



British Thoracic Society Paediatric Pneumonia Audit: a review of 3 years of data

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ABSTRACT

The British Thoracic Society (BTS) guidelines for the management of community-acquired pneumonia in children are used as the audit standard for the annual BTS Paediatric Pneumonia Audit. This report examines 3 years of data from this national audit, highlighting trends in clinical practice and the impact of the 2011 revisions to the BTS guidelines. The findings suggest an over-reliance on investigations to diagnose pneumonia and underuse of oral antibiotics, particularly amoxicillin. There is inappropriate use of chest physiotherapy, outpatient appointments and repeat chest x-rays. Increasing adherence to the BTS guidelines would improve care and also preserve valuable secondary care resources.

BACKGROUND

The British Thoracic Society (BTS) plays a significant role in guideline development within respiratory medicine using a process now accredited by NHS Evidence. The original BTS guidelines for the management of community-acquired pneumonia (CAP) in children were published in 2002,¹ and an update was published in 2011 reviewing evidence published to July 2010.² Since 2009 the BTS audit programme has conducted national audits annually. This report will give an overview of 3 years of national audit data, with the latest audit (2011/2012) postdating the publication of the revised 2011 guidelines. The audit includes children aged >1 year with a diagnosis of CAP who required hospital admission between 1 November and 31 January. Inclusion criteria have been similar for each of the last 3 years.

DEMOGRAPHICS

The number of cases increased in successive years from 891 submissions across 27 institutions in 2009/2010 to 2817 submissions across 101 institutions in 2011/2012. The gender distribution has remained static at 52% male to 48% female cases and reflects the male preponderance reported in epidemiological studies.³ Approximately 45% of patients admitted are aged <3 years, consistent with the finding that younger children are more likely to have severe disease.³

SEVERITY OF ILLNESS

Clinical features at presentation were generally well-documented and the severity of symptoms was similar across all three audit periods. Rates of hypoxaemia were consistent with admission oxygen saturation <92% in 37.5–38.8% of cases. Hypoxaemia is one of the key indications for admission to hospital in both versions of the BTS

guidance. Costal recession was documented in 51–54% of cases, while grunting was noted in 8–9% and apnoea in only 1–2%.

Wheeze was noted less frequently in the 2009/2010 audit compared with subsequent audits. In 2009/2010, 32% of those aged <5 years and 28% of those aged >5 years had wheeze while, in 2010/2011 and 2011/2012, approximately 57% of those aged <5 years and 70% of children aged >5 years wheezed. A history of poor feeding was noted in 55–65%. Fever of 38–39°C was noted in 33.2–37.7%, with a high fever of >39°C present in 29.3–37.8%.

INVESTIGATIONS

Chest x-rays were performed frequently with a marginal reduction from 94% of cases in 2009/2010 to 90% in 2011/2012, although both guidelines suggest it need not be routine in mild uncomplicated CAP. The guidelines also state that acute phase reactants are not helpful in distinguishing bacterial from viral pneumonia and so should not be measured routinely. The latest audit (2011/2012) showed that white blood cell count and C-reactive protein were measured in 62.6% and 62.1% of patients, respectively.

The 2002 CAP guideline recommended that blood cultures be performed in all children suspected of having a bacterial pneumonia, but the 2011 guideline changed the recommendations so that microbiological investigations including blood cultures were reserved for cases of severe pneumonia requiring intensive care or those with complications of CAP. The proportion of children having blood cultures was at its lowest at 52.1% in the 2011/2012 cohort. Rates of other microbiological investigations have also decreased (28.2% in 2011/2012, 36.8% in 2010/2011 and 45.8% in 2009/2010) and may reflect adherence to the revised BTS recommendations.

A causative organism was identified in 17% of samples sent in 2009/2010 compared with 20% and 14% in 2010/2011 and 2011/2012, respectively. Table 1 shows the commonest organisms isolated in each audit period. Viral pathogens were the most frequently isolated with respiratory syncytial virus (RSV) being the commonest. In the 2010/2011 cohort, influenza viruses also played a very significant role and, in fact, cumulatively influenza types A, B and H1N1 caused more cases than RSV (23.2% vs 17.3%). *Streptococcus pneumoniae* has consistently been the commonest bacterial pathogen isolated. These findings are in keeping with epidemiological data on causes of pneumonia in the winter season.

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Table 1 Aetiology of CAP where a causative organism was identified in children admitted to hospital with CAP

Organism	cases with specific organism identified (%)		
	2009/2010 (n=149, 17%)	2010/2011 (n=426, 20%)	2011/2012 (n=308, 14%)
Bacterial			
Group A β haemolytic <i>Streptococcus</i>	2.7	2.5	1.6
<i>Haemophilus influenzae</i>	4	3.3	4.9
MRSA	0.7	0.2	–
<i>Moraxella catarrhalis</i>	0.7	0.7	1.6
<i>Mycoplasma pneumoniae</i>	2.7	4	8.4
<i>Pseudomonas</i> sp	2	1.9	6.5
<i>Staphylococcus aureus</i>	2	0.9	2.3
<i>Streptococcus pneumoniae</i>	21.5	10.3	11
Viral			
Adenovirus	0.7	1.6	3.2
Influenza A	1.3	4.9	3.6
Influenza B	–	6.3	0.3
Influenza H1N1	6.7	12.0	–
Parainfluenza	0.7	1.4	3.2
RSV	34.9	17.3	29.9
Other	19.5	32.3	23.3

CAP, community-acquired pneumonia; MRSA, methicillin-resistant *S aureus*; RSV, respiratory syncytial virus.

