



Why some children hospitalized for pneumonia do not consult with a general practitioner before the day of hospitalization

Joanna C. Crocker, Meirion R. Evans, Colin V. E. Powell, Kerenza Hood & Christopher C. Butler

To cite this article: Joanna C. Crocker, Meirion R. Evans, Colin V. E. Powell, Kerenza Hood & Christopher C. Butler (2013) Why some children hospitalized for pneumonia do not consult with a general practitioner before the day of hospitalization, The European Journal of General Practice, 19:4, 213-220, DOI: [10.3109/13814788.2013.795538](https://doi.org/10.3109/13814788.2013.795538)

To link to this article: <https://doi.org/10.3109/13814788.2013.795538>



Published online: 01 Jul 2013.



Submit your article to this journal [↗](#)



Article views: 687



View related articles [↗](#)



Citing articles: 2 View citing articles [↗](#)

Original Article

Why some children hospitalized for pneumonia do not consult with a general practitioner before the day of hospitalization

Joanna C. Crocker¹, Meirion R. Evans¹, Colin V. E. Powell², Kerenza Hood^{1,3} & Christopher C. Butler¹

¹Institute of Primary Care and Public Health, School of Medicine, Cardiff University, Cardiff, UK, ²Department of Child Health, Institute of Molecular & Experimental Medicine, School of Medicine, Cardiff University, Cardiff, UK, ³South East Wales Trials Unit, School of Medicine, Cardiff University, Cardiff, UK

KEY MESSAGE:

- 38% of children diagnosed in hospital with empyema or pneumonia had not consulted a GP earlier in the illness episode.
- Lack of early GP consultation was associated with shorter pre-hospital illness duration and social deprivation.

ABSTRACT

Background: Early consultation in primary care may provide an opportunity for early intervention in children developing pneumonia, but little is known about why some children do not consult a general practitioner (GP) before hospitalization.

Objectives: To identify differences between children who consulted a GP and children who did not consult a GP before the day of hospital presentation with pneumonia or empyema.

Methods: Carers of children aged six months to 16 years presenting to hospital with pneumonia or empyema completed a questionnaire, with a subset participating in an interview to identify physical, organizational and psychological barriers to consultation. Responses from those who had consulted a GP before the day of hospital presentation were compared with those who had not on a range of medical, social and environmental variables.

Results: Fifty seven (38%) of 151 participants had not consulted a GP before the day of hospital presentation. On multivariate analysis, illness duration ≥ 3 days (odds ratio [OR] 4.36, 95% confidence interval [CI]: 1.67–11.39), prior antibiotic use (OR: 10.35, 95% CI: 2.16–49.55) and home ownership (OR: 3.17, 95% CI: 1.07–9.37) were significantly associated with early GP consultation ($P < 0.05$). Interviews with 28 carers whose children had not seen a GP before the day of presentation revealed that most had not considered it and/or did not think their child's initial symptoms were serious or unusual; 11 (39.3%) had considered consulting a GP but reported barriers to access.

Conclusion: Lack of early GP consultation was strongly associated with rapid evolution of pneumonia.

Keywords: respiratory tract infections, pneumonia, primary health care, patient acceptance of health care, child

INTRODUCTION

In developed countries, approximately 10–15 children per 1000 are diagnosed with community-acquired pneumonia and one-to-four per 1000 are admitted to hospital yearly (1). Hospital admissions in resource-rich countries for pneumonia and pleural empyema in children increased during the 1990's and early 2000's (2–10). General practice consultations for paediatric respiratory tract infection (RTI) in the UK and USA have declined by over a third during this period (11,12). Possible explanations include changes in help-seeking behaviour or in

access to primary care. People may be increasingly likely to use telephone advice services (13), such as the NHS Direct helpline in the UK (14), rather than consult a GP in person. The shift in delivery of out-of-hours primary care from individual GPs to regional emergency centres in the 1990's was associated with a perceived reduction in home visiting in parts of the UK (15) and dissatisfaction among some patients (16).

These changes may have resulted in missed opportunities for early intervention in primary care to reduce the risk of hospitalization for pneumonia and empyema in

children. Early treatment in the community may not always prevent subsequent hospital presentation, but there is some evidence to suggest that antibiotics prescribed for RTIs in primary care can reduce the risk of pneumonia and/or subsequent hospital admission (17–19).

