

BMJ Open

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Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2016-011497
Article Type:	Research
Date Submitted by the Author:	12-Feb-2016
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Primary Subject Heading:	General practice / Family practice
Secondary Subject Heading:	Infectious diseases, Paediatrics, Qualitative research
Keywords:	PRIMARY CARE, QUALITATIVE RESEARCH, Respiratory infections < THORACIC MEDICINE, Paediatric infectious disease & immunisation < PAEDIATRICS

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3 **Prescribing antibiotics to “at-risk” children with influenza-like illness in primary care: qualitative**
4 **study**

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Abstract

Objectives

NICE guidelines recommend immediate antibiotic treatment of respiratory tract infections in “at-risk” individuals with co-morbidities. Observational evidence suggests that influenza particularly predisposes children to bacterial complications. This study investigates GPs’ accounts of factors influencing their decision-making about antibiotic prescribing in management of at-risk children with influenza-like illness (ILI).

Design

Qualitative interview study using a maximum variation sample with thematic analysis through constant comparison

Setting

Semi-structured telephone interviews with UK GPs using a case scenario of a child with co-morbidities presenting with ILI

Participants

41 GPs (41.5% male; 40 from England, 1 from Northern Ireland) with a range of characteristics including length of time in practice, paediatrics experience, practice setting, and deprivation.

Results

There was considerable uncertainty and variation in the way GPs responded to the case, and difference of opinion about how long-term co-morbidities should affect their antibiotic prescribing. Factors influencing their decision included the child’s case history and clinical examination; the GP’s view of the parent’s ability to self-manage; the GP’s own confidence and experiences of managing sick children; and assessment of individual vs. abstract risk. GPs rarely mentioned potential influenza

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3 infection or asked about immunisation status. All said they would want to see the child; views about
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5 delayed prescribing varied in relation to local health service provision including options for follow-up
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7 and paediatric services.
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10 11 *Conclusions*

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13 The study demonstrates diagnostic uncertainty and wide variation in GP decision-making about
14
15 prescribing antibiotics to children with co-morbidity. Future guidelines might encourage
16
17 consideration of a specific diagnosis such as influenza and risk assessment tools could be developed
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19 to allow clinicians to quantify the levels of risk associated with different types of co-morbidity.
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21 However, the wide range of clinical and non-clinical factors involved in decision-making during these
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23 consultations should also be considered in future guidelines.
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Strengths and limitations

- This qualitative study provides an in-depth assessment of GPs' decision-making processes when faced with "at-risk" children with acute respiratory illness, which has not previously been studied.
- The use of a case scenario to simulate a consultation, with information provided in a structured stepwise way, enabled GPs to discuss their decision-making process as if in real-time.
- We sought to obtain a maximum variation sample based on criteria which might affect antibiotic prescribing, such as level of experience in general practice and paediatrics, however this did not seem to impact eventual decision.
- Using a GP to conduct the interviews, and interviews taking place during a winter of low circulating influenza, may have affected the way GPs handled the case and communicated their opinions.

Introduction

Children with cough and fever present commonly to primary care (GP) services in the UK, particularly in the winter months when there are higher levels of circulating respiratory tract viruses. Approximately a third of these presentations are due to influenza infection.¹ Each year there are an estimated 490,000 GP consultations due to seasonal influenza in children aged 14 years or younger.² Testing for influenza infection is not routine in UK general practice, and the term influenza-like illness (ILI) can be used to mean a clinical, rather than confirmed microbiological, diagnosis, and includes children with respiratory tract infections (RTIs) caused by other respiratory viruses. ILI can be defined as a fever $\geq 38^{\circ}\text{C}$ and cough, with onset in the last 10 days.³

For most children ILI is a mild and relatively short viral illness, but some children can become more unwell or develop secondary bacterial infections such as pneumonia or otitis media. This is more likely to occur in children with pre-existing co-morbidities (“at-risk” children).⁴ Antibiotics are usually prescribed for children with influenza who already have a bacterial infection (such as pneumonia), however antibiotics are not generally given to healthy children with ILI who are relatively well, when NICE guidance for management of RTIs recommends no antibiotics or delayed antibiotics, or an immediate antibiotic if the patient is at high risk of serious complications because of pre-existing co-morbidity (which includes patients with significant heart, lung, renal, liver or neuromuscular disease, immunosuppression, cystic fibrosis, and young children who were born prematurely).⁵ However an immediate antibiotic may not be appropriate, and is unlikely to be given, for an at-risk child who has a simple cold. Observational data suggest that influenza may be associated with greater risk of bacterial infections than other respiratory viruses, and that early antibiotic treatment of these bacterial infections may improve clinical prognosis.¹

GPs’ antibiotic prescribing decisions are known to be influenced by diagnostic uncertainty, their own experience and fear of conflict with patients or parents,^{5,6} however no previous studies have focused

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3 on at-risk children. We aimed to investigate what factors influence GPs' decisions in the
4 management of at-risk children with ILI, particularly in relation to antibiotic prescribing decision.
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9 **Methods**

10 *Setting and recruitment*

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12 We aimed to conduct approximately 40 interviews with practising GPs in the UK, as we estimated
13 from previous studies using similar methods⁷ that this would be an appropriate number to obtain
14 data saturation. This study was conducted as part of the ARCHIE (early use of Antibiotics for At-Risk
15 Children with Influenza in primary care) programme. We invited GPs from four areas of England
16 (Thames Valley, Bristol, Southampton and Liverpool) in which we subsequently planned to recruit for
17 a randomised control trial. We obtained deprivation and prescribing information from data publicly
18 available via the NHS Information Centre in October 2012,^{8,9} and aimed for a maximum variation
19 sample including men and women, a range of lengths of time in general practice and local factors
20 (antibiotic prescribing level, deprivation). GPs were invited to take part in a telephone interview with
21 the first author (who is a GP). The response rate was low (5.8%) so recruitment was extended via
22 local Primary Care Trust (PCT) lists, the RCGP members' e-mail bulletin, social media groups and
23 primary care research networks. Participants were selected from those who volunteered to obtain a
24 maximum variation sample in terms of the above characteristics. Informed written consent was
25 taken by post. No reimbursement was offered for GP time, although GPs received a certification of
26 participation.
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49 *Data collection*

50 Participants completed a brief questionnaire (sex, length of time working as a GP, special interest in
51 paediatrics, amount of out-of-hours work, and whether they had their own children) and practice
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3 area (rurality, whether a training practice, and whether practice nurses see children with influenza-
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5 like illness).
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10 Interviews took place between March 2013 and March 2014 and were by telephone or Skype (1 was
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12 conducted face-to-face), lasting approximately 20 minutes (in order to fit in with a busy GP's
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14 schedule), conducted by one author (HFA), who is female, was a GP ST3/ST4 academic registrar at
15
16 the time of the interviews, and had received formal training in qualitative interview techniques. With
17
18 the exception of one GP included in the study who was a former colleague, HFA had no prior
19
20 relationship with the GPs in the study, but corresponded by e-mail with participants to pass on the
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22 clinical scenario and set up the interview time. Participants were aware they were speaking to a GP
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24 registrar with a research interest in child health and infection. No other individuals were present
25
26 during the interviews, as far as we were aware.
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31 Interviews were semi-structured and a case scenario was used to focus the discussion: Lily, aged 2,
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33 with a medical history of prematurity, atrial septal defect and hemiplegia presenting with an acute
34
35 respiratory illness. Using case scenarios is commonly used in UK primary care education and has
36
37 been used previously in qualitative studies.⁷ GPs were e-mailed the first part of a case scenario
38
39 before the interview (see Box 1) with the child's background, and then provided with further
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41 information on history and examination findings throughout the interview, in order to mimic how
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43 information might be provided in a real-life consultation setting, whilst being flexible to the ways in
44
45 which different GPs might gather information. We chose this method to help GPs imagine how they
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47 might handle such a scenario, and more easily be able to discuss their decision-making process as if
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49 in real-time, and deliberately avoided leading the discussion to certain topic areas, rather letting the
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51 participant progress through the consultation and discuss their decision-making, for example not
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53 raising the possibility of influenza infection or immunisation status until later in the interview, and
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55 withholding examination findings in order to discuss how certain potential findings might sway their
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3 decision. The case scenario was written to be realistic but to incorporate several different co-
4 morbidities, albeit none severe in their own right, making the case less straightforward and to
5 provoke discussion around the importance of different components. GPs were advised not to do any
6 special preparation or revision prior to the interview. The interview topic guide was developed and
7 reviewed by the whole research team, and was piloted with two GPs not included in the study, and
8 revised in light of feedback.
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18 Interviews were audio-recorded and professionally transcribed verbatim, then checked for accuracy
19 by the interviewer (HFA). Interview transcripts were reviewed by an experienced qualitative
20 researcher (UR) as recruitment progressed and the topic guide revised to take account of emerging
21 issues. Transcripts were not returned to participants for comment or correction.
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28 *Analysis*

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30 Supervised by the programme's qualitative research lead (SZ), a thematic analysis using constant
31 comparison was used.¹⁰ The coding scheme was derived from the data. NVivo10 software was used
32 for coding, which was conducted by two researchers (HFA and UR) until agreement was reached,
33 and subsequently by one researcher (HFA). The final coding structure was applied systematically to
34 the whole dataset (HFA) using NVivo10 software. This took place while later interviews were
35 ongoing in order to revise the topic guide in light of identified themes and to establish when data
36 saturation was reached. Codes were then grouped into broader anticipated and emerging issues to
37 develop analytic and conceptual categories. The category of "co-morbidity" was then analysed using
38 a mind-mapping method to explore patterns in the data as well as deviant cases.¹⁰ To demonstrate
39 variation in responses to the scenario, we coded the GPs' responses which are presented as relative
40 frequencies (Table 2), and these were then assessed for any patterns in terms of GP characteristics
41 to explore the variation. Further analyses of these data will contribute to the interpretation of an
42 associated trial, within the ARCHIE programme.
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Results

We first discuss the GPs' awareness of the potential consequences of co-morbidity, followed by factors which GPs described as influencing their response to the scenario. 41 interviews were conducted between March 2013 and March 2014, 40 from across England and 1 in Northern Ireland, including one GP trainee. Table 1 shows participant characteristics. Some GPs commented that this was "a very common scenario" and one suggested that this was "a really good scenario for discussing whether GPs are going to prescribe antibiotics or not" (GP22, male, town practice, 25-29 years as a GP).

