

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

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27 **publication of NICE guideline**

28 **ABSTRACT**

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

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

36 **Study design** We prospectively surveyed paediatricians at UK hospital Trusts on the
37 management of bronchiolitis before (March to May 2015) and after (January to May
38 2017) the NICE bronchiolitis guideline publication in June 2015, using an electronic,
39 structured questionnaire.

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

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

47

48 **Keywords:** NICE, bronchiolitis, hospital trusts, viral testing, cohorting

49 **INTRODUCTION**

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

60

61 **OBJECTIVES**

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

68

69 **STUDY DESIGN**

70 A structured electronic questionnaire was sent to paediatricians from all Trusts in the
71 UK that provide paediatric care (n=170) between March to May 2015 and January to

72 May 2017 as previously described [4]. It was sent as a link via e-mail to paediatric
73 consultants and trainees working at each Trust. We compared the responses from
74 Trusts in 2015 and 2017. How many of the same clinicians completed the survey in
75 both years is not known as the survey was completed anonymously but 42 Trusts
76 had a participant complete the survey in both years.

77 **Statistical analysis**

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

83 Ethical approval was not required for this study.

84

85 **RESULTS**

86 **Demographics**

87 Of 100 the Trusts included in 2017, 75% were district general hospitals and 25%
88 university hospitals. 99% of Trusts had an emergency department and 15% a
89 paediatric intensive care unit (PICU). 50% of Trusts reported most children are
90 initially seen by emergency doctors and 46% by paediatric doctors. Responses
91 were obtained from 87 (87%) general paediatric consultants, four (4%) respiratory
92 consultants and nine (9%) junior doctors. All respondents were involved in the
93 management of infants with acute bronchiolitis.

94 111 (65%) Trusts were represented by the responses in 2015 and 100 (59%) in
95 2017. In 2015 100 (90%, 95% confidence interval [95% CI] 83-95%) Trusts had a
96 guideline compared with 89 (89%, 95% CI 81-94%) in 2017, a difference of -1%
97 (95% CI -9 to +7%, P=0.82). In 2017 58 (65%, 95% CI 55-74%) Trusts had updated
98 their bronchiolitis guideline in light of the 2015 NICE guideline.

99 **Use of supplemental oxygen**

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

103 **Intravenous (IV) fluids**

104 Most Trusts reserved IV fluids for infants with severe disease or other specific issues
105 in both years (2015 versus 2017; 86% versus 96%, Difference +10% [95% CI 2-
106 19%], P=0.02).

107 **Chest physiotherapy and suctioning**

108 Similar proportions of Trusts in 2015 and 2017 (26% versus 31%, Difference +5%
109 [95% CI -7 to +18%], P=0.45) recommended undertaking chest physiotherapy only in
110 specific circumstances (e.g. patients with difficulty clearing secretions) in line with the
111 NICE recommendations.

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

115 **Investigations**

116 The majority of Trusts only undertook blood gas testing (84% and 86% in 2015 and
 117 2017 respectively, Difference +2% [95% CI -8 to +12%], P=0.70) and chest x-rays
 118 (65% and 74% in 2015 and 2017 respectively, Difference +9% [95% CI -4 to +22%],
 119 P=0.18) in infants requiring high dependency unit (HDU) or paediatric intensive care
 120 unit (PICU) admission.

121 **Medications**

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

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

Medication	2015	2017	% Difference	P Value
Inhaled (via spacer) bronchodilator (NICE recommendation: Do not use salbutamol or ipratropium bromide)	69 (69%, 59-77%)	72 (81%, 72-88%)	+12% (-0.5 to +24%)	0.059
Nebulised bronchodilator (NICE recommendation: Do not use salbutamol or ipratropium bromide)	53 (53%, 43-63%)	62 (70%, 59-78%)	+17% (3-30%)	0.02
Nebulised adrenaline (NICE recommendation: Do not use nebulised adrenaline)	78 (78%, 69-85%)	78 (88%, 72-93%)	+10% (-1 to +20%)	0.07
Inhaled (via spacer) steroids (NICE recommendation: Do not use inhaled corticosteroids)	95 (95%, 89-98%)	85 (96%, 89-98%)	+1% (-6 to +8%)	0.74
Nebulised steroids (NICE recommendation: Do not use inhaled corticosteroids)	95 (95%, 89-98%)	87 (98%, 92-99%)	+3% (-3 to +9%)	0.27
Oral steroids (NICE recommendation: Do not use oral corticosteroids)	93 (93%, 86-97%)	87 (98%, 92-99%)	+5% (-2 to +12%)	0.10