Grant et al. (20) reported that 21% of 280 young children hospitalized with pneumonia in New Zealand had no opportunity to receive antibiotics before admission; they were not seen in primary care or the parents were advised at the first primary care visit to go directly to hospital. This appeared to be due to rapidly evolving illness requiring urgent hospital admission. Little is known about prior help-seeking by UK families where children with serious RTIs fail to consult in primary care. A study of 22 children admitted to hospital with serious RTIs in Wales identified parental and health service barriers to help-seeking in primary care (21), but these may not necessarily have precluded early GP consultation. We used a hospital-based case series of community-acquired pneumonia and empyema in children to identify differences between children who consulted a GP and children who did not consult a GP before the day of hospital presentation with pneumonia or empyema, and to explore the reasons for not consulting in general practice beforehand. The case series was primarily recruited as part of a case-control study of antibiotic use, and a study of the symptoms of pneumonia and empyema from the carer's perspective, published elsewhere (19,22).

METHODS

Setting and selection of participants

Patients were recruited from seven hospitals with inpatient paediatric units in South Wales (catchment population approximately 2 000 000) between October 2008 and December 2009. Eligible patients were children aged six months to 16 years assessed in hospital and given a clinical or radiographic working diagnosis of community-acquired pneumonia or empyema by any treating clinician. Children were ineligible if they had a serious underlying medical condition, if no chest radiograph was taken, or if the carer(s) did not speak a sufficient level of English for informed consent. Nurses and physicians in the participating hospitals who had volunteered to invite carers ('recruiting clinicians') were asked to approach the carers of as many eligible patients in hospital as

possible during the recruitment period, giving them a study participation pack. Invited carers were asked to complete an enclosed consent form and questionnaire, and children aged over 12 years were also asked to provide assent. Further details of selection and recruitment methods are described elsewhere (19,22).

Participants were subsequently excluded from analysis if the radiologist's report did not describe the presence of at least one of the following features confirming radiographic pneumonia: consolidation, opacification, infiltrate, air bronchogram, air space shadowing, pneumonia or pleural effusion. Participants were also excluded from analysis if the principal discharge diagnosis was not consistent with pneumonia (e.g. bronchiolitis).

Data collection

Recruiting clinicians were asked to keep an anonymous log of invitations, including the age, gender and diagnosis (pneumonia or empyema) of each invited patient. A self-complete questionnaire (19) was used to collect data from carers about the index illness and a range of background demographic, medical and social variables. This included information on the date of illness onset (when carers first noticed their child 'wasn't completely well'), whether or not the carer had obtained advice from various primary care services, and the date of first GP consultation (if applicable). Due to limited resources, only carers recruited between October 2008 and September 2009 were also invited to take part in a structured interview with a member of the research team (JCC) to gather more detailed information about their children's illnesses. This included symptoms (published elsewhere) (22) and reasons for not consulting a GP. A mixture of closed and open questions were used to elicit this qualitative information (Table 1). Key words and phrases used by carers were hand-recorded by the interviewer. For quality assessment purposes, 12 interviews (15%) were audio-taped with the carer's permission (nine in the first three months of interviews and three in the final month of interviews). Both the questionnaire and interview schedule were piloted with non-medical carers and amended accordingly.

We also obtained the Welsh Index of Multiple Deprivation (WIMD) 2008 (23) score associated with each child's home postcode, and converted these into quintiles. The WIMD comprises eight domains: income and employment (together comprising almost half of the

Table 1. Interview questions designed to elicit reasons for not consulting in general practice.

Condition	Question
Child did not see a GP before the index hospital presentation (as indicated in questionnaire)	Did you think about seeing a GP at any point? (Probe: Was there any particular reason why [child] didn't see a GP?)
Child saw a GP before the index hospital presentation (as indicated in questionnaire)	Was that the first time you thought about taking your child to a GP, or did you think about it earlier in the illness? (Probe: Was there any particular reason why [child] didn't see a GP earlier?)

total score), health, education, housing, physical environment, access to services and community safety. The fifth quintile represents the highest level of deprivation. The following variables were extracted from the patient's hospital records as possible indicators of illness severity: discharge diagnosis and length of hospital stay; treatment with intravenous versus oral only antibiotics; respiratory rate, heart rate, temperature, and oxygen saturation at presentation; and chest signs noted by clinicians.

Data analysis

We compared children who had consulted a GP face-to-face before the day of hospital presentation with

pneumonia and, therefore, had an opportunity for early intervention by the GP ('early consulters') with those who had not consulted a GP before the day of hospital presentation and, therefore, had no opportunity for early intervention ('late and non-consulters'). The latter group included children who only consulted a GP on the day that they presented to hospital, in addition to those who presented directly to hospital without ever consulting a GP. Chi-square or Fisher's exact tests (for categorical variables) and Mann-Whitney U-tests (for non-parametric continuous variables) were used to analyse demographic, medical and social variables from the questionnaire (listed in Table 2), WIMD quintile, and the variables extracted from the medical records.

Table 2. Bivariate analysis of GP consultation before the day of hospital presentation with pneumonia.

