Background
Liver MRI with hepatobiliary contrast agents such as gadoxetate disodium (Primovist) plays a key role in liver lesion characterisation. Transient dyspnoea and resultant artefact with these agents is more frequent with gadoxetate disodium, affecting arterial phase sequences. To overcome transient severe motion (TSM) artefact, acquiring multiple arterial phases in a single breath hold may help obtain at least one adequate arterial phase sequence.

Methods (1st audit round)
Retrospective review of consecutive liver MRIs using Primovist between January and August 2014 on single 1.5T MRI scanner. Single reader evaluation of the presence of motion artefact on the arterial phase sequences. A five-point motion scoring system was used as outlined below. A score of ≥4 was deemed as having TSM.

<table>
<thead>
<tr>
<th>Score</th>
<th>Degree of motion artefact</th>
<th>Effect on image quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>Minimal</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Some but not severe</td>
</tr>
<tr>
<td>4</td>
<td>Severe</td>
<td>Images degraded but interpretable</td>
</tr>
<tr>
<td>5</td>
<td>Extensive</td>
<td>Images non-diagnostic</td>
</tr>
</tbody>
</table>

Results (1st audit round)
There were 50 scans in 48 patients (25 male, 23 females) with a mean age of 54.9 years (range 25 – 78). The distribution of the motion scores are illustrated in the chart below, with a mean score of 2.84. The incidence of TSM was 30%.

Methods (2nd audit round)
Retrospective review of consecutive liver MRIs using Primovist with TWIST-VIBE sequences between January and December 2016 on single 1.5T Siemens Aera MRI scanner. Single reader evaluation using motion scoring system as before, with the best score noted for each scan.

Results (2nd audit round)
There were 25 scans in 24 patients (12 male, 12 females) with a mean age of 55.5 years (range 18 – 76). The distribution of the motion scores are illustrated in the chart below, with a mean score of 2.52. The incidence of TSM reduced from 30% in 2014 to 16% in 2016.

1st Action Plan : Add in multiple arterial phase sequences to protocol and repeat audit to assess if diagnostic yield improves.

TWIST-VIBE : Volumetric gradient echo sequence with 5 arterial phase scans in single breath hold, therefore increasing opportunity of obtaining a diagnostic scan. However, potential compromise of reduced spatial resolution given shorter acquisition time per scan.

2nd Action Plan : Repeat audit in one year to ensure diagnostic rate persists and extend to gadobenate dimeglumine (Multihance) studies.

Conclusion
Gadoxetate disodium related breathing artefacts can be overcome using a multiple arterial phase technique. Despite our relatively small numbers, the incidence of TSM reduced from 30% to 16%, comparable to published literature (Davenport et al., 17%; Pietryga et al., 10.7%).

References: