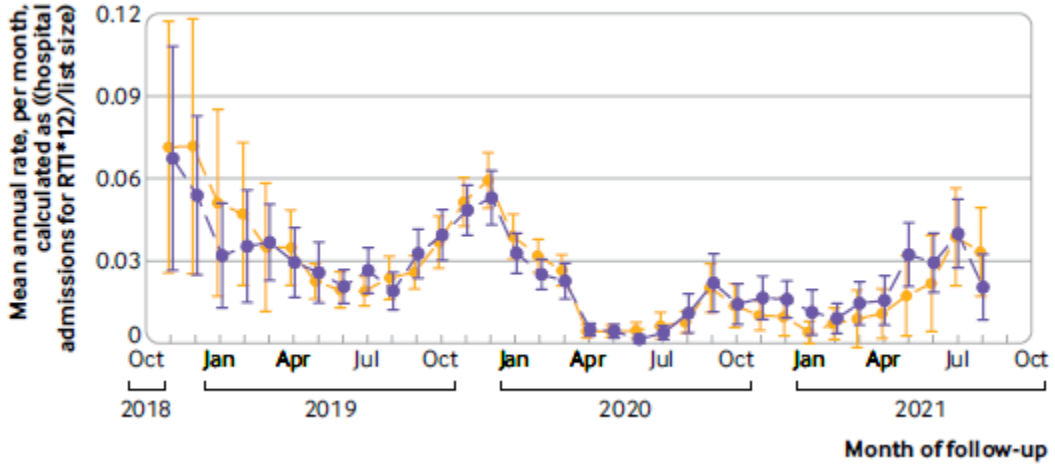


Table 1 | Clinician advice associated with the algorithm output*

CHICO result	Pop-up text
Low risk group	Very reassuring CHICO score: 0 or 1 CHICO predictors: >99.6% of children will recover from this illness with home care. Consider a no or delayed antibiotic prescribing strategy. CHICO leaflet and letter covers common concerns and safety netting advice
Average risk group	Reassuring CHICO score: 2 or 3 CHICO predictors: >98% of children will recover from this illness with home care. Consider no or delayed antibiotic prescribing strategy. CHICO leaflet and letter covers common concerns and safety netting advice
Elevated risk group	Safety netting needed: ≥4 CHICO predictors: This is more than average, but >87% of children will still recover from this illness with home care. Highlight safety netting advice in CHICO leaflet

*As presented in Seume et al, 2021.[15]

!Checkpoint for presenter!

Depending on the audience and the time available for the presentation, you could consider inserting the evidence slide for the SCOUT-CAP study which shows that 5 days of antibiotics for children with pneumonia is as effective as 10 days

Slide available after this slide

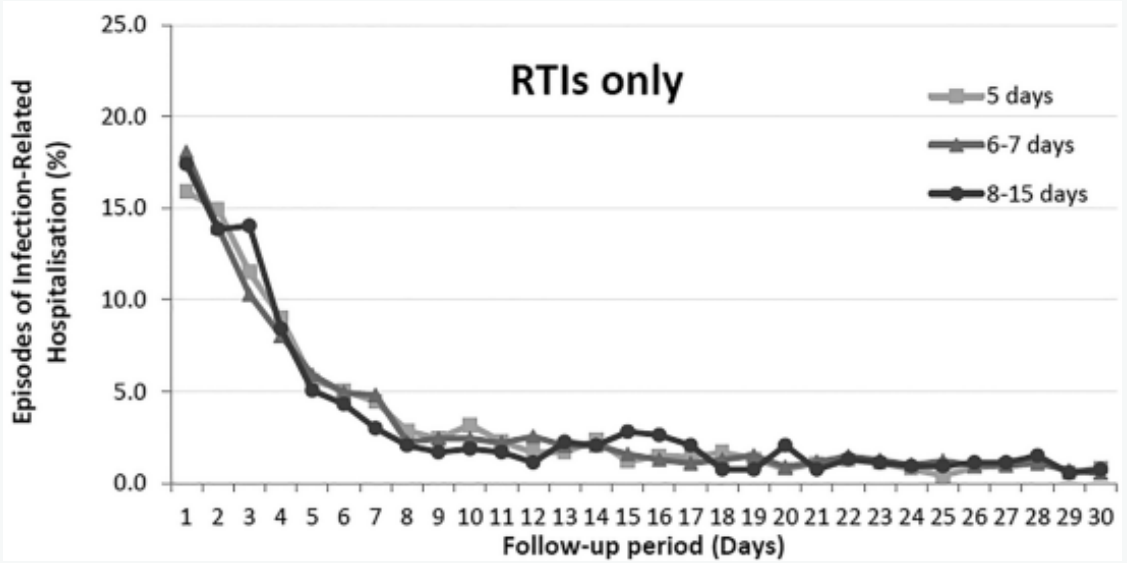
Short vs longer courses of antibiotics for common infections