There was a large variation in the degree of certainty with which GPs responded to the scenario – some seeing it as quite routine

You see goodness knows how many we see and, and by and large most of these are viral presentations... So we would sort of go through that, safety netting, out of hours, in fact we've got a leaflet which we tend to hand out, especially to paediatric under-fives. (GP 33, male, small town/rural practice, 5-9 years as a GP)

although many recognised that this was a more challenging case, "a very grey sort of area", and expressed uneasiness about assessment and management:

I'm feeling uneasy about it because she's not quite a straightforward lively healthy toddler who's got a cold; there's a bit more going on here, or a bit more potentially going on. (GP08, male, inner-city practice, ≥30 years as a GP)

I think it's just hugely difficult... It's a complete nightmare... you sit there in practice and you think, "Well, how on earth can you decide whether it's viral or not?" (GP26, female, small town/rural practice, ≥30 years as a GP)

Awareness of the potential consequences of co-morbidity

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3 GPs recognised that some co-morbidities might be associated with an increased risk of poor
4
5 outcomes following an RTI, both in terms of developing a more severe infection and risk of a
6
7 secondary infection. Some said they aimed for prevention as well as treatment.
8

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10 *And even though it might not be causing a problem while they're fit and well, if they get a*
11 *really bad infection then that can cause them some difficulties and they could actually die.*
12 *(GP27, female, rural practice, 5-9 years as a GP)*

13
14 *Because they do get unwell more quickly. And that is the experience, they'll go in with a*
15 *pneumonia or a chest infection and it just started off as a cold. So, you know it does change*
16 *depending on their past medical history, it can change things quite dramatically. (GP32,*
17 *female, inner-city practice, 5-9 years as a GP)*

18
19 Although GPs suggested that co-morbidity would lower their intervention threshold it was rarely
20
21 described as an important part of the assessment. Table 2 summarises participant responses to
22
23 demonstrate the diversity of responses and degree of variation in our sample for co-morbidity and
24
25 other aspects of discussion. GPs varied in terms of which specific co-morbidities seemed most
26
27 important:
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29 30 31 32 *Atrial septal defect (ASD)*

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34 There was uncertainty about the significance of the ASD and risk of cardiac or respiratory
35
36 decompensation since this required follow-up yet was asymptomatic. Concerns included whether
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38 there would be an increased risk of endocarditis or rheumatic fever which might require antibiotic
39
40 prophylaxis.
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42 43 44 45 *Prematurity*

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47 GPs associated prematurity with being “*more vulnerable*” and with increased susceptibility to
48
49 significant respiratory infections:
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52 *I mean they, they often have had a history of respiratory distress haven't they, sort of in*
53 *those first few weeks. And they're the kind of babies that tend to get bronchiolitis when*
54 *they're little. [...] I think that they are more susceptible to chest infections and to getting*
55 *more sickly so, so yeah I would certainly take that into account. (GP04, female, inner-city*
56 *practice, 10-14 years as a GP)*
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Hemiplegia

For a few GPs the hemiplegia was thought to potentially affect mobility, making children harder to assess. If they were less active they might have difficulty clearing secretions and therefore develop respiratory infections.

I'd be wondering whether the hemiplegia had a sort of effect on her general mobility...I might be thinking [...] is this a child that's not very active and that's going to be a bit more vulnerable to developing a serious respiratory infection...if you see a child for example in a wheelchair, you just wonder about how their respiratory muscles, how sort of fit they are almost. And whether actually their ability to move secretions out of their lungs and you know run around and take lots of exercise is going to make them a bit more vulnerable. I mean that sounds like a bit of sort of, I don't know, pseudo-science really but it, it's kind of borne out of experience as well. (GP29, female, town practice, 25-29 years as a GP)

Other co-morbidities

In contrast, co-morbidities in this case were seen as "slightly soft" and would not necessarily affect an acute presentation of this nature. Some GPs contrasted other co-morbidities which they would regard as more significant, including other chronic neurological problems, Downs syndrome, diabetes, cystic fibrosis and metabolic disorders relating to consanguinity.

Age

GPs were reassured by the lack of problems since the neonatal period and by Lily's age (two and a half).

If she was 8 weeks old it would probably make a lot more difference... I think at eight weeks they are likely to decompensate much more quickly than they are at age two and a half. They've got less reserve. So I'd probably be more cautious the younger the child. [...] And I don't know, I think just a general feeling that I'd be less comfortable treating a child with congenital heart disease who's very young compared to one who's toddler age. (GP05, male, town practice, 10-14 years as a GP)

Clinical assessment guiding antibiotic prescribing decision

All GPs said that they would want to further assess the child in person: it was seen as "a justified request" to be seen as an extra on a Friday. In terms of management decision after assessment,

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3 different GPs discussed a range of possibilities (Table 2) which could be described as a “spectrum of
4 interventions” (sometimes in combination), increasing from reassurance and safety netting, through
5 arranging a GP review later, delayed antibiotic prescribing, immediate antibiotic prescribing,
6 telephone discussion with paediatrics, to immediate hospital referral. Some GPs wanted to start
7 antibiotics earlier in the course of illness than they would with a healthy child. The only GP who
8 wanted to arrange hospital assessment after having heard all of the clinical information was
9 concerned that the “subdued” description might indicate meningitis, and in the context of an ASD
10 she suggested specialist paediatric assessment.
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22 Some GPs talked about the importance of identifying a bacterial infection, with the assumption that
23 this would definitely require antibiotics or hospital assessment. Only a few GPs brought up potential
24 influenza spontaneously, and most felt that identification of the illness as potential influenza versus
25 “A N Other viral thing” was less important in a non-pandemic setting, with GPs tending to assess and
26 manage as a generic RTI. Likewise, Lily’s immunisation status was rarely mentioned spontaneously,
27 and on direct questioning few GPs saw influenza immunisation as particularly relevant to the
28 scenario.
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40 Lily’s co-morbidity worried some of the GPs who were concerned that they might miss a serious
41 diagnosis. This might increase their likelihood of prescribing antibiotics, which was widely seen as
42 the safer, easier and more “risk averse” course of action. Antibiotic resistance and antibiotic side-
43 effects were frequently mentioned, but mainly as an external issue, for example:
44

45 *It’s one of those grey areas where one dreads making a mistake, where you’ve got conflicting*
46 *forces, sometimes parental expectation which is, you know in a sense is almost a side issue,*
47 *but the awareness that inappropriate antibiotics is a major problem but missing one child*
48 *with a pneumonia who then gets ill or dies is ****ing disaster... [...] The easiest thing is to*
49 *dish them out and not worry about the global issue. (GP08, male, inner-city practice, ≥30*
50 *years as a GP)*
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52
53 *What all that [discussion of co-morbidities] builds up to is it’s a brave GP who just simply says*
54 *“Look this is an upper respiratory tract infection, it’s okay not to do anything extra.” (GP22,*
55 *male, town practice, 25-29 years as a GP)*
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3 *Lily's case history and examination*
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5 Lily's past experience of illness and how she seemed on the day were both seen as important. GPs
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7 variously said they would look through Lily's notes, and/or ask the parent to check whether there
8
9 were specific instructions from hospital specialists.
10

11 *You know perhaps one of the previous letters from the cardiologist might even say something*
12 *like, you know, please keep a low threshold for giving antibiotics or referring back if she's*
13 *deteriorating. So I'd want to have a quick scan through hospital letters, see if I can see any*
14 *little informative nuggets like that. (GP35, male, town practice, 20-24 years as a GP)*
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17 GPs wanted to establish Lily's typical trajectory of RTIs, in terms of duration, severity, previous
18 hospital admissions (including any intensive care admissions), and what had helped before, including
19 previous antibiotic prescribing.
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25 The response to the clinical scenario usually included a structured examination, including vital signs
26 (fever, respiratory rate and heart rate), pulse oximetry (although not always available for children),
27 and examining for respiratory distress or chest crepitations. Abnormalities in these areas would tend
28 to raise concerns of a more serious illness, and push the GP towards hospital assessment. However,
29 more important in the decision to prescribe antibiotics was the global assessment of "how she is in
30 herself":
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38 *I think I would probably would just play the child in front of me and be more guided by how*
39 *they were, how worried I was about them at that point rather than their history. (GP19,*
40 *male, inner-city practice, <5 years as a GP)*
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44 As mentioned above, all of the GPs said that they would want to see Lily and some commented that
45 when they did their "gut feeling" would sway their decision about prescribing.
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50 *Mutual trust and confidence with the parent*
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52 GPs often mentioned the need to establish the parental concerns, and work out whether this was a
53 "sensible" parent. The number and nature of previous GP attendances for similar illnesses were also
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3 considered important, and many commented that parents of children with co-morbidity might have
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5 different experiences, expectations, and ability to manage their child's illness than other parents.
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8 *And what I'm picking up now is that Mum thinks she's different to usual. So there's parental*
9 *concern, in my experience of looking after and supporting the families of babies who've had*
10 *a difficult time or have been, spent a lot of time on the special care baby unit, is that they are*
11 *very very expert parents, and so I think I would take the fact that she's an infrequent*
12 *attender, but has come in significantly concerned that she's really not herself very seriously, I*
13 *would be quite worried about that [...]. So often parents who've had a child who's had one*
14 *episode of pneumonia, that experience will influence how they feel about other coughs and*
15 *fevers. So I think I would explore all of that with Mum. (GP09, female, inner-city practice, 10-*
16 *14 years as a GP)*

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18 Others characterised these parents as potentially over-anxious and over-cautious, which could affect
19
20 how they handled the case.
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23 *I think this is sort of premature babies sometimes get sort of wrapped in cotton wool a little*
24 *bit, and thought to be a little bit more precious, but it's just like any other child really but*
25 *they sort of, they carry with them for the first few years that sort of, almost like slightly*
26 *precious "need protecting"-type approach sometimes. (GP31, male, inner-city practice, 10-14*
27 *years as a GP)*

28
29 If Lily's mother was seen as a "sensible parent," this would probably affect how they incorporated
30
31 the mother's opinion, and how much responsibility could be expected in monitoring the child for
32
33 signs of deterioration and returning for further assessment.
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36 *I'm kind of, you know, if they're sick they need to be treated. If they're not sick they need to*
37 *be told to come back. And be given a lot of permission to do that and I'm forever saying "If*
38 *you're worried, I'm worried," to patients, to Mums and Dads. To really underline you know,*
39 *"You're the world's expert," is the other thing that I'm always forever saying, "You're the*
40 *world's expert on your child." (GP21, female, inner-city practice, 5-9 years as a GP)*

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43 Education, culture and language as well as other sources of family support were factors contributing
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45 to the assessment of the parent. Some stated that they were assuming that Lily's mother was a
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47 "coper" or "capable" from the history described. Continuity was mentioned as an important factor
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49 for some GPs: if they had a longstanding and trusting relationship with the family and knew the
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51 child's history, they would feel more confident about managing this episode. Others talked about
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53 sharing the decision about antibiotic prescribing with the parent if they were uncertain about the
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55 best management.
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GP's confidence and experience

Some GPs acknowledged that particular memorable cases had impacted on their current practice, or saw themselves as more or less experienced in assessing children. Some mentioned that they were inexperienced in paediatrics, and that this might affect how they handled Lily's case. However, relative experience in paediatrics did not seem to predict eventual management decisions. Only a handful of GPs (particularly those more recently qualified) mentioned using guidelines or other tools to help with decision-making, although on specific questioning about this, many GPs were aware of the Centor criteria for sore throats⁵ and NICE guidelines (many mentioned the traffic light system for assessment of a feverish child¹¹ but none alluded to the guidance on co-morbidities in relation to antibiotic prescribing for RTI).⁵

But I am aware that ASDs are one of the things where I think there is still a lower threshold for prescribing antibiotics, but I would feel out of my comfort zone as to know when that was. So I would be, I think because I haven't come across an ASD for years I think I would still probably just ring the paediatricians and put it past them to check that, because I'm not quite clear about what the guidelines are with ASDs so I'd feel more comfortable just ringing them and asking them. (GP41, female, small town/rural practice, 20-24 years as a GP, no reported specialist expertise in paediatrics)

Generally speaking you know I'm not impressed by the scoring systems, I've done quite a lot of paediatrics, I'm pretty confident about spotting sick children. I'm pretty confident about guiding parents about what to do in case I've actually got it wrong and given false reassurance. So I'm pretty confident with all that sort of stuff. (GP02, male, town practice, ≥30 years as a GP, some specialty training in paediatrics)

GPs self-identified as being high or low antibiotic prescribers, and this could also relate to how recently qualified the GP was.

