



**QUEEN'S  
UNIVERSITY  
BELFAST**

## Is follow up chest X-ray required in children with round pneumonia?

McCrossan, P., McNaughten, B., Shields, M., & Thompson, A. (2017). Is follow up chest X-ray required in children with round pneumonia? *Archives of Disease in Childhood*, 1-3. <https://doi.org/10.1136/archdischild-2017-313980>

**Published in:**  
Archives of Disease in Childhood

**Document Version:**  
Peer reviewed version

**Queen's University Belfast - Research Portal:**  
[Link to publication record in Queen's University Belfast Research Portal](#)

**Publisher rights**  
Copyright 2017 BMJ Publishing Group. This work is made available online in accordance with the publisher's policies. Please refer to any applicable terms of use of the publisher.

**General rights**  
Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

**Take down policy**  
The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact [openaccess@qub.ac.uk](mailto:openaccess@qub.ac.uk).

## **Authors**

Dr.Patrick McCrossan (Paediatric ST4, Royal Belfast Hospital for Sick Children)

Dr.Benjamin McNaughten (Paediatric teaching fellow, RBHSC)

Professor Michael Shields (Clinical Professor at Queen's University Belfast and Consultant Paediatric Respiratory Physician, RBHSC)

Dr.Andrew Thompson (Consultant Paediatrician, RBHSC)

## **Title**

Is follow up chest X-ray required in children with round pneumonia?

## **Scenario**

An 8-year-old boy was admitted with a 5-day history of cough, shortness of breath and fever. A round opacification on his chest X-ray was reported as a round pneumonia by a consultant radiologist. He was treated with oxygen and intravenous antibiotics. He is clinically improved and medically fit for discharge. You have been asked to arrange a follow up chest X-ray and wonder as to the value of this additional exposure to radiation.

## **Structured clinical question**

Is follow up X-ray required in a child with clinical and radiological findings in-keeping with round pneumonia?

## Search

We performed an online search using PubMed and Medline (1946-present) in July 2017. The key terms used were 'round pneumonia' or 'round opacification'. We limited the search to include articles written in English and those relating to children. Our searches of these databases yielded 67 and 39 results respectively. On review of titles and abstracts we identified 5 relevant articles. In addition we identified a further abstract of relevance to this review. All the included articles are shown in Table 1. The level of evidence was graded according to the Oxford levels of evidence.<sup>1</sup>

## Summary

<b>Citation</b>	<b>Study group (population and comparison)</b>	<b>Study type (level of evidence)</b>	<b>Outcome</b>	<b>Key result</b>	<b>Comments (one line)</b>
Yong-Woo Kim, L. F. (2007). <sup>2</sup>	All children reported to have 'round pneumonia' between 2000-2006 in one hospital (Level 4)	Retrospective review of images.	<ul style="list-style-type: none"><li>• 109 cases</li><li>• Follow up x-ray in 43/109<ul style="list-style-type: none"><li>○ 95% resolution</li></ul></li><li>• There were no cases where bronchogenic cyst, neoplasm or other congenital malformation was mistakenly labelled a round pneumonia.</li></ul>	109 of 109 cases were correctly reported as a round pneumonia.  Radiographic changes resolved in 95% of the 43 patients who had a repeat x-ray. In 5% of cases there was a progression to lobar pneumonia.	Radiological diagnosis of round pneumonia is accurate and X-ray changes resolve with patients improving condition.

<p>Fretzayas A, M. M. (2010).<sup>3</sup></p>	<p>Case controlled clinical series of 30 children with round pneumonia compared with 30 control children with lobar pneumonia. (Level 3)</p>	<p>Case controlled clinical series.</p>	<ul style="list-style-type: none"> <li>• The two groups were not different with respect to severity of disease.</li> <li>• Mean hospital duration the same.</li> <li>• White cell count was considerably higher in round pneumonia.</li> <li>• All two month follow up x-rays showed full resolution</li> <li>• No case of round pneumonia was misdiagnosed.</li> </ul>	<ul style="list-style-type: none"> <li>• All two month x-rays showed full resolution.</li> <li>• No cases were mistakenly labelled as round pneumonia.</li> </ul>	<p>All two month x-rays showed full resolution.</p>
<p>Celebi S, H. M. (2008).<sup>4</sup></p>	<p>4 case reports of children with round pneumonia. (Level 4)</p>	<p>Case reports.</p>	<p>4 children admitted with fever, respiratory distress and crackles on examination. Round lesion seen on chest x-ray.</p>	<p>Symptoms and x-ray appearance resolved rapidly in all 4 cases with appropriate antibiotic therapy.</p>	<p>4 cases were clinically and radiologically in keeping with round pneumonia.</p>

H Bentur, S. H. (2012). <sup>5</sup>	1 case report of child with radiographic findings of round opacification on chest x-ray. (Level 4)	Case report.	Diagnosis of pulmonary arteriovenous malformation.	This child had persistent symptoms despite treatment with antibiotics for presumed pneumonia.	The persistent symptoms were not in keeping with round pneumonia and so further investigation was warranted.
Karabouta Z, A. M.-P. (2012). <sup>6</sup>	Case report of child with 'round pneumonia'. (Level 4)	Case report.	Child presented with fever and respiratory distress. Diagnosis of round pneumonia was made on radiological evidence. Child responded well to treatment (antibiotics).	Repeat chest X-ray two months later showed 'persistent stellate atelectasis' – nil other action taken.	No evidence of round pneumonia seen on follow-up X-ray.
Yen-Li Liu, P.-S. W.-P.-H. (2014). <sup>7</sup>	Case report of child with round pneumonia. (Level 4)	Case report.	1 case of 7 year old boy with fever and cough. Round pneumonia diagnosed on chest x-ray. Subsequently confirmed Strep Pneumoniae. Responded well to oral antibiotics and was afebrile within two days. X-ray findings resolved.	Responded well to oral antibiotics and was afebrile within two days. X-ray findings resolved.	Findings resolved on follow up X-ray.