- Population based cohort study of 4m consultations for acute infections (RTI & UTI) where prescribed a systemic antibiotic (2000-14)
- Outcome was hospital admission within 30 days for infection-related complication
- Reference category was shortest duration group
- Most risk of hospitalisation the longer durations group (HR 1.75, 95% CI: 1.54-2.00)

Clinical Infectious Diseases
MAJOR ARTICLE

Shorter and Longer Courses of Antibiotics for Common Infections and the Association With Reductions of Infection-Related Complications Including Hospital Admissions

Victoria Palin,[1,©] William Welfare,[2] Darren M Ashcroft,[3,4] and Tjeerd Pieter van Staa[1,5]



"Equal effectiveness was found between shorter and longer antibiotic courses and the reduction of infection-related hospitalisations."

Palin et al, Clin Infect Dis 2021; **73**:1805

ARTIC-PC trial

Antibiotics for lower respiratory tract infection in children presenting in primary care in England (ARTIC PC): a double-blind, randomised, placebo-controlled trial

Paul Little, Nick A Francis, Beth Stuart, Gilly O'Reilly, Natalie Thompson, Taeko Becque, Alastair D Hay, Kay Wang, Michael Sharland, Anthony Harnden, Guiqing Yao, James Raftery, Shihua Zhu, Joseph Little, Charlotte Hookham, Kate Rowley, Joanne Euden, Kim Harman, Samuel Coenen, Robert C Read, Catherine Woods, Christopher C Butler, Saul N Faust, Geraldine Leydon, Mandy Wan, Kerenza Hood, Jane Whitehurst, Samantha Richards-Hall, Peter Smith, Michael Thomas, Michael Moore, Theo Verheij

- 432 children aged 6mo-12yrs presenting to primary care with uncomplicated (non-pneumonic) LRTI, randomised to receive amoxicillin or placebo for 7 days, 56 General Practices in England
- Primary outcome was duration of symptoms rated moderately bad-worse for up to 28 days
- Median duration of symptoms amoxicillin group 5 days, (IQR 4-11), placebo 6 days (4-15), HR 1.13, 95% CI: 0.9-1.42
- No difference in outcome for 5 pre-specified clinical subgroups – pts with chest signs, fever, physician rating of unwell, sputum or chest rattle, short of breath