Variable	Early consulters (n = 94)	Late and non consulters (n = 57)	P-value
Age (years)	3.82 (1.60–6.62) ^a	4.19 (1.79–8.75) ^a	NS
Male versus female	56/94 (59.6%)	32/57 (56.1%)	NS
White ethnicity versus other ethnicity	87/94 (92.6%)	55/57 (96.5%)	NS
Illness duration before index hospital presentation (days)	6 (4–12) ^a	2 (1–5) ^a	< 0.001
Presented to hospital during H1N1 flu pandemic (Apr–Dec 2009 inclusive)	59/94 (62.8%)	36/57 (63.2%)	NS
Presented to hospital during winter season (Oct–Mar inclusive)	65/94 (69.1%)	36/57 (63.2%)	NS
Presented to hospital after June 2009 (median month)	41/94 (43.6%)	26/57 (45.6%)	NS
Submitted to hospital by GP referral ^b	62/91 (68.1%)	32/55 (58.2%)	NS
Submitted to hospital by self-referral ^b	27/91 (29.7%)	23/55 (41.8%)	NS
Took antibiotics before day of hospital presentation	42/94 (44.7%)	3/57 (5.3%)	< 0.001
Obtained advice from an alternative primary care service ^{b,c}	32/76 (42.1%)	8/45 (17.8%)	0.006
Obtained advice from NHS Direct telephone helpline ^c	22/76 (28.9%)	5/45 (11.1%)	0.02
Obtained advice from NHS Direct website ^c	7/76 (9.2%)	0/45 (0.0%)	0.05
Obtained advice from a pharmacist/chemist ^c	10/76 (13.2%)	3/45 (6.7%)	NS
Obtained advice from a complementary/alternative therapist ^c	0/76 (0.0%)	1/45 (2.2%)	NS
Uses inhaler for asthma	20/94 (21.3%)	15/57 (26.3%)	NS
Ongoing medical condition apart from asthma ^d	14/94 (14.9%)	9/57 (15.8%)	NS
Chickenpox during month prior to illness	3/94 (3.2%)	4/57 (7.0%)	NS
Number of times child saw a GP in the past year for any other illness ^e	2 (0–4) ^a	2.25 (1–3.25) ^a	NS
Carer is lone parent	14/94 (14.9%)	10/57 (17.5%)	NS
Firstborn child of carer	46/94 (48.9%)	23/57 (40.4%)	NS
Only child ^f living at home	27/94 (28.7%)	14/57 (24.6%)	NS
Attends school, nursery or day care	75/94 (79.8%)	45/57 (78.9%)	NS
Number of people per bedroom living at home (crowding)	1.33 (1.00–1.33) ^a	1.25 (1.00–1.67) ^a	NS
Ratio of children ^f to adults living at home	1.0 (0.5–1.0) ^a	1.0 (1.0–1.5) ^a	0.04
Carer/family owns home	79/94 (84.0%)	36/57 (63.2%)	0.004
Daily smoker living at home	27/94 (28.7%)	23/57 (40.4%)	NS
Welsh Index of Multiple Deprivation (WIMD):			0.01
1st quintile	15/93 (16.1%)	14/57 (24.6%)	
2nd quintile	15/93 (16.1%)	4/57 (7.0%)	
3rd quintile	29/93 (31.2%)	8/57 (14.0%)	
4th quintile	18/93 (19.4%)	11/57 (19.3%)	
5th quintile	16/93 (17.2%)	20/57 (35.1%)	

NS, not significant ($P > 0.05$).

^aMedian (interquartile range).

^bNHS Direct telephone helpline or website, pharmacist, or complementary/alternative therapist

^c30 participants (19.9%) were excluded from analysis as the questionnaire was completed after discharge from hospital and, therefore, it was not clear whether advice was obtained before or after hospital presentation. Data were assumed to be missing completely at random.

^dCarer responses ($n \geq 2$) included eczema ($n = 6$), food allergies ($n = 4$) and glue ear ($n = 2$).

^eIf carer responded with a range instead of a precise value (e.g. '3 or 4' times), the midpoint was used for analysis (e.g. 3.5).

^fAge < 16 years.

^gHospital submission data were missing for five (3.3%) cases (three early consulters and two late/non-consulters). In addition, two early consulters were excluded from both the 'GP referral' and 'self-referral' categories: one was referred by NHS Direct and one was referred by an unspecified 'other immediate' route.

Telephone consultations with GPs, chest signs and oxygen saturation at presentation were not analysed due to their insufficient quality and/or incompleteness. The pre-presentation variables most strongly associated with early GP consultation were entered into a multivariate logistic regression model. Interview responses were initially coded very finely and fine codes were then grouped into themes agreed by the research team. An independent researcher, blinded to the interviewer's records, listened to the 12 audio-taped interviews and hand-recorded the carers' responses. These were compared with the interviewer's original records, showing 96.9% agreement for the two interview questions about early GP consultation. All analyses were carried out using Statistical Package for the Social Sciences (SPSS Inc., Chicago, Illinois) Version 14.