I think down to my own experience and where I feel I am in my practice compared to my peers, it's quite interesting how I use antibiotics quite a lot less and I wonder if that's because I have actually seen people die in hospital, in my career, from bacterial, you know antibiotic resistance and C.Diff diarrhoea and things like that. [...] And I've noticed that talking to my more senior colleagues who are probably 10, 20 years my senior, they've never seen the sort of deaths that I've discussed in hospital. So I think that has a big effect on what I do. (GP07, female, small town/rural mix practice, 5-9 years as a GP)

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3 In contrast, one GP with paediatrics experience said that “*we don’t see sick children like they used to*
4 *in general practice*” (GP02) and more recently qualified doctors would not have seen serious
5 complications of vaccine-preventable infections.
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9 10 11 *Other factors*

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14 The setting of this case on a Friday evening was important and affected prescribing decisions
15 (although some said they were consciously trying to ignore this feature of the scenario).
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17
18 *I think the problem with this is obviously ‘cos it’s a Friday evening. A Friday morning and you*
19 *can still say well see how she goes over the next couple of hours and if there’s any problem*
20 *then bring her back, but a Friday evening if you’re not in on the Saturday makes it, that*
21 *judgement a little bit harder. (GP10, female, town practice, 20-24 years as a GP)*
22

23
24 *Friday evening surgery the threshold for prescribing antibiotics and getting rid of the patient*
25 *that much more quickly is lower. (GP22, male, town practice, 25-29 years as a GP)*
26

27
28 Local circumstances and priorities, including out-of-hours services and proximity to Lily’s home, and
29 the quality of the out-of-hours service were all cited. One rural GP sometimes gave her own
30 telephone number to parents she knew well for use out-of-hours, due to distance from other
31 services. Others said they would prescribe to help reduce pressure on the out-of-hours service over
32 the weekend or, where this facility existed, arrange for a formal review of a child out-of-hours.
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39 40 41 *Delayed prescribing*

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45 Delayed prescribing was the most divisive issue (Table 2). Some GPs wanted to give a delayed
46 prescription so that treatment was started earlier if the child did not improve (particularly in the
47 context of an upcoming weekend); while others preferred to review the child if there was no
48 improvement or if they were not confident the parent would return in the event of deterioration if
49 they already had a prescription.
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Discussion

Principal findings

This is the first study of the impact of co-morbidity on GPs' assessment of children with ILI. There was uncertainty and variation in opinions about whether, and to what extent, long-term co-morbidities are associated with increased risk in children presenting with ILI, and considerable variation in management amongst GPs. Actions included watch-and-wait, immediate or delayed antibiotic prescription and hospital referral. Analysis of GPs' responses to the clinical scenario identified several factors influencing their decisions including the child's history, current appearance, mutual trust and confidence between the GP and the parent, the GP's own confidence and experience, and arrangements for weekend care locally. Neither suspicion of potential influenza infection nor immunisation status were described as important factors affecting assessment or management. Guidelines were rarely mentioned: more important was the GP's global impression of the child, incorporating the above factors to varying degrees. All wanted to see the child. Some participant characteristics, such as previous paediatric experience and rurality, played a role in decision-making, but did not predict ultimate management plan and antibiotic prescribing decision.

Strengths and limitations

We sought a diverse sample of GPs with a range of experiences and practice characteristics. Although we can say nothing about the frequency with which these findings would appear in the wider population, a wide range of views was evident in responses. Our use of a case scenario involving co-morbidities and an uncertain degree of risk enabled us to demonstrate the variation in clinical management. Providing case information in a stepwise manner enabled us to replicate the process of a consultation. Recruitment via mailing lists extended geographical diversity but made it more likely that those GPs who responded had particular special interests or experiences, leading to findings that may represent less variation than might be found in the wider GP population.

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3 Very few GPs mentioned influenza as a potential cause of the RTI until specifically prompted, despite
4 the study title including the term “flu-like illness”, and GPs tended not to differentiate between
5 influenza and other viruses in assessment or management. The interviews were conducted in all
6 seasons, including a winter of low influenza incidence in the UK,¹² and it is possible that influenza
7 was less in the forefront of GPs’ minds.
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16 Knowing they were talking to a GP colleague may have encouraged participants to give a preferred
17 response or collaborate in assumptions about the scenario, but there was considerable expression of
18 uncertainty and little suggestion that participants were drawing on guidelines in their responses.
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20 Interview transcripts were reviewed by a qualitative researcher early in the data collection period to
21 make sure that the interview did not resemble a test.
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28 ***Comparison with existing literature***

29
30 The Department of Health recommends influenza vaccination in specific groups who are considered
31 to be at high risk of serious complications¹³ and NICE guidance recommends an immediate antibiotic
32 prescription “if the patient is at high risk of serious complications because of pre-existing co-
33 morbidity. This includes patients with significant heart, lung, renal, liver or neuromuscular disease,
34 immunosuppression, cystic fibrosis, and young children who were born prematurely.”⁵ A systematic
35 review and meta-analysis found that strong risk factors for hospital admission due to influenza-
36 related complications included neurological disorders, prematurity, diabetes and age under 2 years,
37 as well as presence of more than one risk factor, which is similar to the specific co-morbidities GPs
38 brought up based on their experience.¹⁴
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52 Similar to our findings, a systematic review and meta-ethnography of antibiotic prescribing for RTIs
53 in all ages found that treatment strategies varied between GPs, and this was affected by their
54 previous experience, uncertainty about diagnosis, ease of follow-up, and fear of consequences of
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3 non-prescribing , as well as perceptions of potential conflict with patients.⁶ Another qualitative
4
5 systematic review in children found a particular focus on relationship with the parent, particularly
6
7 perceived pressure to prescribe and consequences for the future doctor-patient relationship.¹⁵ GP
8
9 perception of patient expectation is strongly associated with a decision to prescribe antibiotics^{16,17}
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11 and it may be that the construction of Lily's mother as an "expert parent" would lead to assumptions
12
13 about her antibiotic expectations and changed the dynamic of the consultation (and some GPs
14
15 commented on this assumption). However, GPs' tolerance of antibiotic prescribing conflict varies¹⁸
16
17 and this may account for more of the difference in eventual decision than other GP characteristics.
18
19 Our finding of individual vs. global risk assessment in decision-making was also found in a recent
20
21 cross-study qualitative analysis¹⁹ of prescribing behaviour for children with RTIs, which identified
22
23 antibiotic prescribing as being the safer option to manage clinician uncertainty: an unnecessary
24
25 antibiotic prescription was perceived as less of a threat to professional standing and the child's
26
27 health than a missed serious diagnosis. GPs were also more likely to prescribe if parents were not
28
29 judged to be adequate "risk managers" for the child, similar to our study with the concept of "a
30
31 sensible parent".
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36
37 In terms of clinical assessment, our findings are similar to a study of clinicians' antibiotic prescribing
38
39 behaviour for lower respiratory tract infections in adults,²⁰ where GPs discussed combining different
40
41 clinical and patient preference factors, giving these different weightings which contributed to a
42
43 tipping point for prescribing. However, most important for many GPs was the global assessment of
44
45 how the child appeared in herself, hence the need to see her at the practice. Clinicians' "gut feeling"
46
47 is well-established to be of high diagnostic value in assessing serious infections in children, with high
48
49 correlation with child's overall response and breathing pattern.²¹ Qualitative work has shown that
50
51 GPs use gut feelings (of either reassurance or alarm) as a compass in situations of uncertainty;²² GPs
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53 in our study discussed multiple factors which might inform their decision-making, but it may be that
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3 this gut feeling is the eventual sway to decision-making. Hence the need to see the child rather than
4
5 deal with the consultation entirely by telephone.
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8 9 ***Implications for clinicians, policymakers and future research***

10
11 Our study suggests that, faced with a clinical scenario, GPs expressed wide variation and uncertainty
12
13 about how to manage at-risk children with acute RTI. Current guidelines leave great scope for
14
15 interpretation, and lists of co-morbidities are not exhaustive, such that clinical judgement balancing
16
17 multiple factors is required to assess and quantify the levels of risk. Tolerance of uncertainty is a key
18
19 facet of a skilled GP,²³ and while some GPs were inclined to defer to parental opinion or (in one case)
20
21 to hospital referral, others seemed to think that they would be abrogating their clinical responsibility
22
23 if they reacted to uncertainty in this way. However, this study suggests that this is an area in which
24
25 further research and additional guidance is needed to help bridge this gap. Particularly, development
26
27 of risk assessment tools which allow clinicians to quantify the risk associated with different types of
28
29 co-morbidities and presence of multiple conditions, and weigh this against the potential more general
30
31 risks and benefits of early antibiotic prescribing. This might facilitate more consistent and accurate
32
33 antibiotic prescribing amount health care professionals who assess these types of scenarios. Also
34
35 notable was that GPs did not view influenza differently from other causes of RTI in children, despite
36
37 the greater risk of bacterial infections.¹ This may be an area for further research into diagnostic
38
39 accuracy of clinical features of influenza, potential training and educational interventions, and/or
40
41 assessment of whether there may be a greater role for rapid point-of-care tests for influenza in UK
42
43 primary care.²⁴ Decisions about antibiotic prescribing are particularly important in the context of a
44
45 pandemic where hospital capacity may be an issue.
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52 When incorporating any new evidence into practice and producing guidance in this area, it will be
53
54 important to take into account the factors raised here, and inclusion of non-clinical factors such as
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parental experience are likely to be particularly important in what will undoubtedly remain a complex decision-making process.