MANAGEMENT

In 2009/2010 and 2010/2011, data on the type of antibiotic but not the route of administration were collected. Co-amoxiclav was the commonest antibiotic used (29.7–34.5% in those aged <5 years and 25.5–29.4% in those aged \geq 5 years) with macrolides in second place (20.1% in those aged <5 years and 23.3–27.2% in those aged \geq 5 years). Amoxicillin was only prescribed in 17.6–21.1% of children aged <5 years and 10.8–15.2% of those \geq aged 5 years. The latest audit (2011/2012) provides data on antibiotics according to mode of delivery. There were 3123 prescriptions of oral antibiotics in 2482 children (88.2%). Of the 3123 prescriptions, 35.2% were for a macrolide, 34.2% were for co-amoxiclav and only 24.2% were for amoxicillin. There were 1704 prescriptions of intravenous antibiotics in 1469 children (52.1%). The most commonly prescribed intravenous antibiotics were co-amoxiclav (39.6%), cefuroxime (17.8%), amoxicillin (7.6%) and cefotaxime (6.3%). The results indicate that the BTS guideline recommendation that amoxicillin should be used as the first-line antibiotic is not being followed in practice, despite this being upheld in the 2011 update. It may be that the use of antibiotics prior to hospital admission (28.6–31.8% of children in each cohort) impacted on the choice of antibiotic during the subsequent admission.

Intravenous fluids were used in 28–32% of cases. It seems likely that these children also received intravenous antibiotics. However, in the 2011/2012 audit, only 28% needed intravenous fluids while 52.1% had intravenous antibiotics, which indicates that an inability to tolerate oral fluids is not the main reason for the decision to give intravenous antibiotics. The 2011 guideline is clear that intravenous antibiotics should only be used where oral antibiotics are not tolerated/absorbed or when there is evidence of septicaemia or complicated CAP.

Oxygen was administered to approximately 46% of cases during all three audit periods. Intensive care with assisted ventilation was required in only 3–4%. Bronchodilators were used in a significant proportion of children admitted with CAP and

increased slightly over the three audit periods from 35% in 2009/2010 to 41% in 2010/2011 and 43% in 2011/2012. This is consistent with wheeze being a more common clinical sign in the more recent audits. The use of chest physiotherapy remained static at 15–17% across the three audit periods, despite increasingly strong evidence that chest physiotherapy is not useful in the management of CAP in children,⁴ as reflected in both versions of the BTS guideline. This is overuse of an already overstretched secondary care resource.

OUTCOMES, COMPLICATIONS AND FOLLOW-UP

Duration of hospital stay for children with CAP is consistently low with a median length of stay of 1 day in all datasets. The proportion staying less than 3 days increased from approximately 60% in 2009/2010 to 67% in 2011/2012. Only 17–22% of cases were admitted for 5 days or more.

The commonest complication in those admitted with CAP was empyema, affecting 2–7% of cases. Lung abscess was identified in <1%. Other complications were identified in only 1–2%. The BTS guideline recommends re-evaluation of a child who remains febrile or unwell 48 h after hospital admission for possible complications.

Hospital follow-up is only recommended in those with severe pneumonia, empyema or lung abscess. Despite this, 33–36% of cases received an outpatient appointment, which seems excessive based on the severity data and complication rates reported. The guideline states that a follow-up chest x-ray should be considered in those with round pneumonia, collapse or persisting symptoms only. The audit data reveal that follow-up chest x-rays were performed in 15% in 2009/2010, 14% in 2010/2011 and 11% in 2011/2012. There appears to be a slight downward trend, although more should be done to curtail this practice.

CONCLUSION

Childhood pneumonia is a common reason for hospital admission. The cases that were audited demonstrate similar demographics, illness severity and complication rates across the three audit periods. However, the results suggest that investigations are overused. The results also suggest that more cases could be managed with oral rather than intravenous antibiotics and that amoxicillin is an underused antibiotic. Chest physiotherapy, outpatient reviews and repeat chest x-rays are overused despite good evidence to back up the BTS recommendations on these topics. In order to provide optimal evidence-based clinical care and preserve valuable secondary care resources, these practices need to change.

These data have highlighted areas for improvement in the management of pneumonia in children. We hope that there will be a continuing rise in the number of centres participating in the annual BTS Paediatric Pneumonia Audit, and this will facilitate ongoing discussion about management of this common and potentially serious childhood illness.

Competing interests None.

Provenance and peer review Not commissioned; internally peer reviewed.

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