Ethics approval

The study was approved by the Research Ethics Committee for Wales (Ref. 08/MRE09/45).

RESULTS

Participants

Figure 1 shows the flow of potential participants from invitation to data analysis. The estimated response rate was 60.0% (195/325 invitations recorded by recruiting clinicians). There was no significant difference between the 195 responders and the 130 non-responders in terms of age, sex or pneumonia or empyema diagnosis at the time of invitation ($P > 0.1$). Of the 151 cases eligible for analysis (Figure 1), 130 (86.1%) were diagnosed with pneumonia and 21 (13.9%) with empyema. The sample was skewed toward younger age (mean five years; median three years and 11 months; range six months to 15 years and eight months; interquartile range one year and nine months—seven years and four months). Of the 84 patients ineligible for analysis, 17 (20.2%) did not meet inclusion criteria and 67 (79.8%) did not meet diagnostic criteria (Figure 1). All carers completed a questionnaire on recruitment, and 32 (21.2%) were subsequently contacted by telephone to clarify ambiguous, inconsistent or missing responses. 105 (69.5%) carers were recruited between October 2008 and September 2009 and were, therefore, invited to take part in the additional interview; 79 (75.2%) of these were interviewed (Figure 1), either face-to-face in hospital (8/79, 10.1%) or by telephone after discharge from hospital (71/79, 89.9%). Interviews were conducted a median of 21 days after hospital presentation.

Bivariate comparison of early consulters versus late and non-consulters

Fifty-seven of 151 children (37.7%) had not consulted a GP before the day of hospital presentation, including

38 (25.2%) who consulted a GP only on the day of presentation, and 19 (12.6%) who did not consult a GP at all. Compared to early consulters, these late and non-consulters were significantly less likely to have taken antibiotics before presenting to hospital ($P < 0.001$; Table 2). They were also significantly less likely to have obtained advice from the NHS Direct telephone helpline and website (Table 2) and had a significantly more rapid onset of illness (Table 2). Other variables significantly associated with late or non-consultation ($P < 0.05$) were lack of home ownership, WIMD quintile, and higher ratio of children to adults in the household (Table 2). Within the group of late and non-consulters, there were no significant differences between late consulters and non-consulters on any of the variables shown in Tables 2 and 3, except hospital submission route (84.2% versus 0.0% by GP referral; $P < 0.001$).

Multivariate comparison of early consulters versus late and non-consulters

Illness duration, antibiotic use, advice from alternative primary care service (including NHS Direct) and home ownership were entered into a multivariate logistic regression analysis of pre-presentation variables (Table 4). No other variables were included due to the limited sample size. Home ownership was selected above other social variables due to its greater correlation coefficient. Longer illness duration, antibiotic use and home ownership were independently associated with early GP consultation in this model ($P < 0.05$).