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Box 1: Case scenario*Background information (provided before interview)*

You see Lily who is 2 ½ years old as an urgent extra at the end of a Friday evening surgery. You haven't met the family before but a brief flick of the notes shows that Lily was born prematurely at 32 weeks and spent a week in the special care baby unit for intravenous antibiotics. She was diagnosed with an atrial septal defect which has been asymptomatic but she continues to be seen periodically at the hospital for serial echos for this. She also has a hemiplegia under follow up with community paediatrics. Despite this she's been generally well and she isn't a frequent attender at the surgery.

Presenting history (provided at start of interview)

Mum has brought her in urgently because she's concerned about Lily. She wouldn't normally bother the doctor but this "seems to be more than just a cold". She's had a runny nose, temperature and cough for the last 2 days but just this afternoon she's seemed more unwell. She can't keep her temperature down with Calpol^{®1} and she's become concerned that she seems to be struggling more with her breathing, and has vomited once. She's keen to have her checked out and to see if she needs antibiotics.

Further assessment and examination findings (provided during interview after initial discussion; items underlined were provided to all GPs, other items were given only if specifically asked)

- Off her food for the last day but managing fluids, and is passing urine normally
- Temperatures measured at home up to 39°C
- Older sister who has just started school has had a cold but has not been this ill with it
- No rash
- Immunisations up-to-date including influenza immunisation
- Lily appears quite grizzly and subdued, preferring to sit on Mum's knee and not interested in the toys in the corner
- Appears miserable, but pink and well-perfused
- Temperature of 38.4°C
- No signs of respiratory distress
- Oxygen saturations 97%
- Chest examination: good air entry with lots of upper airway noise but no crackles
- Ear, nose and throat examination: Heavy green nasal discharge but no obvious focus of infection on examination

Interview content

- Discussion of scenario and thought processes and management of case
- Extra information to acquire and how this might change management
- Factors driving decision to prescribe antibiotics or not
- Importance (or not) of co-morbidity
- Impact of thinking this might be influenza, or in the influenza season
- Importance of immunisation status
- Tools of guidelines used in decision-making
- Advice to parents and safety netting
- Delayed prescribing
- Discussion of trial of antibiotics in at-risk children with ILI and how this might change practice

¹ Calpol[®] is a widely used term in the UK to describe a popular brand of liquid paracetamol (acetaminophen) sold for children

Table 1: Participant characteristics

GP characteristics (n=41)	n (%)	
<i>Sex</i>		
Male	17	(41.5)
Female	24	(58.5)
<i>Years in general practice since qualification</i>		
<5	9	(22.0)
5-9	13	(31.7)
10-14	4	(9.8)
15-19	1	(2.4)
20-24	7	(17.1)
25-29	2	(4.9)
≥30	5	(12.2)
<i>Undertake out-of-hours work</i>		
No	26	(63.4)
Yes – rarely	3	(7.3)
Yes – sometimes	2	(4.9)
Yes – often	10	(24.4)
<i>Special interest in paediatrics^a</i>		
No	27	(65.9)
Yes	14	(34.1)
<i>Own children</i>		
No	11	(26.8)
Yes	30	(73.2)
Practice characteristics ^b	n (%)	
<i>Practice area (n=41)</i>		
Rural	2	(4.9)
Small town/rural	7	(17.1)
Town	17	(41.5)
Inner-city	15	(36.6)
<i>Training practice (n=38)</i>		
No	7	(18.4)
Yes	31	(81.6)
<i>Practice nurses see children with influenza-like illness (n=36)</i>		
No	20	(55.6)
Yes	16	(44.4)
<i>Practice list size (n=38)^c</i>	Median (IQR)	7788 (5986)
	Range	2455 – 38532
	England average	6845
<i>% children under 18 registered (n=38)^c</i>	Median (IQR)	21.1% (3.9%)
	Range	12.7 – 36.7%
	England average	20.8%

<i>Index of Multiple Deprivation (n=38)^{cd}</i>	Median (IQR)	27.5 (20.2)
	Range	4.3 – 49.4
	<i>England average</i>	21.5

^a Details of special interests described included hospital paediatrics experience, the Diploma in Child Health and responsibility for child health surveillance/baby clinics within the practice

^b Data not available for some characteristics as 3 locum GPs included in the study, or where details not completed.

^c Practice list size, deprivation score and percentage number of children under 18 registered at the practice were recorded using the Public Health England National General Practice Profiles²⁵ on the date of recruitment. Average values for England were recorded at the start of the interviews in March 2013.

^d Index of Multiple Deprivation provides information on relative levels of deprivation in England, and range nationally from 2.9 (lowest deprivation) to 68.4 (highest deprivation). Lower Layer Super Output Area level deprivation data are applied proportionally to the Attribution Data Set practice populations.²⁵

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Table 2: GP summarised responses to aspects of the case scenario to demonstrate variation in responses^a

Area of discussion	n(%)
<i>Effect of co-morbidity on management decision^b</i>	
Lower threshold to prescribe antibiotics	18 (43.9)
Lower threshold to refer to hospital	3 (7.3)
Combination of above	5 (12.2)
No change in management	12 (29.3)
Other	3 (7.3)
<i>Overall management of Lily^{cd}</i>	
Nothing/reassurance/conservative measures/safety-netting	22 (37.9)
Arrange further review in community (GP/out-of-hours)	11 (19.0)
Delayed antibiotic prescription	16 (27.6)
Immediate antibiotic prescription	8 (13.8)
Referral for paediatric assessment	1 (1.7)
<i>Delayed antibiotic prescribing^{ce}</i>	
Yes/probably	20 (48.8)
Possibly/unsure	4 (9.8)
No/very unlikely	15 (36.6)
Not discussed	2 (4.9)

^a This qualitative study is based on a maximum variation sample, therefore the data are intended to be representative of the range of views and experiences rather than the relative frequencies of such views. We include this table to demonstrate the degree of variation in our sample, not to suggest that the findings are numerically representative of the population.

^b Response to co-morbidity was discussed prior to the GP receiving full information about Lily's examination findings in this scenario. GPs were asked broadly about how Lily's co-morbidity might impact their management of the scenario. "Other" category responses included an impact on parent expectation which might in turn affect management (n=2) and wanting to assess the child in person rather than over the telephone (n=1).

^c Discussions about delayed prescribing and overall management decision took place after all information about Lily and her examination findings (Box 1) had been communicated.

^d 16 GPs gave more than one management decision

^e This was not discussed with 2 GPs due to focusing on other issues within the time constraints of the interview (it was not brought up by the GPs themselves and discussion of additional topics beyond the 20 minutes' time allotted was not possible for them).

Funding

This article presents independent research funded by the National Institute for Health Research (NIHR) under its Programme Grants for Applied Research Programme (Grant Reference Number RP-PG-1210-12012). The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. This report contains transcripts of interviews conducted in the course of the research and contains language that may offend some readers.

Ethical approval

This study was approved by the University of Oxford Medical Sciences Division Interdivisional Research Ethics Committee (reference MSD/IDREC/2010/P17.1).

Competing interests

The authors have no competing interests.

Contributorship statement

KW, SZ and AH conceived the idea for the study. All authors contributed to study design. HFA conducted the interviews and analysis, with input from UR and SZ. HFA drafted the paper. All authors were involved in critical revisions of the paper and approved the final draft before submission.

Data sharing statement

No additional data are publicly available, but please contact the corresponding author if specific queries.

Acknowledgements

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The authors would like to thank all the GPs who participated in the study or were pilot interviewees, and both the RCGP and GP Hot Topics course for helping with recruitment by advertising our study on their mailing lists.

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Prescribing antibiotics to “at-risk” children with influenza-like illness in primary care: qualitative study submitted to BMJOpen 12.02.2016

Location within submitted paper in bold

Table 1

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description
Domain 1: Research team and reflexivity		
Personal Characteristics		
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group? Page 7
2.	Credentials	What were the researcher's credentials? <i>E.g. PhD, MD</i> Page 7
3.	Occupation	What was their occupation at the time of the study? Page 7
4.	Gender	Was the researcher male or female? Page 7
5.	Experience and training	What experience or training did the researcher have? Page 7
Relationship with participants		
6.	Relationship established	Was a relationship established prior to study commencement? Page 7
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? <i>e.g. personal goals, reasons for doing the research</i> Page 7
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? <i>e.g. Bias, assumptions, reasons and interests in the research topic</i> Page 7
Domain 2: study design		
Theoretical framework		

No	Item	Guide questions/description
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? <i>e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i> Page 8
Participant selection		
10.	Sampling	How were participants selected? <i>e.g. purposive, convenience, consecutive, snowball</i> Page 6
11.	Method of approach	How were participants approached? <i>e.g. face-to-face, telephone, mail, email</i> Page 6
12.	Sample size	How many participants were in the study? Page 9
13.	Non-participation	How many people refused to participate or dropped out? Reasons? N/a
Setting		
14.	Setting of data collection	Where was the data collected? <i>e.g. home, clinic, workplace</i> Page 7
15.	Presence of non-participants	Was anyone else present besides the participants and researchers? Page 7
16.	Description of sample	What are the important characteristics of the sample? <i>e.g. demographic data, date</i> Page 9 and Table 1
Data collection		
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested? Page 7,8 and Box 1
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many? N/a
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data? Page 8
20.	Field notes	Were field notes made during and/or after the interview or focus group? Page 8
21.	Duration	What was the duration of the interviews or focus group? Page 7
22.	Data saturation	Was data saturation discussed? Page 6

No	Item	Guide questions/description
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction? Page 8
Domain 3: analysis and findingsz		
Data analysis		
24.	Number of data coders	How many data coders coded the data? Page 8
25.	Description of the coding tree	Did authors provide a description of the coding tree? Page 8
26.	Derivation of themes	Were themes identified in advance or derived from the data? Page 8
27.	Software	What software, if applicable, was used to manage the data? Page 8
28.	Participant checking	Did participants provide feedback on the findings? Page 8
Reporting		
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.g. <i>participant number</i> Throughout results
30.	Data and findings consistent	Was there consistency between the data presented and the findings? Throughout results
31.	Clarity of major themes	Were major themes clearly presented in the findings? Throughout results
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes? Throughout results

BMJ Open

Prescribing antibiotics to “at-risk” children with influenza-like illness in primary care: qualitative study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2016-011497.R1
Article Type:	Research
Date Submitted by the Author:	01-Apr-2016
Complete List of Authors:	Ashdown, Helen; University of Oxford, Nuffield Department of Primary Care Health Sciences Räisänen, Ulla; University of Oxford, Nuffield Department of Primary Care Health Sciences Kay, Wang; University of Oxford, Nuffield Department of Primary Care Health Sciences Ziebland, Sue; University of Oxford, Nuffield Department of Primary Care Health Sciences Harnden, Anthony; Oxford University, Nuffield Department of Primary Care Health Sciences
Primary Subject Heading:	General practice / Family practice
Secondary Subject Heading:	Infectious diseases, Paediatrics, Qualitative research
Keywords:	PRIMARY CARE, QUALITATIVE RESEARCH, Respiratory infections < THORACIC MEDICINE, Paediatric infectious disease & immunisation < PAEDIATRICS

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3 **Prescribing antibiotics to “at-risk” children with influenza-like illness in primary care: qualitative**
4 **study**

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Abstract*Objectives*

NICE guidelines recommend immediate antibiotic treatment of respiratory tract infections in “at-risk” individuals with co-morbidities. Observational evidence suggests that influenza particularly predisposes children to bacterial complications. This study investigates GPs’ accounts of factors influencing their decision-making about antibiotic prescribing in management of at-risk children with influenza-like illness (ILI).

