Background:
The emerging practice of Portable CT Head imaging brings significant benefits for critically ill patients, for whom leaving the Intensive Care Unit (ICU) presents a considerable safety risk. However, the dose implication for other patients and staff remains unclear. Additionally, doubts remain with respect to image quality and diagnostic utility of studies obtained from the portable CT unit.

We aimed to identify if the practice of Portable Head CT imaging is associated with a significant increase in the background radiation level of a Neuro ICU at a University Hospital.

Methods:
Over a 3 month period, from 25 August 2016 – 25 November 2016 four optically stimulated luminescence (OSL) radiation monitors were strategically installed in the Neuro ICU with access to Portable CT imaging. As a control, three OSL monitors were also positioned in the General ICU. A non-inferiority study approach was taken with a margin (d)= 75 µSv. A further monitor was attached to the operator console of the Portable CT scanner.

All portable CT studies carried out on the Neurointensive care unit (NICU) between September 2015 and March 2017 were reviewed by a Consultant Neuroradiologist and Senior Neuroradiology trainee and assessed whether:
- Answered clinical question
- Gave good overall assessment

Scoring method utilised for determining scan quality

<table>
<thead>
<tr>
<th>Score</th>
<th>Comment</th>
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<tbody>
<tr>
<td>1</td>
<td>Clinical question cannot be answered</td>
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<tr>
<td>2</td>
<td>Clinical question answered</td>
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<tr>
<td>3</td>
<td>Clinical question answered with good overall interpretation</td>
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<td>4</td>
<td>Image quality as good as departmental CT</td>
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Dose results:
No significant increase in radiation level was detected in Neuro ICU compared with General ICU (mean dose differential 2.5±/−0.5 µSv, d=75 µSv, p<0.05), with similar numbers of plain radiographs performed each month in both departments (x vs. y, p= n.s.). The dose recorded at the operator's console was also low (10 µSv).

In total, 15 portable CT head investigations were performed during the 3 month observation period, with a mean patient dose length product (DLP) of 660.1 mGy.cm. This dose compared favourably with the mean departmental DLP of 921.7 mGy.cm.

Study quality results:
741 CT studies requested by NICU during audit period. 135 (18.2%) were portable studies
All portable CT head studies were deemed of sufficient quality to answer the clinical question. 67 of the 135 portable studies carried out between September 2015 and March 2017 also allowed a “good overall assessment”.

Conclusions:
Portable CT studies do not incur dose penalties for the patient, other NICU patients or NICU staff. All portable CT studies met the minimum requirement for interpretation and were capable of addressing the specific clinical question posed.

Implications:
Increased utilisation of portable CT brain studies on selected patients could reduce the burden on intensive care units to transfer unstable patients, without compromising diagnostic accuracy or at a dose cost to other patients and clinical staff.