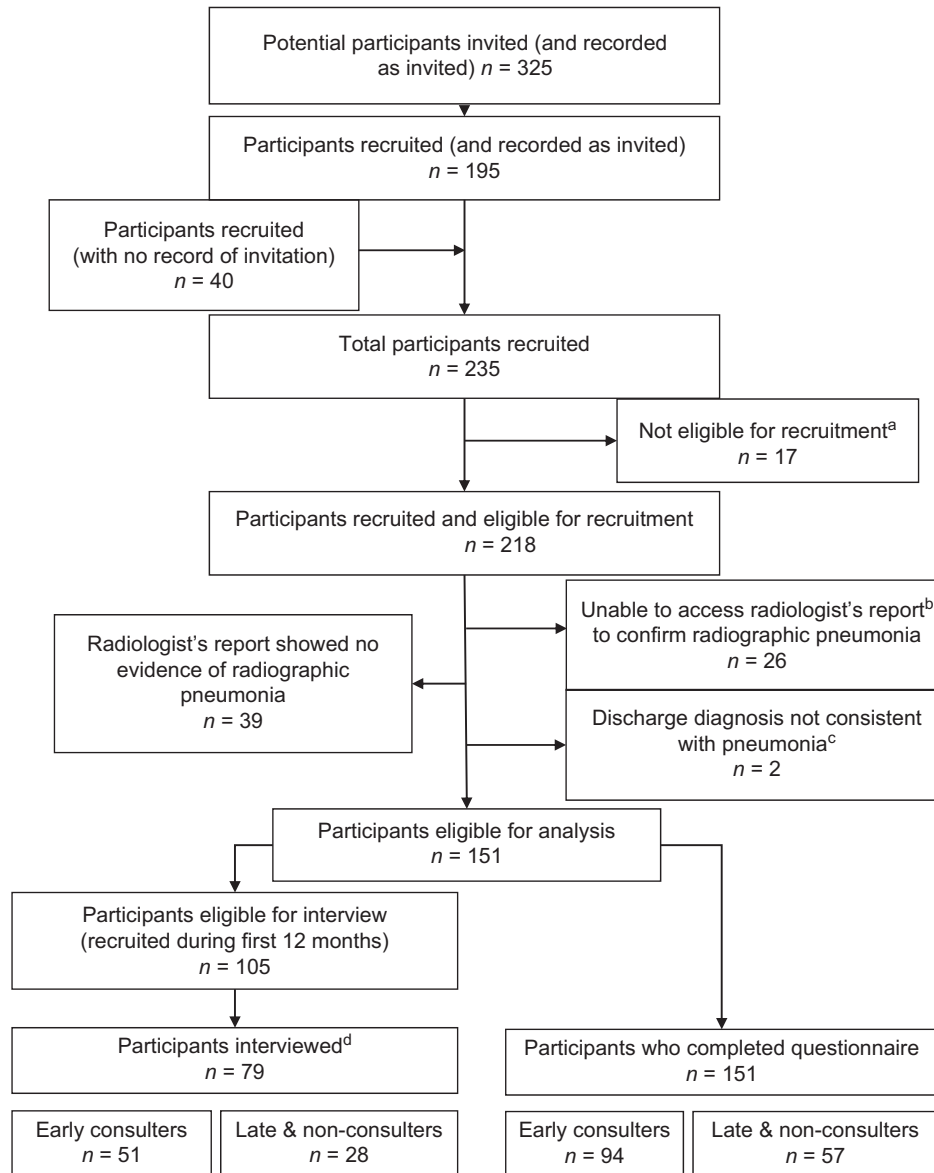
Reasons for late or non-consultation

Twenty-eight (35.4%) of the 79 patients whose carers were interviewed had not consulted a GP before the day of hospital presentation. Most reported that they simply had not considered seeing a GP and/or did not think their child's initial symptoms were serious or unusual (Table 5). Barriers to access were reported by 11 (39.3%) carers who had considered seeing a GP (Table 5), including out-of-hours closure of their local surgery ($n = 5$), difficulty getting a GP appointment ($n = 2$), negative preconceptions (afraid of wasting the GP's time and/or anticipated a viral diagnosis) ($n = 2$), and inability to travel to the surgery coupled with GP reluctance to provide a home visit ($n = 2$).

DISCUSSION

Main findings

Over one-third of children hospitalized for pneumonia had not consulted a GP before the day of presentation to hospital. Having a short illness was strongly associated with late or non-consultation, suggesting that in



^aSerious underlying medical condition ($n = 6$), age < 6 months ($n = 5$), duplicate invitation ($n = 3$), chest X-ray not taken ($n = 2$), and hospital-acquired pneumonia ($n = 1$).

^bCarers had not given consent for the researchers to access their child's medical records ($n = 16$) or administrative difficulties prevented access ($n = 10$).

^cBronchiolitis ($n = 1$); exacerbation of asthma ($n = 1$).

^dNineteen participants declined to take part in the interview; an additional seven participants were not interviewed because they could not be contacted.

Figure 1. Invitation, recruitment and selection of participants for analysis.

some cases rapid disease progression may have precluded early consultation in primary care. This is supported by clinical data indicating that illness in late and non-consulters was at least as severe as illness in early consulters at hospital presentation. There was some evidence that social deprivation (as measured by lack of home ownership) may reduce the likelihood of early GP consultation, independently of disease progression. Some practice-related barriers were identified in the interviews with carers, including

difficulty getting a GP appointment and inability to travel to the surgery, but most carers simply did not consider consulting a GP earlier or did not feel it was necessary.

Strengths and limitations of the study

This was a multicentre study recruiting participants from urban and rural locations. We collected data mostly from carers rather than from medical records,

Table 3. Bivariate analysis of indicators of illness severity.

Variable	Early consulters (<i>n</i> = 94)	Late and non consulters (<i>n</i> = 57)	Odds ratio (95% CI) for early consultation	<i>P</i> -value
Tachypnoeic ^a at presentation	31/92 ^c (33.7%)	20/55 ^c (36.4%)	0.79 (0.36–1.74)	NS
Tachycardic ^b at presentation	54/94 (57.4%)	40/57 (70.2%)	0.57 (0.29–1.16)	NS
Temperature > 38.5°C at presentation	20/94 (21.3%)	18 (31.6%)	0.59 (0.28–1.23)	NS
Length of hospital stay (days): median (interquartile range)	2 (1–5) days ^c	2 (1–3) days	1.60 (0.81–3.14) for > 2 days	NS
Treated with intravenous antibiotics	53/90 ^c (58.9%)	37/53 ^c (69.8%)	0.62 (0.30–1.27)	NS
Discharge diagnosis of empyema	15/94 (16.0%)	6/57 (10.5%)	1.61 (0.59–4.43)	NS

NS, not significant (*P* > 0.05).

