Change in viral bronchiolitis management in hospitals in the UK after the publication of NICE guideline

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ABSTRACT

Background  Viral bronchiolitis is one of the most common causes of hospitalisation in young infants. It has previously been shown that many UK hospital Trusts were not compliant with many aspects of the NICE bronchiolitis guideline prior to its publication.

Objectives  This study aimed to investigate changes in the management of bronchiolitis by hospital Trusts between 2015 (before NICE guideline publication) and 2017, after publication.

Study design  We prospectively surveyed paediatricians at UK hospital Trusts on the management of bronchiolitis before (March to May 2015) and after (January to May 2017) the NICE bronchiolitis guideline publication in June 2015, using an electronic, structured questionnaire.

Results  In 2015 111 Trusts were represented and in 2017 100 Trusts. Significant improvements were seen in the use of nebulised bronchodilators and hypertonic saline and provision of parental written guidance. However, full compliance with the guideline did not change with 18% of Trusts compliant before publication of the guideline in 2015 and 19% fully compliant with the guideline in 2017.

Conclusions  Overall there were modest but important improvements in the reported management of bronchiolitis after the publication of the NICE guideline.

Keywords: NICE, bronchiolitis, hospital trusts, viral testing, cohorting
INTRODUCTION

Viral bronchiolitis results in up to 25,000 hospital admissions per year in England with a 15-fold variation in hospital admission rates between different NHS Trusts across England [1]. Individual differences in hospital management have been suggested as a contributory factor to this variation [2]. The National Institute for Health and Care Excellence (NICE) published the first national (English) bronchiolitis guideline in June 2015 [3] to try to reduce this variation in management. We have previously shown that many Trusts were not compliant with the NICE guideline prior to its’ publication [4], despite similar guidance already being available from the Scottish Intercollegiate Guideline Network (SIGN) [5]. This study investigates the changes in hospital Trust management after NICE guideline publication.

OBJECTIVES

The aim of this study was to investigate changes in the management of bronchiolitis by hospital Trusts between 2015 (before NICE guideline publication) and 2017, after publication. In our previous study we had also investigated the use of respiratory virus testing and isolation/cohorting of infants with viral bronchiolitis by Trusts and thus a secondary aim of this study was to assess any changes in these practices. The data from the 2015 survey have been published previously [4].

STUDY DESIGN

A structured electronic questionnaire was sent to paediatricians from all Trusts in the UK that provide paediatric care (n=170) between March to May 2015 and January to
May 2017 as previously described [4]. It was sent as a link via e-mail to paediatric consultants and trainees working at each Trust. We compared the responses from Trusts in 2015 and 2017. How many of the same clinicians completed the survey in both years is not known as the survey was completed anonymously but 42 Trusts had a participant complete the survey in both years.

Statistical analysis

Proportions were compared using the Chi squared or Fisher’s exact test. Continuous variables were tested for normality using the Shapiro-Wilk test and data were analysed using either the independent T-test or the Mann-Whitney U test as appropriate. Statistical analysis was carried out with IBM SPSS Statistics (Version 24, New York, USA).

Ethical approval was not required for this study.

RESULTS

Demographics

Of 100 the Trusts included in 2017, 75% were district general hospitals and 25% university hospitals. 99% of Trusts had an emergency department and 15% a paediatric intensive care unit (PICU). 50% of Trusts reported most children are initially seen by emergency doctors and 46% by paediatric doctors. Responses were obtained from 87 (87%) general paediatric consultants, four (4%) respiratory consultants and nine (9%) junior doctors. All respondents were involved in the management of infants with acute bronchiolitis.
111 (65%) Trusts were represented by the responses in 2015 and 100 (59%) in 2017. In 2015 100 (90%, 95% confidence interval [95% CI] 83-95%) Trusts had a guideline compared with 89 (89%, 95% CI 81-94%) in 2017, a difference of -1% (95% CI -9 to +7%, P=0.82). In 2017 58 (65%, 95% CI 55-74%) Trusts had updated their bronchiolitis guideline in light of the 2015 NICE guideline.

**Use of supplemental oxygen**

There was no significant change in the proportion of Trusts advising supplemental oxygen at the NICE recommended threshold of <92% after the guideline was published (58% versus 66%, Difference +8% [95% CI -6% to +21%], P=0.25).

**Intravenous (IV) fluids**

Most Trusts reserved IV fluids for infants with severe disease or other specific issues in both years (2015 versus 2017; 86% versus 96%, Difference +10% [95% CI 2-19%], P=0.02).

**Chest physiotherapy and suctioning**

Similar proportions of Trusts in 2015 and 2017 (26% versus 31%, Difference +5% [95% CI -7 to +18%], P=0.45) recommended undertaking chest physiotherapy only in specific circumstances (e.g. patients with difficulty clearing secretions) in line with the NICE recommendations.

The proportion of Trusts recommending nasal suctioning for all hospitalised infants significantly decreased from 2015 to 2017 (39% versus 22%, Difference -17% [95% CI -4 to -29%], P=0.01) in line with the NICE recommendations.

