TITLE: O-Arm Technology in Spinal, Neurological, Orthopedic, or Trauma Surgery Settings: Clinical Effectiveness, and Benefits and Harms

DATE: 07 August 2013

RESEARCH QUESTIONS

1. What is the clinical effectiveness of O-arm technology used in spinal, neurological, orthopedic, or trauma surgery settings?

2. What are the benefits and harms associated with O-arm technology in patients undergoing spinal, neurological, orthopedic, or trauma surgeries?

3. What are the harms associated with the use of O-arm technology in operating room hospital staff?

KEY MESSAGE

One randomized controlled trial and nine non-randomized studies were identified regarding the clinical effectiveness, benefits, and harms of O-arm technology used in surgical settings.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2013, Issue 6), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2003 and July 29th, 2013. Internet links were provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

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RESULTS

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials (RCTs), and non-randomized studies. One RCT and nine non-randomized studies were identified. Due to the large volume of relevant literature, non-comparative studies on O-arm effectiveness have been included in the appendix. Additional references of potential interest are also provided in the appendix.

OVERALL SUMMARY OF FINDINGS

Overall, studies agreed that the O-arm system was safe and accurate, with minimal radiation exposure, for spinal surgery and deep brain stimulation. One study, on radiation exposure during orthopedic surgery, found that the O-arm delivered higher doses of radiation to operators than did the C-arm technology. Further details of the included studies are provided in Table 1.

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Study Type</th>
<th>Surgical Procedure</th>
<th>Comparator</th>
<th>Authors’ Conclusions</th>
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<tbody>
<tr>
<td>Shin et al. 2013</td>
<td>RCT</td>
<td>Thoracic and lumbar spines</td>
<td>C-arm fluoroscopy</td>
<td>O-arm system was more accurate and safer than the fluoroscopy method for pedicle screw placement</td>
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<tr>
<td>Holloway et al. 2013</td>
<td>NRS</td>
<td>Deep brain stimulation</td>
<td>Computed tomography (CT)</td>
<td>O-arm system was as accurate as the CT scan</td>
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<tr>
<td>Hodges et al. 2012</td>
<td>NRS</td>
<td>Spinal surgery</td>
<td>C-arm</td>
<td>O-arm system could reduce the need for pedicle screw revision</td>
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<tr>
<td>Houten et al. 2012</td>
<td>NRS</td>
<td>Lumbar fusion</td>
<td>Fluoroscopy-guided method</td>
<td>O-arm system was safe and effective, improving overall accuracy and reducing operative time</td>
</tr>
<tr>
<td>Shin et al. 2012</td>
<td>NRS</td>
<td>Thoracic and lumbar spines</td>
<td>C-arm fluoroscopy</td>
<td>O-arm system was more accurate and safer, but surgical time was longer than with C-arm fluoroscopy</td>
</tr>
<tr>
<td>Silbermann et al. 2011</td>
<td>NRS</td>
<td>Lumbar and sacral spines</td>
<td>CT scan using free-hand</td>
<td>O-arm system showed greater accuracy than CT scan using free-hand</td>
</tr>
<tr>
<td>Nottmeier et al. 2010</td>
<td>NRS</td>
<td>Upper cervical spine and occiput</td>
<td>C-arm</td>
<td>O-arm system was as safe and accurate as the C-arm method</td>
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<tr>
<th>Radiation exposure</th>
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<tr>
<td>Nottmeier et al. 2013</td>
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<tr>
<td>Author, Year Study Type</td>
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<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Abdullah et al. 2012&lt;sup&gt;9&lt;/sup&gt; NRS</td>
</tr>
<tr>
<td>Park et al. 2012&lt;sup&gt;10&lt;/sup&gt; NRS</td>
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</tbody>
</table>

NRS = non-randomized study; RCT = randomized controlled study
REFERENCES SUMMARIZED

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses
No literature identified.

Randomized Controlled Trials


Non-Randomized Studies

Effectiveness


Radiation Exposure


PREPARED BY:
Canadian Agency for Drugs and Technologies in Health
Tel: 1-866-898-8439
www.cadth.ca
APPENDIX – FURTHER INFORMATION:

Non-Randomized Studies – non-comparative


Radiation Exposure – model


Economic Studies


Review Articles