Nebulised hypertonic saline (NICE recommendation: Do not use nebulised hypertonic saline)	45 (45%, 36-55%)	60 (67%, 57-76%)	+22% (8-35%)	0.003
Antibiotics (NICE recommendation: Do not use antibiotics)	69 (69%, 59-77%)	72 (81%, 72-88%)	+12% (-0.5 to +24%)	0.059
Montelukast (NICE recommendation: Do not use montelukast)	100 (100%, 96-100%)	87 (98%, 92-99%)	-2% (-7 to +2%)	0.16
Heliox (No NICE recommendation on Heliox)	99 (99%, 95-100%)	86 (97%, 91-99%)	-2% (-8 to +3%)	0.32
Ribavirin (No NICE recommendation on ribavirin)	96 (96%, 90-98%)	83 (93%, 86-97%)	-3% (-11 to +4%)	0.36

126

127 **Written advice**

128 Significantly more Trusts routinely gave written information to parents in 2017 than
129 2015 (51% versus 87%, Difference +36% [95% CI 23-47%], P<0.0001).

130 **Overall NICE guideline compliance**

131 There was no significant improvement in the proportion of Trusts that were fully
132 compliant with the NICE guideline from 2015 to 2017 (18% versus 19%, Difference
133 +1% [95% CI -10 to +12%], P=0.86). Compliance with individual aspects of the
134 NICE guideline ranged from 43% to 100% in 2015 and 52% to 97% in 2017.

135 **Respiratory viral testing**

136 The proportion of Trusts routinely testing hospitalised infants for respiratory viruses
137 significantly decreased between 2015 and 2017 (72% versus 44%, Difference -27%
138 [95% CI -14 to -39%], P=0.0001).

139 There was an increase in those Trusts only undertaking respiratory virus testing in
 140 infants with severe bronchiolitis (requiring HDU/PICU) (15% versus 40%, Difference
 141 25% [95% CI 13-36%], P<0.0001).

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

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

149 **Cohorting policies**

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

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

Cohorting policy	2015	2017	Difference	P value*
All infants to individual rooms/cubicles	39 (35%, 27-45%)	29 (29%, 21-39%)	-6% (-18 to +7%)	0.46
Cohort infants regardless of virus	18 (16%, 11-24%)	15 (15%, 9-23%)	-1% (-11 to +9%)	
Cohort infants with the same virus	18 (16%, 11-24%)	26 (26%, 18-35%)	+10% (-1 to 21%)	
Cohort infants testing positive for RSV separate to infants testing positive for other viruses	25 (23%, 16-31%)	19 (19%, 13-28%)	-4% (-15 to +7%)	
Other	10 (9%, 5-16%)	11 (11%, 6-19%)	+2% (-6 to +11%)	

153 *The P value compares the five different cohorting options across the two years.

154

155 **DISCUSSION**

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

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

169 The American Academy of Paediatrics published their bronchiolitis guideline in 2006.
170 A large study investigated adherence to the guideline in three time cohorts; pre-
171 guideline, post-guideline early (one to two years post guideline) and post-guideline
172 late (five to six years post guideline) [8]. There was minimal change between pre-
173 guideline and post-guideline early but significant reductions in the use of steroids
174 and bronchodilators and number of blood tests and chest X-rays performed between
175 the pre-guideline and post-guideline late groups. This suggests significant changes

176 take time to be adopted into clinical practice. A Swiss study surveyed 1180
177 paediatricians, and found that one to three years after publication of a bronchiolitis
178 guideline with a national implementation strategy there were significant reductions in
179 the use of bronchodilators and steroids [9], similar results to our study.

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

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

196 In conclusion, modest but significant improvements in reported care have been
197 made since the publication of NICE guideline. Given the high-volume nature of this
198 condition, even small improvements may affect the care of large numbers of
199 children.

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