**Investigations**
The majority of Trusts only undertook blood gas testing (84% and 86% in 2015 and 2017 respectively, Difference +2% [95% CI -8 to +12%], P=0.70) and chest x-rays (65% and 74% in 2015 and 2017 respectively, Difference +9% [95% CI -4 to +22%], P=0.18) in infants requiring high dependency unit (HDU) or paediatric intensive care unit (PICU) admission.

**Medications**

Between 2015 and 2017 there were improvements in the reported use of almost all medications not recommended by NICE (Table 1).

Table 1: The number of Trusts advising against routine use of various medications in each year. Data presented as n (%, 95% confidence interval).

<table>
<thead>
<tr>
<th>Medication</th>
<th>2015</th>
<th>2017</th>
<th>% Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhaled (via spacer) bronchodilator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(NICE recommendation: Do not use salbutamol or ipratropium bromide)</td>
<td>69 (69%, 59-77%)</td>
<td>72 (81%, 72-88%)</td>
<td>+12% (-0.5 to +24%)</td>
<td>0.059</td>
</tr>
<tr>
<td>Nebulised bronchodilator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(NICE recommendation: Do not use salbutamol or ipratropium bromide)</td>
<td>53 (53%, 43-63%)</td>
<td>62 (70%, 59-78%)</td>
<td>+17% (3-30%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Nebulised adrenaline</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(NICE recommendation: Do not use nebulised adrenaline)</td>
<td>78 (78%, 69-85%)</td>
<td>78 (88%, 72-93%)</td>
<td>+10% (-1 to +20%)</td>
<td>0.07</td>
</tr>
<tr>
<td>Inhaled (via spacer) steroids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(NICE recommendation: Do not use inhaled corticosteroids)</td>
<td>95 (95%, 89-98%)</td>
<td>85 (96%, 89-98%)</td>
<td>+1% (-6 to +8%)</td>
<td>0.74</td>
</tr>
<tr>
<td>Nebulised steroids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(NICE recommendation: Do not use inhaled corticosteroids)</td>
<td>95 (95%, 89-98%)</td>
<td>87 (98%, 92-99%)</td>
<td>+3% (-3 to +9%)</td>
<td>0.27</td>
</tr>
<tr>
<td>Oral steroids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(NICE recommendation: Do not use oral corticosteroids)</td>
<td>93 (93%, 86-97%)</td>
<td>87 (98%, 92-99%)</td>
<td>+5% (-2 to +12%)</td>
<td>0.10</td>
</tr>
<tr>
<td>Treatment</td>
<td>2015 (%)</td>
<td>2017 (%)</td>
<td>Difference (%)</td>
<td>P-value</td>
</tr>
<tr>
<td>-----------------------------------</td>
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<td>----------</td>
<td>----------------</td>
<td>---------</td>
</tr>
<tr>
<td>Nebulised hypertonic saline</td>
<td>45 (45%, 36-55%)</td>
<td>60 (67%, 57-76%)</td>
<td>+22% (8-35%)</td>
<td>0.003</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>69 (69%, 59-77%)</td>
<td>72 (81%, 72-88%)</td>
<td>+12% (-0.5 to +24%)</td>
<td>0.059</td>
</tr>
<tr>
<td>Montelukast</td>
<td>100 (100%, 96-100%)</td>
<td>87 (98%, 92-99%)</td>
<td>-2% (-7 to +2%)</td>
<td>0.16</td>
</tr>
<tr>
<td>Heliox</td>
<td>99 (99%, 95-100%)</td>
<td>86 (97%, 91-99%)</td>
<td>-2% (-8 to +3%)</td>
<td>0.32</td>
</tr>
<tr>
<td>Ribavirin</td>
<td>96 (96%, 90-98%)</td>
<td>83 (93%, 86-97%)</td>
<td>-3% (-11 to +4%)</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Written advice

Significantly more Trusts routinely gave written information to parents in 2017 than 2015 (51% versus 87%, Difference +36% [95% CI 23-47%], P<0.0001).

Overall NICE guideline compliance

There was no significant improvement in the proportion of Trusts that were fully compliant with the NICE guideline from 2015 to 2017 (18% versus 19%, Difference +1% [95% CI -10 to +12%], P=0.86). Compliance with individual aspects of the NICE guideline ranged from 43% to 100% in 2015 and 52% to 97% in 2017.

Respiratory viral testing

The proportion of Trusts routinely testing hospitalised infants for respiratory viruses significantly decreased between 2015 and 2017 (72% versus 44%, Difference -27% [95% CI -14 to -39%], P=0.0001).
There was an increase in those Trusts only undertaking respiratory virus testing in infants with severe bronchiolitis (requiring HDU/PICU) (15% versus 40%, Difference 25% [95% CI 13-36%], P<0.0001).

Twenty-two (20%) Trusts in 2015 and 18 (18%) in 2017 (Difference -2% [95% CI -13 to +9%], P=0.71) used respiratory syncytial virus (RSV) point of care tests in the emergency department (ED) to diagnose RSV infection as a cause of bronchiolitis.