Design

Qualitative interview study using a maximum variation sample with thematic analysis through constant comparison

Setting

Semi-structured telephone interviews with UK GPs using a case vignette of a child with co-morbidities presenting with ILI

Participants

41 GPs (41.5% male; 40 from England, 1 from Northern Ireland) with a range of characteristics including length of time in practice, paediatrics experience, practice setting, and deprivation.

Results

There was considerable uncertainty and variation in the way GPs responded to the case, and difference of opinion about how long-term co-morbidities should affect their antibiotic prescribing. Factors influencing their decision included the child’s case history and clinical examination; the GP’s view of the parent’s ability to self-manage; the GP’s own confidence and experiences of managing sick children; and assessment of individual vs. abstract risk. GPs rarely mentioned potential influenza

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3 infection or asked about immunisation status. All said they would want to see the child; views about
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5 delayed prescribing varied in relation to local health service provision including options for follow-up
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7 and paediatric services.
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10 11 *Conclusions*

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13 The study demonstrates diagnostic uncertainty and wide variation in GP decision-making about
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15 prescribing antibiotics to children with co-morbidity. Future guidelines might encourage
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17 consideration of a specific diagnosis such as influenza and risk assessment tools could be developed
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19 to allow clinicians to quantify the levels of risk associated with different types of co-morbidity.
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21 However, the wide range of clinical and non-clinical factors involved in decision-making during these
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23 consultations should also be considered in future guidelines.
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Strengths and limitations

- This qualitative study provides an in-depth assessment of GPs' decision-making processes when faced with "at-risk" children with acute respiratory illness, which has not previously been studied.
- The use of a case vignette to simulate a consultation, with information provided in a structured stepwise way, enabled GPs to discuss their decision-making process as if in real-time.
- We sought to obtain a maximum variation sample based on criteria which might affect antibiotic prescribing, such as level of experience in general practice and paediatrics, however this did not seem to impact eventual decision.
- Using a GP to conduct the interviews, and interviews taking place during a winter of low circulating influenza, may have affected the way GPs handled the case and communicated their opinions.

Introduction

Children with cough and fever present commonly to primary care (GP) services in the UK, particularly in the winter months when there are higher levels of circulating respiratory tract viruses. Approximately a third of these presentations are due to influenza infection.¹ Each year there are an estimated 490,000 GP consultations due to seasonal influenza in children aged 14 years or younger.² Testing for influenza infection is not routine in UK general practice, and the term influenza-like illness (ILI) can be used to mean a clinical, rather than confirmed microbiological, diagnosis, and includes children with respiratory tract infections (RTIs) caused by other respiratory viruses. ILI can be defined as a fever $\geq 38^{\circ}\text{C}$ and cough, with onset in the last 10 days.³

For most children ILI is a mild and relatively short viral illness, but some children can become more unwell or develop secondary bacterial infections such as pneumonia or otitis media. This is more likely to occur in children with pre-existing co-morbidities (“at-risk” children).⁴ Antibiotics are usually prescribed for children with influenza who already have a bacterial infection (such as pneumonia), however antibiotics are not generally given to healthy children with ILI who are relatively well, when NICE guidance for management of RTIs recommends no antibiotics or delayed antibiotics, or an immediate antibiotic if the patient is at high risk of serious complications because of pre-existing co-morbidity (which includes patients with significant heart, lung, renal, liver or neuromuscular disease, immunosuppression, cystic fibrosis, and young children who were born prematurely).⁵ However an immediate antibiotic may not be appropriate, and is unlikely to be given, for an at-risk child who has a simple cold. Observational data suggest that influenza may be associated with greater risk of bacterial infections than other respiratory viruses, and that early antibiotic treatment of these bacterial infections may improve clinical prognosis.¹

GPs’ antibiotic prescribing decisions are known to be influenced by diagnostic uncertainty, their own experience and fear of conflict with patients or parents,^{6,7} however no previous studies have focused

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3 on at-risk children. We aimed to investigate what factors influence GPs' decisions in the
4 management of at-risk children with ILI, particularly in relation to antibiotic prescribing decision.
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8 9 **Methods**

10 *Setting and recruitment*

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12 We aimed to conduct approximately 40 interviews with practising GPs in the UK, as we estimated
13 from previous studies using similar methods⁸ that this would be an appropriate number to obtain
14 data saturation. This study was conducted as part of the ARCHIE (early use of Antibiotics for At-Risk
15 Children with Influenza in primary care) programme. We invited GPs from four areas of England
16 (Thames Valley, Bristol, Southampton and Liverpool) in which we subsequently planned to recruit for
17 a randomised control trial. We obtained deprivation and prescribing information from data publicly
18 available via the NHS Information Centre in October 2012,^{9,10} and aimed for a maximum variation
19 sample including men and women, a range of lengths of time in general practice and local factors
20 (antibiotic prescribing level, practice population deprivation). GPs were invited to take part in a
21 telephone interview with the first author (who is a GP). The response rate was low (5.8%) so
22 recruitment was extended via local Primary Care Trust (PCT) lists, the RCGP members' e-mail
23 bulletin, social media groups and primary care research networks. Participants were selected from
24 those who volunteered to obtain a maximum variation sample in terms of the above characteristics.
25 Informed written consent was taken by post. No reimbursement was offered for GP time, although
26 GPs received a certification of participation.
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49 *Data collection*

50 Participants completed a brief questionnaire (sex, length of time working as a GP, special interest in
51 paediatrics, amount of out-of-hours work, and whether they had their own children) and practice
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3 area (rurality, whether a training practice, and whether practice nurses see children with influenza-
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5 like illness).
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10 Interviews took place between March 2013 and March 2014 and were by telephone or Skype (1 was
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12 conducted face-to-face), lasting approximately 20 minutes (in order to fit in with a busy GP's
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14 schedule), conducted by one author (HFA), who is female, was a GP ST3/ST4 academic registrar at
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16 the time of the interviews, and had received formal training in qualitative interview techniques. With
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18 the exception of one GP included in the study who was a former colleague, HFA had no prior
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20 relationship with the GPs in the study, but corresponded by e-mail with participants to pass on the
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22 clinical vignette and set up the interview time. Participants were aware they were speaking to a GP
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24 registrar with a research interest in child health and infection. No other individuals were present
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26 during the interviews, as far as we were aware.
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31 Interviews were semi-structured and a case vignette was used to focus the discussion: Lily, aged 2,
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33 with a medical history of prematurity, atrial septal defect and hemiplegia presenting with an acute
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35 respiratory illness. Using case vignettes is commonly used in UK primary care education and has
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37 been used previously in qualitative studies.⁸ GPs were e-mailed the first part of a case vignette
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39 before the interview (see Box 1) with the child's background, and then provided with further
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41 information on history and examination findings throughout the interview, in order to mimic how
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43 information might be provided in a real-life consultation setting, whilst being flexible to the ways in
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45 which different GPs might gather information. We chose this method to help GPs imagine how they
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47 might handle such a scenario, and more easily be able to discuss their decision-making process as if
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49 in real-time, and deliberately avoided leading the discussion to certain topic areas, rather letting the
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51 participant progress through the consultation and discuss their decision-making, for example not
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53 raising the possibility of influenza infection or immunisation status until later in the interview, and
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55 withholding examination findings in order to discuss how certain potential findings might sway their
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3 decision. The case vignette was written to be realistic but to incorporate several different co-
4 morbidities, albeit none severe in their own right, making the case less straightforward and to
5 provoke discussion around the importance of different components. GPs were advised not to do any
6 special preparation or revision prior to the interview. The interview topic guide was developed and
7 reviewed by the whole research team, and was piloted with two GPs not included in the study, and
8 revised in light of feedback.
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18 Interviews were audio-recorded and professionally transcribed verbatim, then checked for accuracy
19 by the interviewer (HFA). Interview transcripts were reviewed by an experienced qualitative
20 researcher (UR) as recruitment progressed and the topic guide revised to take account of emerging
21 issues. Transcripts were not returned to participants for comment or correction.
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28 *Analysis*

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30 Supervised by the programme's qualitative research lead (SZ), a thematic analysis using constant
31 comparison was used.¹¹ The coding scheme was derived from the data. NVivo10 software was used
32 for coding, which was conducted by two researchers (HFA and UR) until agreement was reached,
33 and subsequently by one researcher (HFA). The final coding structure was applied systematically to
34 the whole dataset (HFA) using NVivo10 software. This took place while later interviews were
35 ongoing in order to revise the topic guide in light of identified themes and to establish when data
36 saturation was reached. Codes were then grouped into broader anticipated and emerging issues to
37 develop analytic and conceptual categories. The category of "co-morbidity" was then analysed using
38 a mind-mapping method to explore patterns in the data as well as deviant cases.¹¹ We assessed for
39 any patterns in terms of GP characteristics to explore the variation in GPs' responses. Further
40 analyses of these data will contribute to the interpretation of an associated trial, within the ARCHIE
41 programme.
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Results

We first discuss the GPs' awareness of the potential consequences of co-morbidity, followed by factors which GPs described as influencing their response to the vignette. 41 interviews were conducted between March 2013 and March 2014, 40 from across England and 1 in Northern Ireland, including one GP trainee. Table 1 shows participant characteristics. Some GPs commented that this was "a very common scenario" and one suggested that this was "a really good scenario for discussing whether GPs are going to prescribe antibiotics or not" (GP22, male, town practice, 25-29 years as a GP).

There was a large variation in the degree of certainty with which GPs responded to the vignette – some seeing it as quite routine

You see goodness knows how many we see and, and by and large most of these are viral presentations... So we would sort of go through that, safety netting, out of hours, in fact we've got a leaflet which we tend to hand out, especially to paediatric under-fives. (GP 33, male, small town/rural practice, 5-9 years as a GP)

although many recognised that this was a more challenging case, "a very grey sort of area", and expressed uneasiness about assessment and management:

I'm feeling uneasy about it because she's not quite a straightforward lively healthy toddler who's got a cold; there's a bit more going on here, or a bit more potentially going on. (GP08, male, inner-city practice, ≥30 years as a GP)

I think it's just hugely difficult... It's a complete nightmare... you sit there in practice and you think, "Well, how on earth can you decide whether it's viral or not?" (GP26, female, small town/rural practice, ≥30 years as a GP)

Awareness of the potential consequences of co-morbidity

GPs recognised that some co-morbidities might be associated with an increased risk of poor outcomes following an RTI, both in terms of developing a more severe infection and risk of a secondary infection. Some said they aimed for prevention as well as treatment.