^aDefined as above the normal range for age: >40 breaths per minute (bpm) for age < 1 year, >35 bpm for age 1–2 years, >30 bpm for age 2–5 years, >25 bpm for age 5–12 years and >20 bpm for age >12 years (29).

^bDefined as above the normal range for age: >160 beats per minute (bpm) for age < 1 year, >150 bpm for age 1–2 years, >140 bpm for age 2–5 years, >120 bpm for age 5–12 years and >100 bpm for age >12 years (29).

^cIndicates missing data in medical records (<5% of subsample).

allowing us to elicit information about help-seeking behaviour in primary care, as well as social and environmental factors. However, there are several limitations, most importantly invitation and response bias, selection bias, and small sample size. Recruiting clinicians were not able to invite all eligible carers and there is likely to be a considerable non-invitation rate. We were unable to collect reliable data on the number of eligible patients whose carers were not invited by recruiting clinicians, and therefore, were unable to estimate the proportion of eligible patients captured by our sample, or to compare invitation rates across hospital sites. Although there were no demographic differences between responders and non-responders to invitations recorded by clinicians, the approximately 40% non-response rate among invited carers may have introduced other types of response bias. For example, carers who frequently used health services may have been more likely to take part in this study about health service use, leading to possible underrepresentation of carers who did not consult in general practice. Similarly, 25% of participants eligible for the additional interview were not interviewed. The small number of interviewed carers may not be representative of the much larger number of children

presenting to hospital with community-acquired pneumonia or empyema, and limits our ability to estimate the frequency of the identified barriers to GP access. Furthermore, we grouped late consulters and non-consulters together; there could be important differences between these groups that our sample size was insufficient to detect.

Our study findings are at risk of selection bias. Ideally, we would have included children with pneumonia who saw a GP and never presented to hospital in our study. This would have been difficult in practice, partly because radiographic pneumonia is usually not confirmed in primary care. This excluded subgroup is likely to have had less severe pneumonia than the consulters who presented to hospital, therefore, biasing our group of consulters toward greater illness severity. It could explain why there were a greater proportion of empyema diagnoses among early consulters compared to late and non-consulters. Had this missing subgroup been included, we might have observed significantly greater disease severity among late and non-consulters compared to early consulters (Table 3), further supporting our finding that rapid progression of pneumonia reduces opportunities for early GP intervention.

Table 4. Multivariate analysis of pre-presentation variables associated with early GP consultation (*n* = 121).

Variable	Crude OR (95% CI)	Adjusted OR (95% CI)	<i>P</i> -value
Illness duration ≥ 3 days ^a	7.98 (3.64–17.49)	4.36 (1.67–11.39)	0.003
Took antibiotics before day of hospital presentation	14.54 (4.24–49.82)	10.35 (2.16–49.55)	0.003
Obtained advice from an alternative primary care service ^{b,c}	3.36 (1.38–8.19)	2.20 (0.81–6.01)	0.13
Carer/family owns home	3.07 (1.42–6.64)	3.17 (1.07–9.37)	0.04

OR, odds ratio; CI, confidence interval.

^aIllness duration before hospital presentation was not linear in the logit of GP consultation, therefore, it was converted into a binary variable.

^bNHS Direct telephone helpline or website, pharmacist, or complementary/alternative therapist.

^cThirty participants (19.9%) were excluded from analysis as the questionnaire was completed after discharge from hospital and, therefore, it was not clear whether advice was obtained before or after hospital presentation. Data were assumed to be missing completely at random.

Table 5. Reasons for not seeing a GP before the day of hospital presentation ($n = 28$).

Reason ^a	<i>n</i>	%
• Carer did not consider consulting a GP earlier	11	39.3
• Carer did not think earlier symptoms were serious/unusual	10	35.7
– No further details given	3	10.7
– Child seemed to improve initially	2	7.1
– Presumed asthma	2	7.1
– Thought abdominal pain was due to a pulled muscle	1	3.6
– Child was active/alert	1	3.6
– Child's breathing was normal	1	3.6
– Presumed common self-limiting infection	1	3.6
• GP surgery closed (out of hours)	5	17.9
– Decided to wait until surgery open	4	14.3
– Consulted NHS Direct instead	1	3.6
• Difficulty getting GP appointment	2	7.1
– No emergency appointments available	1	3.6
– Surgery advised carer not to bring child in due to chickenpox	1	3.6
• A&E used as alternative to GP	2	7.1
– Sudden onset of severe symptoms	1	3.6
– Out-of-hours (Thursday afternoon) not covered by any GP service	1	3.6
• Negative preconceptions	2	7.1
– Afraid of wasting the doctor's time	2	7.1
– Anticipated GP would diagnose viral infection	1	3.6
• Unable to travel to GP surgery and GP declined home visit	2	7.1
– Child too ill to move	1	3.6
– Carer had no car	1	3.6

^aCategories are not mutually exclusive; some carers gave more than one reason.