In 2015, 74 (68%) Trusts tested respiratory samples for RSV, influenza and other respiratory viruses, 28 (26%) for RSV only and four (4%) for RSV and influenza only compared with 52 (52%), 21 (21%) and 10 (10%) in 2017 respectively (P=0.10, comparing the mutually exclusive different options of testing between the years).

**Cohorting policies**

Cohorting policies remained similar across the two years (P=0.46) (Table 2).

Table 2: The number of Trusts using each of the different cohorting policies. Data presented as n (%, 95% confidence interval). The options were mutually exclusive.

<table>
<thead>
<tr>
<th>Cohorting policy</th>
<th>2015</th>
<th>2017</th>
<th>Difference</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>All infants to individual rooms/cubicles</td>
<td>39 (35%, 27-45%)</td>
<td>29 (29%, 21-39%)</td>
<td>-6% (-18 to +7%)</td>
<td></td>
</tr>
<tr>
<td>Cohort infants regardless of virus</td>
<td>18 (16%, 11-24%)</td>
<td>15 (15%, 9-23%)</td>
<td>-1% (-11 to +9%)</td>
<td></td>
</tr>
<tr>
<td>Cohort infants with the same virus</td>
<td>18 (16%, 11-24%)</td>
<td>26 (26%, 18-35%)</td>
<td>+10% (-1 to 21%)</td>
<td>0.46</td>
</tr>
<tr>
<td>Cohort infants testing positive for RSV separate to infants testing positive for other viruses</td>
<td>25 (23%, 16-31%)</td>
<td>19 (19%, 13-28%)</td>
<td>-4% (-15 to +7%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>10 (9%, 5-16%)</td>
<td>11 (11%, 6-19%)</td>
<td>+2% (-6 to +11%)</td>
<td></td>
</tr>
</tbody>
</table>
*The P value compares the five different cohorting options across the two years.

**DISCUSSION**

In this study we demonstrated modest but significant improvements in Trusts’ reported management of viral bronchiolitis after the publication of the NICE guideline. We have previously shown the NICE guideline resulted in similar modest improvements in the primary care management of bronchiolitis [6].

That only modest improvements are seen is not surprising given the relatively short time between the surveys, that there was already very high compliance in several areas and resistance to change and difficulties translating guidelines into clinical practice being long-recognised problems. To try to overcome these problems NICE recommends using questionnaires to obtain a clear picture of current practice [7], which was the aim of this study. Widely distributed educational materials, regular national surveys and individual Trust audits are useful in helping adopt new guidelines into routine clinical practice [7]. We would welcome this for future updates of the NICE bronchiolitis guideline.

The American Academy of Paediatrics published their bronchiolitis guideline in 2006. A large study investigated adherence to the guideline in three time cohorts; pre-guideline, post-guideline early (one to two years post guideline) and post-guideline late (five to six years post guideline) [8]. There was minimal change between pre-guideline and post-guideline early but significant reductions in the use of steroids and bronchodilators and number of blood tests and chest X-rays performed between the pre-guideline and post-guideline late groups. This suggests significant changes
take time to be adopted into clinical practice. A Swiss study surveyed 1180 paediatricians, and found that one to three years after publication of a bronchiolitis guideline with a national implementation strategy there were significant reductions in the use of bronchodilators and steroids [9], similar results to our study.

Our study has several strengths and limitations. We have prospective, longitudinal data from a large number of Trusts representative of different size hospitals and geographic locations throughout the UK. Responses were only obtained from approximately 60% of relevant Trusts and thus it is possible that clinicians in higher performing Trusts may have been more likely to respond. Individual patient notes were not examined and so we cannot comment on how these reported results translate to actual patient care. In addition, as some Trusts had replies from multiple clinicians which were not always identical, there may have been some individual clinician bias which may have resulted in either an under or over estimation of the use of investigations or non-recommended medications. Forty-two Trusts completed the survey in both years, thus some differences may be due to variation in the others completing the survey in each year.

Although it is recognised that guidelines are not always followed by individual clinicians, it remains important to establish Trusts’ recommendations as best practice. Many departments have high turnover of staff, particularly of junior doctors, and thus guidelines are an important tool in maintaining good clinical practice.

In conclusion, modest but significant improvements in reported care have been made since the publication of NICE guideline. Given the high-volume nature of this condition, even small improvements may affect the care of large numbers of children.
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Competing interests: AJP has previously conducted studies on behalf of Oxford University funded by vaccine manufacturers, but currently does not undertake industry funded clinical trials. AJP chairs the UK Department of Health’s (DH) Joint Committee on Vaccination and Immunisation (JCVI) and is a member of the World Health Organization’s (WHO) Strategic Advisory Group of Experts. The views expressed in this manuscript are those of the authors and do not necessarily reflect the views of the JCVI, the DH, or the WHO.

SBD, EJC and RB have no conflicts of interest to declare.

Ethical approval: Not required.

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