## Commentary

It is widely accepted that routine follow-up chest x-ray is not indicated in children with uncomplicated pneumonia who have responded well to appropriate antibiotic therapy.<sup>8,9,10,11</sup> Guidance on the value of follow-up chest radiography in children with round pneumonia is less definitive. Some articles and reviews recommend that children with round pneumonia should have a repeat x-ray in approximately 8 weeks.<sup>12,13,14</sup>

Our current practice to perform follow up x-ray in children with round pneumonia is likely to be an extension from adult practice, where lung cancer is common.<sup>15</sup> By contrast, round pneumonia is a well known entity within paediatrics. The physiological reasons for this are well understood.<sup>2</sup> Children have poorly developed pathways of collateral ventilation, more closely apposed connective tissue septae and smaller alveoli than adults. The result is more compact areas of pulmonary consolidation.<sup>16</sup>

An article in 2004 on the best practice for management of paediatric community acquired pneumonia recommends repeat chest X-ray in cases of round pneumonia.<sup>13</sup> This article cites two papers as justification for this recommendation; the first is a paper in the British Medical Journal (BMJ) by Gibson, referenced above, which does not specifically mention round pneumonia. The second paper is based on a questionnaire sent out to consultants asking when they would repeat chest X-ray.<sup>17</sup> The 2011 British Thoracic Society guidelines on the management of paediatric community acquired pneumonia also suggest considering performing follow-up chest X-ray in those with round pneumonia.<sup>12</sup> However, no evidence is cited to support this recommendation.

There is a paucity of literature relating to follow-up X-ray in round pneumonia and none of the abstracts we identified directly answer the question posed above. The case reports describe children who had a round opacification on chest X-ray, presenting with typical features of pneumonia and responded well to antibiotic therapy.<sup>5,6,7</sup> In all cases when the X-ray was repeated there was full resolution of the pneumonia. The case report by Bentur et al highlights the importance of considering an alternative diagnosis for a round opacification on chest X-ray when symptoms are persistent despite appropriate treatment.<sup>5</sup> The case controlled clinical series by Fretzayas et al demonstrated full resolution of round pneumonia on all follow-up X-rays and showed that no cases of round pneumonia were reported incorrectly.<sup>3</sup> A retrospective review of 109 chest X-rays showed that radiological diagnosis of round pneumonia is accurate and that the X-ray changes resolve with patients improving condition.<sup>2</sup>

These studies would suggest that a follow-up chest X-ray is of limited value, if at all, in children with round pneumonia who are responding well clinically to appropriate treatment.

### **Clinical bottom lines**

1. A child presenting with features of lower respiratory tract infection – fever, cough, increased work of breathing – who is found to have a round opacification on chest X-ray (reported by a radiologist as a round pneumonia), should be treated with appropriate antibiotics. (Grade C)
2. A child with round pneumonia who is responding appropriately to antibiotic therapy does not require follow-up chest X-ray. (Grade C)

Competing interest: None declared.

### **References**

1. OCEBM Levels of evidence working group. (2011, january 1). *The Oxford 2011 Levels of evidence*. Retrieved 2017, from The Oxford 2011
2. Yong-Woo Kim, L. F. (2007). Round pneumonia: imaging findings in a large series of children. *Paediatric radiology* , 1235-1240.
3. Fretzayas A, M. M. (2010). Observations in febrile children with round air space opacities. *Paediatrics international* , 444-446.
4. Celebi S, H. M. (2008). Round pneumonia in children. *Indian journal of paediatrics* , 75, 523-525.
5. H Bentur, S. H. (2012). The value of repeat chest radiograph in a child with pneumonia. *Archives of disease in childhood (supplement 1)* (97), A186
6. Karabouta Z, A. M.-P. (2012). Single pulmonary round mass in a 12-year old boy. *BMJ case reports* , 6356.
7. Yen-Li Liu, P.-S. W.-P.-H. (2014). Paeditric roudn penumonia. *Paediatrics ands neonatology* , 491-494
8. N A Gibson, A. S. (1993). value of radiological follow up of childhood pneumonia. *Britsih Medical Journal* , 1117

9. R. Virkki, T. J. (2005). Radiographic follow-up of pneumonia in children. *Paediatric pulmonology* , 223-227.
10. Pal Suren, K. T.-O. (2008). Radiographic follow-up of community-acquired pneumonia in children. *Acta Paediatrica* , 46-50
11. Ian Wacogne, R. J. (2003). Are follow up chest xray examinations helpful in the management of children recovering from pneumonia? *Archives of Disease in Childhood* , 457-458.
12. Michael Harris, J. C. (2011). Guideline for the management of community acquired pneumonia in children: update 2011. *Thorax* , Volume 66 Supplement 2.
13. Monica Lakhanpaul, m. A. (2004). Community acquired pneumonia in children: a clinical update. *Archives of disease in childhood. Education and practice* , 29-34.
14. Restrepo R, P. R. (2010). Imaging of round pneumonia and mimics in children. *Paediatric radiology* , 1931-1940.
15. Zhang Y, Y. Y. (2014). Round pneumonia in an adult. *Southeast Asian Journal of Tropical Medicine and Public Health* , 2017-213.
16. MK, M. (1998). Radiology rounds. Round pneumonia. *Canadian family physician* , 757-759.
17. Heaton P, A. K. (1998). The utility of chest radiography in the follow-up of childhood pneumonia. *New Zealand Medical Journal* , 315-317.