

Chest radiographs and ultrasound for the assessment of chest wall abnormalities in paediatrics

Dr Christopher Barrett (Junior Clinical Fellow), Ms Stephanie French (Specialist Paediatric Radiographer), Dr Mark Phillips (Consultant Paediatric Radiologist)
Leeds Teaching Hospitals NHS Trust

Background

GPs commonly refer children for chest X-rays (CXR) for assessment of chest wall abnormalities. Trust guidelines for Leeds Teaching Hospitals NHS Trust (LTHT) advise:

- ‘Thoracic cage anomaly’ is a valid indication for paediatric CXR.
- Lateral views **should** be included.
- Ultrasounds (USS) should be **considered to aid diagnosis**.

This audit evaluated:

- **Guideline adherence**
- Whether imaging results were **clinically actionable**.

RCR Standards (2018) emphasise the importance of actionable imaging that guides diagnosis and next steps in patient care. This audit assessed appropriateness and impact of imaging in this context, using the principle of actionable reporting as a benchmark.

Audit Standards

- Lateral views should be performed for CXRs investigating chest wall abnormality.
- USS should be performed, especially where abnormalities are likely related to costal cartilage concern.
- Imaging should provide clinically actionable information that influences diagnosis or management

Methodology

A retrospective CRIS search identified all GP-requested CXRs for patients under 16 years across the calendar year of 2023, where the referral mentioned chest wall abnormality (keywords : lump, deformity, asymmetry, prominence).

For each case, we recorded whether:

- CXR was normal or abnormal
- Abnormal findings were relevant to the clinical question or incidental
- Lateral view was performed
- USS was performed
- Imaging findings altered patient management (referral, treatment, follow-up)

Results

36 patients were identified (age range: 9 months – 15 years).

- **20/36 (56%)** had abnormal CXRs
- **15/36 (42%)** had findings relevant to the referral question, while 5/36 (14%) had incidental findings
- **8/36 (22%)** had a lateral view
- **11/36 (31%)** had USS
- **5/36 (14%)** had a tangible change to management (e.g. surgery, bracing, follow-up), although a greater number received ‘reassurance’ in follow-up by GP or in clinic.
- **Nearly half (47%)** had no follow-up

Pathology on XR of those related to clinical question:	
Scoliosis	3
Sternum angulation/bowing	3
Rib spacing	1
Exostosis	1
Broad rib	1
Thorax asymmetry likely asymmetry costal cartilage	1
Rib numbers unequal	1
Abnormality visualised on XR report but not reported	1
Scoliosis and pectus carinatum	1
Bifid rib	2

Pathology of the 15 patients with findings on CXR related to the clinical question

Referred to ortho/spinal (4) - outcome	
Awaiting scoliosis surgery	2
Seen in spinal clinic and referred on to thoracic surgery for pectus carinatum	1
Seen in spinal clinic and disagreed with original XR finding of scoliosis, offered further follow up for parental reassurance	1

Outcome of the 4 patients referred to orthopaedics/spinal team

The remaining 31 patients either had reassurance (from GP or from secondary care clinic) or no follow up.

Follow up of those related to clinical question:	
Referral to paediatric surgery	3
Referral to orthopaedic/spinal team	4
Offered and refused referral to surgery	2
GP follow up - reassurance	4
None	2

Follow up of the 15 patients with findings on CXR related to clinical question

Referred to paediatric surgery (3) - outcome	
Reassured and discharged	2
Reassurance, offer of bracing / referral to orthotics	1

Outcomes of the 3 patients referred to paediatric surgery

Overall, 5 patients (14%) with tangible changes to their management	
Offer of referral to orthotics from paediatric surgery	1
Scoliosis surgeries	2
Onward referral to thoracic surgery from spinal surgery	1
6 month follow up in spinal surgery (with repeat XRs) offered for parental reassurance	1

Outcomes of these 5 patients with changes to management

Discussion

Limited impact of CXRs on clinical management

- 5 of 36 cases (14%) led to tangible changes in management.
- CXRs mostly provided reassurance but no diagnostic or management value.
- Several patients were referred to surgery or spinal teams (especially for scoliosis), but often XR imaging played a supplementary rather than decisive role.

Examination often sufficient

- Common findings – e.g. scoliosis, pectus deformities – are typically clinically apparent on examination.
- CXR offered little beyond what a confident clinical assessment could provide.
- Potentially lack of confidence in referring GPs regarding assessment and appropriate local imaging pathways.

Lateral views underutilised

- Trust guideline adherence for lateral CXRs was poor (22%).
- Although lateral views rarely altered interpretation; only tangential views (in one exostosis case) proved useful.

Role of USS in cartilage abnormalities

- Cases concerning costal cartilage were better evaluated with USS, and could potentially go straight to USS based on examination findings
- Many of these sent for CXR first, despite limited value

Action Plan

- Improve vetting of GP referrals: flag unclear requests to radiologist for input, especially when considering whether request may go straight to USS
- Reinforce adherence to lateral view protocol, or otherwise remove this protocol given low utility of lateral views
- Educational outreach to GPs on appropriate imaging for chest wall abnormalities.
- Adopting RCR-aligned reporting standards – focused on actionable, clinically useful imaging – could reduce unnecessary tests and improve imaging value.

References

- The Leeds Teaching Hospitals NHS Trust. Paediatric X-Ray, Protocols and Authorisation Guidelines, version 2.1. 2024.
- The Royal College of Radiologists. Standards for interpretation and reporting of imaging investigations, second edition. London: The Royal College of Radiologists, 2018.