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3 *And even though it might not be causing a problem while they're fit and well, if they get a*
4 *really bad infection then that can cause them some difficulties and they could actually die.*
5 *(GP27, female, rural practice, 5-9 years as a GP)*
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7 *Because they do get unwell more quickly. And that is the experience, they'll go in with a*
8 *pneumonia or a chest infection and it just started off as a cold. So, you know it does change*
9 *depending on their past medical history, it can change things quite dramatically. (GP32,*
10 *female, inner-city practice, 5-9 years as a GP)*
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12 Although GPs suggested that co-morbidity would lower their intervention threshold it was rarely
13 described as an important part of the assessment. GPs varied in terms of which specific co-
14 morbidities seemed most important:
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18 *Atrial septal defect (ASD)*

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There was uncertainty about the significance of the ASD and risk of cardiac or respiratory
decompensation since this required follow-up yet was asymptomatic. Concerns included whether
there would be an increased risk of endocarditis or rheumatic fever which might require antibiotic
prophylaxis.

61 *Prematurity*

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GPs associated prematurity with being “*more vulnerable*” and with increased susceptibility to
significant respiratory infections:

101 *I mean they, they often have had a history of respiratory distress haven't they, sort of in*
102 *those first few weeks. And they're the kind of babies that tend to get bronchiolitis when*
103 *they're little. [...] I think that they are more susceptible to chest infections and to getting*
104 *more sickly so, so yeah I would certainly take that into account. (GP04, female, inner-city*
105 *practice, 10-14 years as a GP)*
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107 *Hemiplegia*

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For a few GPs the hemiplegia was thought to potentially affect mobility, making children harder to
assess. If they were less active they might have difficulty clearing secretions and therefore develop
respiratory infections.

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3 *I'd be wondering whether the hemiplegia had a sort of effect on her general mobility...I might*
4 *be thinking [...] is this a child that's not very active and that's going to be a bit more*
5 *vulnerable to developing a serious respiratory infection...if you see a child for example in a*
6 *wheelchair, you just wonder about how their respiratory muscles, how sort of fit they are*
7 *almost. And whether actually their ability to move secretions out of their lungs and you know*
8 *run around and take lots of exercise is going to make them a bit more vulnerable. I mean*
9 *that sounds like a bit of sort of, I don't know, pseudo-science really but it, it's kind of borne*
10 *out of experience as well. (GP29, female, town practice, 25-29 years as a GP)*
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12 13 14 15 *Other co-morbidities*

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17 In contrast, co-morbidities in this case were seen as “slightly soft” and would not necessarily affect
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19 an acute presentation of this nature. Some GPs contrasted other co-morbidities which they would
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21 regard as more significant, including other chronic neurological problems, Downs syndrome,
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23 diabetes, cystic fibrosis and metabolic disorders relating to consanguinity.
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25 26 27 28 *Age*

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30 GPs were reassured by the lack of problems since the neonatal period and by Lily's age (two and a
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32 half).
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34 *If she was 8 weeks old it would probably make a lot more difference... I think at eight weeks*
35 *they are likely to decompensate much more quickly than they are at age two and a half.*
36 *They've got less reserve. So I'd probably be more cautious the younger the child. [...] And I*
37 *don't know, I think just a general feeling that I'd be less comfortable treating a child with*
38 *congenital heart disease who's very young compared to one who's toddler age. (GP05, male,*
39 *town practice, 10-14 years as a GP)*
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44 **Clinical assessment guiding antibiotic prescribing decision**

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46 All GPs said that they would want to further assess the child in person: it was seen as “a justified
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48 request” to be seen as an extra on a Friday. In terms of management decision after assessment,
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50 different GPs discussed a range of possibilities which could be described as a “spectrum of
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52 interventions” (sometimes in combination), increasing from reassurance and safety netting, through
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54 arranging a GP review later, delayed antibiotic prescribing, immediate antibiotic prescribing,
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56 telephone discussion with paediatrics, to immediate hospital referral. Some GPs wanted to start
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3 antibiotics earlier in the course of illness than they would with a healthy child. The only GP who
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5 wanted to arrange hospital assessment after having heard all of the clinical information was
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7 concerned that the “subdued” description might indicate meningitis, and in the context of an ASD
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9 she suggested specialist paediatric assessment.
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14 Some GPs talked about the importance of identifying a bacterial infection, with the assumption that
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16 this would definitely require antibiotics or hospital assessment. Only a few GPs brought up potential
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18 influenza spontaneously, and most felt that identification of the illness as potential influenza versus
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20 “A N Other viral thing” was less important in a non-pandemic setting, with GPs tending to assess and
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22 manage as a generic RTI. Likewise, Lily’s immunisation status was rarely mentioned spontaneously,
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24 and on direct questioning few GPs saw influenza immunisation as particularly relevant to the
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26 scenario.
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31 Lily’s co-morbidity worried some of the GPs who were concerned that they might miss a serious
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33 diagnosis. This might increase their likelihood of prescribing antibiotics, which was widely seen as
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35 the safer, easier and more “risk averse” course of action. Antibiotic resistance and antibiotic side-
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37 effects were frequently mentioned, but mainly as an external issue, for example:
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41 *It’s one of those grey areas where one dreads making a mistake, where you’ve got conflicting*
42 *forces, sometimes parental expectation which is, you know in a sense is almost a side issue,*
43 *but the awareness that inappropriate antibiotics is a major problem but missing one child*
44 *with a pneumonia who then gets ill or dies is ****ing disaster... [...] The easiest thing is to*
45 *dish them out and not worry about the global issue. (GP08, male, inner-city practice, ≥30*
46 *years as a GP)*
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49 *What all that [discussion of co-morbidities] builds up to is it’s a brave GP who just simply says*
50 *“Look this is an upper respiratory tract infection, it’s okay not to do anything extra.” (GP22,*
51 *male, town practice, 25-29 years as a GP)*
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54 *Lily’s case history and examination*
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3 Lily's past experience of illness and how she seemed on the day were both seen as important. GPs
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5 variously said they would look through Lily's notes, and/or ask the parent to check whether there
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7 were specific instructions from hospital specialists.
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10 *You know perhaps one of the previous letters from the cardiologist might even say something*
11 *like, you know, please keep a low threshold for giving antibiotics or referring back if she's*
12 *deteriorating. So I'd want to have a quick scan through hospital letters, see if I can see any*
13 *little informative nuggets like that. (GP35, male, town practice, 20-24 years as a GP)*
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15 GPs wanted to establish Lily's typical trajectory of RTIs, in terms of duration, severity, previous
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17 hospital admissions (including any intensive care admissions), and what had helped before, including
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19 previous antibiotic prescribing.
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23 The response to the clinical vignette usually included a structured examination, including vital signs
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25 (fever, respiratory rate and heart rate), pulse oximetry (although not always available for children),
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27 and examining for respiratory distress or chest crepitations. Abnormalities in these areas would tend
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29 to raise concerns of a more serious illness, and push the GP towards hospital assessment. However,
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31 more important in the decision to prescribe antibiotics was the global assessment of "how she is in
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33 herself":
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36 *I think I would probably would just play the child in front of me and be more guided by how*
37 *they were, how worried I was about them at that point rather than their history. (GP19,*
38 *male, inner-city practice, <5 years as a GP)*
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42 As mentioned above, all of the GPs said that they would want to see Lily and some commented that
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44 when they did their "gut feeling" would sway their decision about prescribing.
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47 48 *Mutual trust and confidence with the parent*

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50 GPs often mentioned the need to establish the parental concerns, and work out whether this was a
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52 "sensible" parent. The number and nature of previous GP attendances for similar illnesses were also
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54 considered important, and many commented that parents of children with co-morbidity might have
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56 different experiences, expectations, and ability to manage their child's illness than other parents.
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3 *And what I'm picking up now is that Mum thinks she's different to usual. So there's parental*
4 *concern, in my experience of looking after and supporting the families of babies who've had*
5 *a difficult time or have been, spent a lot of time on the special care baby unit, is that they are*
6 *very very expert parents, and so I think I would take the fact that she's an infrequent*
7 *attender, but has come in significantly concerned that she's really not herself very seriously, I*
8 *would be quite worried about that [...]. So often parents who've had a child who's had one*
9 *episode of pneumonia, that experience will influence how they feel about other coughs and*
10 *fevers. So I think I would explore all of that with Mum. (GP09, female, inner-city practice, 10-*
11 *14 years as a GP)*

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14 Others characterised these parents as potentially over-anxious and over-cautious, which could affect
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16 how they handled the case.

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18 *I think this is sort of premature babies sometimes get sort of wrapped in cotton wool a little*
19 *bit, and thought to be a little bit more precious, but it's just like any other child really but*
20 *they sort of, they carry with them for the first few years that sort of, almost like slightly*
21 *precious "need protecting"-type approach sometimes. (GP31, male, inner-city practice, 10-14*
22 *years as a GP)*

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24 If Lily's mother was seen as a "sensible parent," this would probably affect how they incorporated
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26 the mother's opinion, and how much responsibility could be expected in monitoring the child for
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28 signs of deterioration and returning for further assessment.

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31 *I'm kind of, you know, if they're sick they need to be treated. If they're not sick they need to*
32 *be told to come back. And be given a lot of permission to do that and I'm forever saying "If*
33 *you're worried, I'm worried," to patients, to Mums and Dads. To really underline you know,*
34 *"You're the world's expert," is the other thing that I'm always forever saying, "You're the*
35 *world's expert on your child." (GP21, female, inner-city practice, 5-9 years as a GP)*

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38 Education, culture and language as well as other sources of family support were factors contributing
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40 to the assessment of the parent. Some stated that they were assuming that Lily's mother was a
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42 "coper" or "capable" from the history described. Continuity was mentioned as an important factor
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44 for some GPs: if they had a longstanding and trusting relationship with the family and knew the
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46 child's history, they would feel more confident about managing this episode. Others talked about
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48 sharing the decision about antibiotic prescribing with the parent if they were uncertain about the
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50 best management.

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55 *GP's confidence and experience*

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3 Some GPs acknowledged that particular memorable cases had impacted on their current practice, or
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5 saw themselves as more or less experienced in assessing children. Some mentioned that they were
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7 inexperienced in paediatrics, and that this might affect how they handled Lily's case. However,
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9 relative experience in paediatrics did not seem to predict eventual management decisions. Only a
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11 handful of GPs (particularly those more recently qualified) mentioned using guidelines or other tools
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13 to help with decision-making, although on specific questioning about this, many GPs were aware of
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15 the Centor criteria for sore throats⁵ and NICE guidelines (many mentioned the traffic light system for
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17 assessment of a feverish child¹² but none alluded to the guidance on co-morbidities in relation to
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19 antibiotic prescribing for RTI).⁵
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23 *But I am aware that ASDs are one of the things where I think there is still a lower threshold*
24 *for prescribing antibiotics, but I would feel out of my comfort zone as to know when that*
25 *was. So I would be, I think because I haven't come across an ASD for years I think I would still*
26 *probably just ring the paediatricians and put it past them to check that, because I'm not*
27 *quite clear about what the guidelines are with ASDs so I'd feel more comfortable just ringing*
28 *them and asking them. (GP41, female, small town/rural practice, 20-24 years as a GP, no*
29 *reported specialist expertise in paediatrics)*
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32 *Generally speaking you know I'm not impressed by the scoring systems, I've done quite a lot*
33 *of paediatrics, I'm pretty confident about spotting sick children. I'm pretty confident about*
34 *guiding parents about what to do in case I've actually got it wrong and given false*
35 *reassurance. So I'm pretty confident with all that sort of stuff. (GP02, male, town practice,*
36 *≥30 years as a GP, some specialty training in paediatrics)*
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38 GPs self-identified as being high or low antibiotic prescribers, and this could also relate to how
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40 recently qualified the GP was.
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43 *I think down to my own experience and where I feel I am in my practice compared to my*
44 *peers, it's quite interesting how I use antibiotics quite a lot less and I wonder if that's because*
45 *I have actually seen people die in hospital, in my career, from bacterial, you know antibiotic*
46 *resistance and C.Diff diarrhoea and things like that. [...] And I've noticed that talking to my*
47 *more senior colleagues who are probably 10, 20 years my senior, they've never seen the sort*
48 *of deaths that I've discussed in hospital. So I think that has a big effect on what I do. (GP07,*
49 *female, small town/rural mix practice, 5-9 years as a GP)*
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52 In contrast, one GP with paediatrics experience said that "we don't see sick children like they used to
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54 in general practice" (GP02) and more recently qualified doctors would not have seen serious
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56 complications of vaccine-preventable infections.
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Other factors

The setting of this case on a Friday evening was important and affected prescribing decisions (although some said they were consciously trying to ignore this feature of the vignette).

I think the problem with this is obviously 'cos it's a Friday evening. A Friday morning and you can still say well see how she goes over the next couple of hours and if there's any problem then bring her back, but a Friday evening if you're not in on the Saturday makes it, that judgement a little bit harder. (GP10, female, town practice, 20-24 years as a GP)

Friday evening surgery the threshold for prescribing antibiotics and getting rid of the patient that much more quickly is lower. (GP22, male, town practice, 25-29 years as a GP)

Local circumstances and priorities, including out-of-hours services and proximity to Lily's home, and the quality of the out-of-hours service were all cited. One rural GP sometimes gave her own telephone number to parents she knew well for use out-of-hours, due to distance from other services. Others said they would prescribe to help reduce pressure on the out-of-hours service over the weekend or, where this facility existed, arrange for a formal review of a child out-of-hours.

Delayed prescribing

Delayed prescribing was the most divisive issue. Some GPs wanted to give a delayed prescription so that treatment was started earlier if the child did not improve (particularly in the context of an upcoming weekend); while others preferred to review the child if there was no improvement or if they were not confident the parent would return in the event of deterioration if they already had a prescription.

Discussion

Principal findings

This is the first study of the impact of co-morbidity on GPs' assessment of children with ILI. There was uncertainty and variation in opinions about whether, and to what extent, long-term co-

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3 morbidity are associated with increased risk in children presenting with ILI, and considerable
4 variation in management amongst GPs. Actions included watch-and-wait, immediate or delayed
5 antibiotic prescription and hospital referral. Analysis of GPs' responses to the clinical vignette
6 identified several factors influencing their decisions including the child's history, current appearance,
7 mutual trust and confidence between the GP and the parent, the GP's own confidence and
8 experience, and arrangements for weekend care locally. Neither suspicion of potential influenza
9 infection nor immunisation status were described as important factors affecting assessment or
10 management. Guidelines were rarely mentioned: more important was the GP's global impression of
11 the child, incorporating the above factors to varying degrees. All wanted to see the child. Some
12 participant characteristics, such as previous paediatric experience and rurality, played a role in
13 decision-making, but did not predict ultimate management plan and antibiotic prescribing decision.
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29 ***Strengths and limitations***

30 We sought a diverse sample of GPs with a range of experiences and practice characteristics.
31 Although we can say nothing about the frequency with which these findings would appear in the
32 wider population, a wide range of views was evident in responses. Our use of a case vignette
33 involving co-morbidities and an uncertain degree of risk enabled us to demonstrate the variation in
34 clinical management. Providing case information in a stepwise manner enabled us to replicate the
35 process of a consultation. Recruitment via mailing lists extended geographical diversity but made it
36 more likely that those GPs who responded had particular special interests or experiences, leading to
37 findings that may represent less variation than might be found in the wider GP population.
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50 Very few GPs mentioned influenza as a potential cause of the RTI until specifically prompted, despite
51 the study title including the term "flu-like illness", and GPs tended not to differentiate between
52 influenza and other viruses in assessment or management. The interviews were conducted in all
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3 seasons, including a winter of low influenza incidence in the UK,¹³ and it is possible that influenza
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5 was less in the forefront of GPs' minds.
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10 Knowing they were talking to a GP colleague may have encouraged participants to give a preferred
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12 response or collaborate in assumptions about the case vignette, but there was considerable
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14 expression of uncertainty and little suggestion that participants were drawing on guidelines in their
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16 responses. Interview transcripts were reviewed by a qualitative researcher early in the data
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18 collection period to make sure that the interview did not resemble a test.
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22 We did not interview practice nurses, although a significant minority (39.0%) of GPs reported in their
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24 preliminary questionnaire that practice nurses did see children with ILI. On further questioning
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26 about this, many said that practice nurses would be unlikely to assess a child with significant or
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28 complex co-morbidities, and a recent qualitative clinician interview study found no differences in
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30 practice between practice nurses and GPs.⁷
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33 34 35 ***Comparison with existing literature*** 36

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38 The Department of Health recommends influenza vaccination in specific groups who are considered
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40 to be at high risk of serious complications¹⁴ and NICE guidance recommends an immediate antibiotic
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42 prescription "if the patient is at high risk of serious complications because of pre-existing co-
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44 morbidity. This includes patients with significant heart, lung, renal, liver or neuromuscular disease,
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46 immunosuppression, cystic fibrosis, and young children who were born prematurely."⁵ A systematic
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48 review and meta-analysis found that strong risk factors for hospital admission due to influenza-
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50 related complications included neurological disorders, prematurity, diabetes and age under 2 years,
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52 as well as presence of more than one risk factor, which is similar to the specific co-morbidities GPs
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54 brought up based on their experience.¹⁵
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3 Similar to our findings, a systematic review and meta-ethnography of antibiotic prescribing for RTIs
4 in all ages found that treatment strategies varied between GPs, and this was affected by their
5 previous experience, uncertainty about diagnosis, ease of follow-up, and fear of consequences of
6 non-prescribing , as well as perceptions of potential conflict with patients.⁶ Another qualitative
7 systematic review in children found a particular focus on relationship with the parent, particularly
8 perceived pressure to prescribe and consequences for the future doctor-patient relationship,
9 although this was based on clinical need as much as the need to preserve this future relationship.¹⁶
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11 GP perception of patient expectation is strongly associated with a decision to prescribe
12 antibiotics^{17,18} and it may be that the construction of Lily's mother as an "expert parent" would lead
13 to assumptions about her antibiotic expectations and changed the dynamic of the consultation (and
14 some GPs commented on this assumption). However, GPs' tolerance of antibiotic prescribing conflict
15 varies¹⁹ and this may account for more of the difference in eventual decision than other GP
16 characteristics. Our finding of individual vs. global risk assessment in decision-making was also found
17 in a recent cross-study qualitative analysis²⁰ of prescribing behaviour for children with RTIs, which
18 identified antibiotic prescribing as being the safer option to manage clinician uncertainty: an
19 unnecessary antibiotic prescription was perceived as less of a threat to professional standing and the
20 child's health than a missed serious diagnosis. GPs were also more likely to prescribe if parents were
21 not judged to be adequate "risk managers" for the child, similar to our study with the concept of "a
22 sensible parent". Quantitative studies on antibiotic prescribing for respiratory infections in adults
23 have also found considerable variation in antibiotic prescribing, which cannot be explained by
24 variation in clinical presentation.²¹
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In terms of clinical assessment, our findings are similar to a study of clinicians' antibiotic prescribing
behaviour for lower respiratory tract infections in adults,²² where GPs discussed combining different
clinical and patient preference factors, giving these different weightings which contributed to a
tipping point for prescribing. However, most important for many GPs was the global assessment of

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3 how the child appeared in herself, hence the need to see her at the practice. This was also found in a
4 recently published qualitative interview study of clinicians, which described a rapid initial
5 assessment based on pattern recognition, then a more formal deductive process.⁷ Clinicians' "gut
6 feeling" is well-established to be of high diagnostic value in assessing serious infections in children,
7 with high correlation with child's overall response and breathing pattern.²³ Qualitative work has
8 shown that GPs use gut feelings (of either reassurance or alarm) as a compass in situations of
9 uncertainty;²⁴ GPs in our study discussed multiple factors which might inform their decision-making,
10 but it may be that this gut feeling is the eventual sway to decision-making. Hence the need to see
11 the child rather than deal with the consultation entirely by telephone. The recently published
12 clinician qualitative interview study mentioned above had similar findings in many other areas,
13 including uncertainty over managing intermediate illness severity, difficulty differentiating bacterial
14 from viral infection clinically, and GPs' self-confidence and experience in paediatrics.⁷ Some GPs in
15 our study discussed parental pressure to prescribe, but generally this was seen as less important.
16 This may have been because our study particularly focused on co-morbidity, with GPs identifying
17 "expert parents" and their ability to manage uncertainty appropriately. Evidence from studies with
18 parents suggests that parents are not necessarily seeking antibiotics but prefer to defer this decision
19 to the clinician.^{16,20}

20 21 22 ***Implications for clinicians, policymakers and future research***

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24 Our study suggests that, faced with a clinical scenario, GPs expressed wide variation and uncertainty
25 about how to manage at-risk children with acute RTI. Current guidelines leave great scope for
26 interpretation, and lists of co-morbidities are not exhaustive, such that clinical judgement balancing
27 multiple factors is required to assess and quantify the levels of risk. Tolerance of uncertainty is a key
28 facet of a skilled GP,²⁵ and while some GPs were inclined to defer to parental opinion or (in one case)
29 to hospital referral, others seemed to think that they would be abrogating their clinical responsibility
30 if they reacted to uncertainty in this way. However, this study suggests that this is an area in which

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3 further research and additional guidance is needed to help bridge this gap. Particularly, development
4 of risk assessment tools which allow clinicians to quantify the risk associated with different types of
5 co-morbidities and presence of multiple conditions, and weigh this against the potential more
6 general risks and benefits of early antibiotic prescribing. This might facilitate more consistent and
7 accurate antibiotic prescribing amount health care professionals who assess these types of
8 scenarios. Also notable was that GPs did not view influenza differently from other causes of RTI in
9 children, despite the greater risk of bacterial infections.¹ This may be an area for further research
10 into diagnostic accuracy of clinical features of influenza, potential training and educational
11 interventions, and/or assessment of whether there may be a greater role for rapid point-of-care
12 tests for influenza in UK primary care.²⁶ Decisions about antibiotic prescribing are particularly
13 important in the context of a pandemic where hospital capacity may be an issue. At-risk individuals
14 make up a larger proportion of those presenting with ILI than found in the general population,⁴ with
15 over 70,000 consultations estimated to take place for 'at risk' children with ILI,^{4,27} and so this may be
16 a particularly worthwhile group to target for such interventions.
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When incorporating any new evidence into practice and producing guidance in this area, it will be important to take into account the factors raised here, and inclusion of non-clinical factors such as parental experience are likely to be particularly important in what will undoubtedly remain a complex decision-making process.