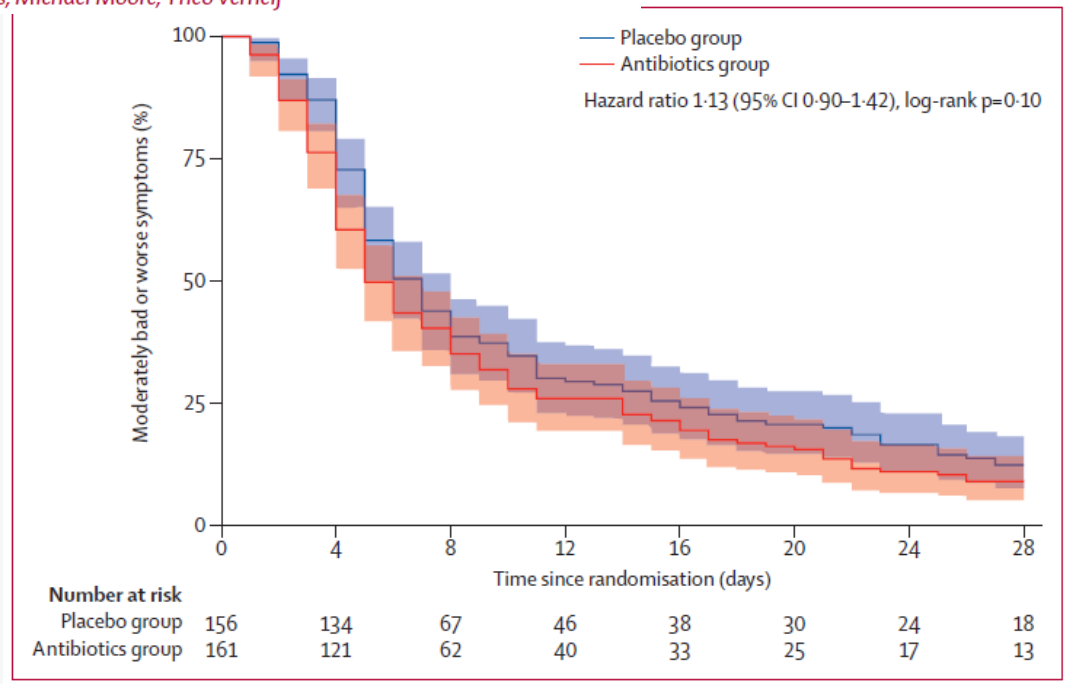


Figure 2: Kaplan-Meier curve of duration of moderately bad or worse symptoms in days

Amoxicillin for uncomplicated chest infections is **unlikely to be clinically effective** overall or for key subgroups in whom antibiotics are commonly prescribed

Unless pneumonia is suspected, **clinicians should provide safety-netting advice but not prescribe antibiotics** for most children presenting with chest infections

Little et al, *Lancet* 2021;**398**:1417

Evidence for impact of communication in acute cough in general practice

Effect of point of care testing for C reactive protein and training in communication skills on antibiotic use in lower respiratory tract infections: cluster randomised trial

Jochen W L Cals, general practitioner trainee and researcher,[1] Christopher C Butler, professor of primary care medicine,[2] Rogier M Hopstaken, general practitioner and researcher,[1,3] Kerenza Hood, reader in statistics,[2,4] Geert-Jan Dinant, professor of general practice[1]

- 431 patients with LRTI from 20 general practices in the Netherlands
- GPs received training in enhanced communication skills and had access to CRP testing, training in enhanced communication skills alone or usual care
- Primary outcome was antibiotic prescribing at index consultation

Care for LRTI	Antibiotics prescribed
Usual care	67%
Communication skills and leaflet	33%
CRP to aid diagnosis	39%
Both CRP & communication	23%

Enhanced communication skills delivered by brief workshop training and included

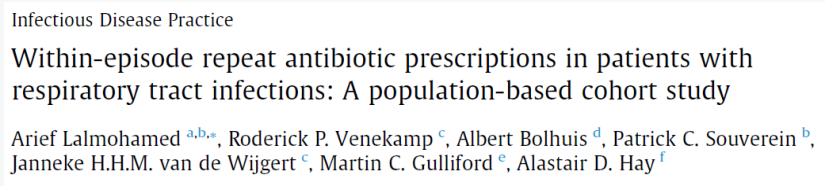
- Exploring patient's fears and expectations
- Asking patient's opinion on antibiotics
- Outlining natural duration of cough in LRTI

Based on an elicit-provide-elicit framework for counselling

Once learned, did not increase mean consultation times

Cals et al, *BMJ* 2009;**338**:b1374

Within-episode repeat antibiotic prescriptions (WERP) for RTI


Infectious Disease Practice

Within-episode repeat antibiotic prescriptions in patients with respiratory tract infections: A population-based cohort study

Arief Lalmohamed [a,b,*], Roderick P. Venekamp [c], Albert Bolhuis [d], Patrick C. Souverein [b], Janneke H.H.M. van de Wijgert [c], Martin C. Gulliford [e], Alastair D. Hay [f]

