TITLE: Portable Ultrasound Devices for Musculoskeletal Conditions: Clinical Effectiveness, Cost-Effectiveness, and Guidelines

DATE: 09 March 2016

RESEARCH QUESTIONS

1. What is the clinical effectiveness regarding the use of portable ultrasound devices for the assessment and management of patients with musculoskeletal conditions?

2. What is the comparative accuracy of portable ultrasound versus MRI or fixed ultrasound devices to detect musculoskeletal conditions in patients?

3. What is the cost-effectiveness of portable ultrasound for patients with musculoskeletal conditions?

KEY FINDINGS

Six non-randomized studies were identified regarding the clinical effectiveness and accuracy of portable ultrasound devices for assessment and management of patients with musculoskeletal conditions; no economic evaluations were identified regarding the cost-effectiveness of these devices for patients with musculoskeletal conditions.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, 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, 2011 and March 1, 2016. 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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SELECTION CRITERIA

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

<table>
<thead>
<tr>
<th>Population</th>
<th>Patients with musculoskeletal conditions (e.g., rotator cuff and ligament injury, other soft tissue injuries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>Portable ultrasound devices</td>
</tr>
</tbody>
</table>
| Comparator  | Q1: Magnetic resonance imaging (MRI); fixed ultrasound; no ultrasound; standard of care  
Q2: MRI; fixed ultrasound  
Q3: MRI; fixed ultrasound; standard of care |
| Outcomes    | Q1: clinical effectiveness; impact on condition/disease; benefits (e.g., reduced time to surgery); harms  
Q2: diagnostic accuracy, specificity, sensitivity  
Q3: cost-effectiveness |
| Study Designs | Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, economic evaluations |

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, non-randomized studies, and economic evaluations.

Six non-randomized studies were identified regarding the clinical effectiveness and accuracy of portable ultrasound devices for assessment and management of patients with musculoskeletal conditions; No health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, or economic evaluations were identified.

Additional references of potential interest are provided in the appendix.

OVERALL SUMMARY OF FINDINGS

Six non-randomized studies were identified regarding the clinical effectiveness and accuracy of portable ultrasound devices for assessment and management of patients with musculoskeletal conditions. One study focused on hand and wrist joints in patients with rheumatoid arthritis,1 two studies focused on feet and ankles,2,3 one study included imaging of various extremity tendons,4 one focused on shoulders,5 and another on patients with soft tissue and degenerative musculoskeletal conditions.6 All studies concluded that portable ultrasound devices were generally clinically effective and accurate for the assessment and management of patients with musculoskeletal conditions. No economic evaluations regarding the cost-effectiveness of portable ultrasound for patients with musculoskeletal conditions were identified. Details on the included clinical studies are provided in Table 2.
<table>
<thead>
<tr>
<th>First author; Year</th>
<th>Clinical indication; Number of patients (N)</th>
<th>Comparator</th>
<th>Portable ultrasound operators</th>
<th>Abstract conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceponis; 2014†</td>
<td>Hand and wrist joint examination for rheumatoid arthritis; N = 51</td>
<td>Clinical examination</td>
<td>NR</td>
<td>Good correlation between ultrasound findings and clinical examination in many joints, provided physicians with increased confidence in their clinical decision and aided in pharmacologic management</td>
</tr>
<tr>
<td>Crofts; 2014‡</td>
<td>Foot structure; N = 10</td>
<td>Inter-operator agreement</td>
<td>NR</td>
<td>Good inter-operator agreement</td>
</tr>
<tr>
<td>Gun; 2013§</td>
<td>Anterior talofibular ligament injury; N = 65</td>
<td>Ankle x-ray and MRI</td>
<td>Emergency physicians</td>
<td>Diagnostic accuracy of portable ultrasound was not statistically different from MRI</td>
</tr>
<tr>
<td>Wu; 2012‡</td>
<td>Extremity tendon injuries (finger, hand, arm, forearm, lower extremity); N = 34</td>
<td>Clinical examination, findings in operating room, or MRI</td>
<td>Emergency physicians</td>
<td>Diagnostic accuracy of portable ultrasound was more sensitive and specific than physical examination and was faster than traditional wound exploration or MRI</td>
</tr>
<tr>
<td>Seagger; 2011§</td>
<td>Shoulder injuries (rotator cuff); N = 77</td>
<td>Departmental ultrasonography</td>
<td>Orthopedic surgeons</td>
<td>Portable ultrasound significantly reduced time to treatment and cost</td>
</tr>
<tr>
<td>Sivan; 2011§</td>
<td>Soft tissue and degenerative musculoskeletal conditions (overuse tendinopathy, degenerative arthritis, bursitis, acute/chronic sports injuries, acute/chronic back pain); N = 1,166</td>
<td>None</td>
<td>Musculoskeletal and sports physician</td>
<td>Portable ultrasound reduced hospital appointments and improved quality of care in the outpatient clinic, with no adverse incidents</td>
</tr>
</tbody>
</table>

MRI = magnetic resonance imaging; N = number; NR = not reported
REFERENCES SUMMARIZED

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses
No literature identified.

Randomized Controlled Trials
No literature identified.

Non-Randomized Studies


Economic Evaluations
No literature identified.

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APPENDIX – FURTHER INFORMATION:

Systematic Reviews – Bone Fractures


Non-Randomized Studies – Bone Fractures


**Review Articles**


**Additional References**