Box 1: Case vignette*Background information (provided before interview)*

You see Lily who is 2 ½ years old as an urgent extra at the end of a Friday evening surgery. You haven't met the family before but a brief flick of the notes shows that Lily was born prematurely at 32 weeks and spent a week in the special care baby unit for intravenous antibiotics. She was diagnosed with an atrial septal defect which has been asymptomatic but she continues to be seen periodically at the hospital for serial echos for this. She also has a hemiplegia under follow up with community paediatrics. Despite this she's been generally well and she isn't a frequent attendee at the surgery.

Presenting history (provided at start of interview)

Mum has brought her in urgently because she's concerned about Lily. She wouldn't normally bother the doctor but this "seems to be more than just a cold". She's had a runny nose, temperature and cough for the last 2 days but just this afternoon she's seemed more unwell. She can't keep her temperature down with Calpol^{®1} and she's become concerned that she seems to be struggling more with her breathing, and has vomited once. She's keen to have her checked out and to see if she needs antibiotics.

Further assessment and examination findings (provided during interview after initial discussion; items underlined were provided to all GPs, other items were given only if specifically asked)

- Off her food for the last day but managing fluids, and is passing urine normally
- Temperatures measured at home up to 39°C
- Older sister who has just started school has had a cold but has not been this ill with it
- No rash
- Immunisations up-to-date including influenza immunisation
- Lily appears quite grizzly and subdued, preferring to sit on Mum's knee and not interested in the toys in the corner
- Appears miserable, but pink and well-perfused
- Temperature of 38.4°C
- No signs of respiratory distress
- Oxygen saturations 97%
- Chest examination: good air entry with lots of upper airway noise but no crackles
- Ear, nose and throat examination: Heavy green nasal discharge but no obvious focus of infection on examination

Interview content

- Discussion of scenario and thought processes and management of case
- Extra information to acquire and how this might change management
- Factors driving decision to prescribe antibiotics or not
- Importance (or not) of co-morbidity
- Impact of thinking this might be influenza, or in the influenza season
- Importance of immunisation status
- Tools of guidelines used in decision-making
- Advice to parents and safety netting
- Delayed prescribing
- Discussion of trial of antibiotics in at-risk children with ILI and how this might change practice

¹ Calpol[®] is a widely used term in the UK to describe a popular brand of liquid paracetamol (acetaminophen) sold for children

Table 1: Participant characteristics

GP characteristics (n=41)	n (%)	
<i>Sex</i>		
Male	17	(41.5)
Female	24	(58.5)
<i>Years in general practice since qualification</i>		
<5	9	(22.0)
5-9	13	(31.7)
10-14	4	(9.8)
15-19	1	(2.4)
20-24	7	(17.1)
25-29	2	(4.9)
≥30	5	(12.2)
<i>Undertake out-of-hours work</i>		
No	26	(63.4)
Yes – rarely	3	(7.3)
Yes – sometimes	2	(4.9)
Yes – often	10	(24.4)
<i>Special interest in paediatrics^a</i>		
No	27	(65.9)
Yes	14	(34.1)
<i>Own children</i>		
No	11	(26.8)
Yes	30	(73.2)
Practice characteristics (n=41)	n (%)	
<i>Practice area</i>		
Rural	2	(4.9)
Small town/rural	7	(17.1)
Town	17	(41.5)
Inner-city	15	(36.6)
<i>Training practice</i>		
No	7	(17.1)
Yes	31	(75.6)
Not known/not applicable ^b	3	(7.3)
<i>Practice nurses see children with influenza-like illness</i>		
No	20	(48.8)
Yes	16	(39.0)
Not known/not applicable ^b	5	(12.2)
<i>Practice list size (n=38)^{bc}</i>	Median (IQR)	7788 (5986)
	Range	2455 – 38532
	England average	6845
<i>% children under 18 registered (n=38)^{bc}</i>	Median (IQR)	21.1% (3.9%)

<i>Index of Multiple Deprivation (n=38)^{bcd}</i>	Range	12.7 – 36.7%
	<i>England average</i>	20.8%
	Median (IQR)	27.5 (20.2)
	Range	4.3 – 49.4
	<i>England average</i>	21.5

^a Details of special interests described included hospital paediatrics experience, the Diploma in Child Health and responsibility for child health surveillance/baby clinics within the practice

^b Data not available for some characteristics as 3 locum GPs included in the study, or where details not completed.

^c Practice list size, deprivation score and percentage number of children under 18 registered at the practice were recorded using the Public Health England National General Practice Profiles²⁸ on the date of recruitment. Average values for England were recorded at the start of the interviews in March 2013.

^d Index of Multiple Deprivation provides information on relative levels of deprivation in England, and range nationally from 2.9 (lowest deprivation) to 68.4 (highest deprivation). Lower Layer Super Output Area level deprivation data are applied proportionally to the Attribution Data Set practice populations.²⁸

Or peer review only

Funding

This article presents independent research funded by the National Institute for Health Research (NIHR) under its Programme Grants for Applied Research Programme (Grant Reference Number RP-PG-1210-12012). The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. This report contains transcripts of interviews conducted in the course of the research and contains language that may offend some readers.

Ethical approval

This study was approved by the University of Oxford Medical Sciences Division Interdivisional Research Ethics Committee (reference MSD/IDREC/2010/P17.1).

Competing interests

The authors have no competing interests.

Contributorship statement

KW, SZ and AH conceived the idea for the study. All authors contributed to study design. HFA conducted the interviews and analysis, with input from UR and SZ. HFA drafted the paper. All authors were involved in critical revisions of the paper and approved the final draft before submission.

Data sharing statement

No additional data are publicly available, but please contact the corresponding author if specific queries.

Acknowledgements

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3 The authors would like to thank all the GPs who participated in the study or were pilot interviewees,
4
5 and both the RCGP and GP Hot Topics course for helping with recruitment by advertising our study
6
7 on their mailing lists.
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For peer review only

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Prescribing antibiotics to “at-risk” children with influenza-like illness in primary care: qualitative study submitted to BMJOpen 12.02.2016

Location within submitted paper in bold

Table 1

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description
Domain 1: Research team and reflexivity		
Personal Characteristics		
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group? Page 7
2.	Credentials	What were the researcher's credentials? <i>E.g. PhD, MD</i> Page 7
3.	Occupation	What was their occupation at the time of the study? Page 7
4.	Gender	Was the researcher male or female? Page 7
5.	Experience and training	What experience or training did the researcher have? Page 7
Relationship with participants		
6.	Relationship established	Was a relationship established prior to study commencement? Page 7
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? <i>e.g. personal goals, reasons for doing the research</i> Page 7
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? <i>e.g. Bias, assumptions, reasons and interests in the research topic</i> Page 7
Domain 2: study design		
Theoretical framework		

No	Item	Guide questions/description
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? <i>e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i> Page 8
Participant selection		
10.	Sampling	How were participants selected? <i>e.g. purposive, convenience, consecutive, snowball</i> Page 6
11.	Method of approach	How were participants approached? <i>e.g. face-to-face, telephone, mail, email</i> Page 6
12.	Sample size	How many participants were in the study? Page 9
13.	Non-participation	How many people refused to participate or dropped out? Reasons? N/a
Setting		
14.	Setting of data collection	Where was the data collected? <i>e.g. home, clinic, workplace</i> Page 7
15.	Presence of non-participants	Was anyone else present besides the participants and researchers? Page 7
16.	Description of sample	What are the important characteristics of the sample? <i>e.g. demographic data, date</i> Page 9 and Table 1
Data collection		
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested? Page 7,8 and Box 1
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many? N/a
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data? Page 8
20.	Field notes	Were field notes made during and/or after the interview or focus group? Page 8
21.	Duration	What was the duration of the interviews or focus group? Page 7
22.	Data saturation	Was data saturation discussed? Page 6

No	Item	Guide questions/description
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction? Page 8
Domain 3: analysis and findingsz		
Data analysis		
24.	Number of data coders	How many data coders coded the data? Page 8
25.	Description of the coding tree	Did authors provide a description of the coding tree? Page 8
26.	Derivation of themes	Were themes identified in advance or derived from the data? Page 8
27.	Software	What software, if applicable, was used to manage the data? Page 8
28.	Participant checking	Did participants provide feedback on the findings? Page 8
Reporting		
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.g. <i>participant number</i> Throughout results
30.	Data and findings consistent	Was there consistency between the data presented and the findings? Throughout results
31.	Clarity of major themes	Were major themes clearly presented in the findings? Throughout results
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes? Throughout results

Correction: Prescribing antibiotics to ‘at-risk’ children with influenza-like illness in primary care: qualitative study

Ashdown HF, Räisänen U, Wang K, et al. Prescribing antibiotics to ‘at-risk’ children with influenza-like illness in primary care: qualitative study. *BMJ Open* 2016;6:e011497. Owing to a misunderstanding, the correct process required for ethical approval was not followed by the authors, and the reference number for ethical approval provided in the article relates to the sponsorship of the study rather than the decision of the ethics committee. Study documents have retrospectively been reviewed by the University of Oxford Medical Sciences Inter-Divisional Research Ethics Committee who have confirmed that it is probable that the committee would have granted ethical approval (Reference R21617/RE001) and also acknowledge that these documents were reviewed, before the research started, by the University’s Clinical Trials and Research Governance (CTRG) team, including the information to be provided to participants and the consent process to be used. The first author acknowledges this oversight and will ensure that the correct procedures are followed in future work.

BMJ Open 2016;6:e011497corr1. doi:10.1136/bmjopen-2016-011497corr1



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