- 530 GP practices in England, all patients with a primary care RTI consultation and prescribed an antibiotic
- Outcome measure was repeat antibiotic prescription within 28 days of RTI visit
- 905,964 RTI episodes identified; in adults, 19.9% had at least one WERP for a lower RTI and 10.5% for upper RTI; around 10% of children regardless of lower or upper
- Median was 10 days after initial prescription
- **Take home messages**:
    - when abx prescribed, clinicians should emphasise a single treatment course is likely to be microbiologically adequate
    - Remind patients of the natural history of RTI longer than abx course, persisting symptoms unlikely to require WERP in the absence of deterioration

Lalmohamed et al, *Journal of Infection*, 2024;**88** 106135

Duration of symptoms and reconsultation rate in sore throat[1]

- No antibiotics, delayed antibiotics or immediate 10-days of antibiotics for sore throat and abnormal physical sign on examination; followed up for 1 year
- Prescribing antibiotics increased return to the surgery (38% vs 27%); increased further if they had had prior antibiotics or prior attendance for uRTI
- Prolonged duration of sore throat increased the rate of return to practice within 6 weeks of original illness (crude HR 1.43 (1.05-1.94))
- Half the subjects who returned did so within 8 days
- **Take home messages**:
    - Explanation of the natural history of illness (average duration 5 days after consultation and that almost 40% of people have a sore throat for longer than 5 days) may reduce expectations and alter subsequent attendance behaviours

[1]Little et al BMJ 2009;**314**:722

Immune Defence trial

- Open label RCT run over 3 winters (2020-2023) in 332 UK general practices
- 13,799 adults with 3+ RTIs per year or co-morbidity/risk factor for adverse outcomes
- Intervention: saline or gel-based nasal spray or behavioural website vs usual care
- Outcomes: total number of days of respiratory illness, days of work lost, number of courses of antibiotics at 6 months
- Saline nasal spray had reduced incidence of respiratory illness (IRR 0.81, 95% CI: 0.74-0.88) and number of antibiotic courses (OR 0.69, 95% CI: 0.54-0.88)

Advice to use nasal sprays reduced illness duration and antibiotic use

[Little et al, Lancet Resp Med 2024]

Nasal sprays and behavioural interventions compared with usual care for acute respiratory illness in primary care: a randomised, controlled, open-label, parallel-group trial

Paul Little, Jane Vennik, Kate Rumsby, Beth Stuart, Taeko Becque, Michael Moore, Nick Francis, Alastair D Hay, Theo Verheij, Katherine Bradbury, Kate Greenwell, Laura Dennison, Sian Holt, James Denison-Day, Ben Ainsworth, James Raftery, Tammy Thomas, Christopher C Butler, Samantha Richards-Hall, Deb Smith, Hazel Patel, Samantha Williams, Jane Barnett, Karen Middleton, Sascha Miller, Sophie Johnson, Jacqui Nuttall, Fran Webley, Tracey Sach, Lucy Yardley, Adam W A Geraghty

	Usual care (N=3451)	Gel spray (N=3448)	Saline spray (N=3450)	Website (N=3450)
Days with moderately bad symptoms	Mean: 3.0 IRR: 1 (ref)	Mean: 2.4 IRR 0.81 (0.73-0.91) p<0.0001	Mean: 2.3 IRR 0.82 (0.74-0.92) p<0.001	Mean: 2.6 IRR 0.89 (0.8-0.99) p=0.04
Days of work lost	Mean: 1.6 IRR: 1 (ref)	Mean: 1.2 IRR: 0.81(0.67-0.98) p=0.03	Mean 1.0 IRR: 0.87 (0.69-1.1) p=0.24	Mean: 1.2 IRR: 0.87 (0.72-1.06) p=0.17
No. of antibiotic courses	Mean: 0.17 IRR: 1 (ref)	Mean: 0.12 IRR: 0.65 (0.5-0.84) p=0.001	Mean: 0.12 IRR: 0.69 (0.54-0.88) p=0.003	Mean: 0.14 IRR: 0.74 (0.57-0.94) p=0.02