Data were collected retrospectively from carers and might, therefore, be prone to recall bias, particularly those collected by interview, which in some cases occurred after a considerable delay.

We attempted to reduce misclassification within our sample by excluding from recruitment children with no chest X-ray, and excluding from analysis children with no accessible radiologist's report, no radiographic evidence of pneumonia, or a discharge diagnosis inconsistent with pneumonia. This may have resulted in the exclusion of some genuine cases of pneumonia. Furthermore, there is known variability in the interpretation of paediatric chest radiographs among radiologists and clinicians (24,25), therefore, a minority of participants might have been wrongly included.

Finally, our study was not designed to investigate whether early GP consultation can prevent hospital presentation for pneumonia or empyema, and under what circumstances this might or might not be appropriate. This would require a large, prospective cohort study of RTI in the community with adjustment for confounding by illness severity.

Comparison with existing literature

Our findings provide further evidence that rapid illness progression precludes early consultation (20). Many of the barriers to GP consultation identified in our interviews have also been reported in previous qualitative

studies of help-seeking for serious RTIs in children (21,26). For example, in a study of 12 Samoan children admitted to hospital with pneumonia in New Zealand, carers reported several problems accessing their GP, including a lack of available appointments, limited transport, and out-of-hours closure of the practice (26). Lack of transportation and feeling too ill to travel have also been identified as the main barriers to out-of-hours attendance in UK general practice (27,28).

Implications for clinical practice and research

The rapid evolution of pneumonia in some children appears to be an important factor precluding early consultation in general practice. Our interviews with carers suggest that practice-related factors, such as limited GP emergency appointments and transport provision, may also reduce opportunities for early consultation in a small minority of children. Larger, prospective studies (including children who do not present to hospital) are needed to confirm our findings and determine the impact of these factors, if any, on outcomes for children with RTIs in the community.

Conclusion

The rapid evolution of pneumonia in some children may preclude early consultation in general practice.

ACKNOWLEDGEMENTS

The authors are very grateful to the following people: all carers and children who took part in the study; all clinicians who kindly recruited patients for the study; Lead Collaborators Dr Anjum Gandhi and Dr Ian Hodges (Royal Glamorgan Hospital), Dr David Deekollu (Prince Charles Hospital), Dr Kate Creese and Dr Nirupa D'Souza (Princess of Wales Hospital), Dr Marcus Pierrepont and Dr Yvette Cloete (Nevill Hall Hospital), Dr Michelle Barber (Royal Gwent Hospital) and Dr Rachel Evans (Morrison Hospital); Ann Russell, Anwen Howells and Marie Williams at the NISCHR Clinical Research Centre for helping to collect medical data; and Hayley Prout at Cardiff University for providing an independent quality assessment of interview records.

FINANCIAL RESOURCES

This study was supported by the Medical Research Council as part of a PhD Studentship (grant number G0600288); the British Society for Antimicrobial Chemotherapy (grant number GA854); and the South East Wales Trials Unit and Wales School for Primary Care Research, both funded by the National Institute for Social Care and Health Research (NISCHR), Welsh Government.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

REFERENCES

- Farha T, Thomson AH. The burden of pneumonia in children in the developed world. *Paediatr Respir Rev*. 2005;6:76–82.
- Roxburgh CSD, Youngson GG, Townend JA, Turner SW. Trends in pneumonia and empyema in Scottish children in the past 25 years. *Arch Dis Child*. 2008;93:316–8.
- Koshy E, Murray J, Bottle A, Sharland M, Saxena S. Impact of the seven-valent pneumococcal conjugate vaccination (PCV7) programme on childhood hospital admissions for bacterial pneumonia and empyema in England: National time-trends study, 1997–2008. *Thorax* 2010;65:770–4.
- Gupta R, Crowley S. Increasing paediatric empyema admissions. *Thorax* 2006;61:179–80.
- Wu PS, Huang LM, Chang IS, Lu CY, Shao PL, Tsai FY, et al. The epidemiology of hospitalized children with pneumococcal/lobar pneumonia and empyema from 1997 to 2004 in Taiwan. *Eur J Pediatr*. 2010;169:861–6.
- Strachan R, Jaffe A. Assessment of the burden of paediatric empyema in Australia. *J Paediatr Child Health*. 2009;45:431–6.
- Grijalva CG, Nuorti JP, Zhu Y, Griffin MR. Increasing incidence of empyema complicating childhood community-acquired pneumonia in the United States. *Clin Infect Dis*. 2010;50:805–13.
- Finley C, Clifton J, FitzGerald JM, Yee J. Empyema: An increasing concern in Canada. *Can Respir J*. 2008;15:85–9.
- Van Ackere T, Proesmans M, Vermeulen F, Van Raemdonck D, De Boeck K. Complicated parapneumonic effusion in Belgian children: Increased occurrence before routine pneumococcal vaccine implementation. *Eur J Pediatr*. 2009;168:51–8.
- Francois P, Desrumaux A, Cans C, Pin I, Pavese P, Labarere J. Prevalence and risk factors of suppurative complications in children with pneumonia. *Acta Paediatr*. 2010;99:861–6.
- Meropol SB, Chen Z, Metlay JP. Reduced antibiotic prescribing for acute respiratory infections in adults and children. *Br J Gen Pract*. 2009;59:735–41.
- McCaig LF, Besser RE, Hughes JM. Trends in antimicrobial prescribing rates for children and adolescents. *J Am Med Assoc*. 2002;287:3096–102.
- Shekelle P, Roland M. Nurse-led telephone-advice lines. *Lancet* 1999;354:88–9.
- McLellan NJ. NHS Direct: Virtually engaged. *Arch Dis Child*. 2004;89:57–9.
- Jessopp L, Beck I, Hollins L, Shipman C, Reynolds M, Dale J. Changing the pattern out of hours: A survey of general practice cooperatives. *Br Med J*. 1997;314:199–200.
- Richards SH, Pound P, Dickens A, Greco M, Campbell JL. Exploring users' experiences of accessing out-of-hours primary medical care services. *Qual Saf Health Care* 2007;16:469–77.
- Petersen I, Johnson AM, Islam A, Duckworth G, Livermore DM, Hayward AC. Protective effect of antibiotics against serious complications of common respiratory tract infections: Retrospective cohort study with the UK General Practice Research Database. *Br Med J*. 2007;335:982.
- Winchester CC, Macfarlane TV, Thomas M, Price D. Antibiotic prescribing and outcomes of lower respiratory tract infection in UK primary care. *Chest* 2009;135:1163–72.
- Crocker JC, Powell CV, Evans MR, Hood K, Butler CC. Paediatric pneumonia or empyema and prior antibiotic use in primary care: A case-control study. *J Antimicrob Chemother*. 2012;67:478–87.
- Grant C, Harnden A, Mant D, Emery D, Coster G. Why do children hospitalised with pneumonia not receive antibiotics in primary care? *Arch Dis Child*. 2012;97:21–7.
- Francis NA, Crocker JC, Gamper A, Brookes-Howell L, Powell C, Butler CC. Missed opportunities for earlier treatment? A qualitative interview study with parents of children admitted to hospital with serious respiratory tract infections. *Arch Dis Child*. 2011;96:154–9.
- Crocker JC, Evans MR, Butler CC, Hood K, Powell CV. Carers' perspectives on the presentation of community-acquired pneumonia and empyema in children: A case series. *BMJ Open*. 2012;2:e001500.
- Statistics for Wales. Welsh index of multiple deprivation 2008. Available at: <http://wales.gov.uk/topics/statistics/theme/wimd/2008/> (accessed 16 September 2011).
- Swingler GH. Observer variation in chest radiography of acute lower respiratory infections in children: A systematic review. *BMC Med Imaging*. 2001;1:1.
- Edwards M, Lawson Z, Morris S, Evans A, Harrison S, Isaac R, et al. The presence of radiological features on chest radiographs: How well do clinicians agree? *Clin Radiol*. 2012;67:664–8.
- Young N. The pre-hospital experiences of Samoan families who have had a child admitted to hospital with pneumonia: A qualitative investigation. *Pac Health Dialog*. 2001;8:20–8.
- Cragg DK, Campbell SM, Roland MO. Out of hours primary care centres: Characteristics of those attending and declining to attend. *Br Med J*. 1994;309:1627–9.
- Shipman C, Payne F, Dale J, Jessopp L. Patient-perceived benefits of and barriers to using out-of-hours primary care centres. *Fam Pract*. 2001;18:149–55.
- Advanced Life Support Group. The seriously ill child. In: Samuels M, Wieteska S, editors. *Advanced paediatric life support: The practical approach*. 5th ed. Oxford: Wiley-Blackwell; 2011:58.