Critically Appraised Topics
A Tool for Evidence-Based Practice
The views expressed in this publication are those of the author and do not necessarily reflect the official policy of the Department of Defense, Department of Army, U.S. Army Medical Department, or the U.S. Government.
Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research.

Individual Clinical Expertise

Best External Evidence

Patient Values & Expectations

EBM
External Clinical Evidence

Primary Knowledge Sources
- Peer Reviewed Journal Articles
- Dissertations
- Conference Proceedings

Secondary Knowledge Sources
- Summaries of multiple primary knowledge sources
- Lit Reviews, Meta-Analyses, Clinical Practice Guidelines, Critically Appraised Topics (CATs)
- In O&P: SSCs, Evidence Report, Evidence Note
State of the Science Conference Findings

The Academy’s State-of-the-Science Conferences (SSCs) serve two equally vital purposes. They offer clinical guidance about those practice fundamentals that have been scientifically validated, defining and encouraging best practices in the field and training programs. They also identify research priorities that will strengthen the science used to support clinical decision-making in the future.

#13: Economic Science in Lower-Limb Prosthetic Rehabilitation

Recent years have witnessed an increased interest in the economic science associated with prosthetic rehabilitation. This has been evidenced in a series of economic publications, reports and analyses. Recognizing the increasing relevance of economics in healthcare policy and decision making, the American Academy of Orthotists and Prosthetists (AAOP) held a State of the Science Conference on November 2-3, 2017 on this important topic. Several of the presenters shared materials created through recent collaborations with the American Orthotic and Prosthetic Association. The participation of both organizations in this event allowed for a comprehensive consideration of all available economic publications in a single setting. The following proceedings include reprints of relevant economic publications, multidisciplinary perspective pieces and an introduction to economic science for those working in amputee rehabilitation.

oandp.org/page/SSCs
<table>
<thead>
<tr>
<th>Question</th>
<th>Evidence Note</th>
<th>CAT</th>
<th>Evidence Report</th>
<th>Literature Review</th>
<th>Meta-Analysis†</th>
<th>Clinical Practice Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who uses it</td>
<td>Probably clinicians; anyone needing synopsis info</td>
<td>Probably clinicians; anyone needing synopsis info</td>
<td>Scientists, professional organization members, educators</td>
<td>Clinicians, educators, scientists, policy makers, reimbursement groups</td>
<td>Clinicians, educators, scientists, policy makers, reimbursement groups</td>
<td>Clinicians, educators, scientists, policy makers, reimbursement groups</td>
</tr>
<tr>
<td>Length</td>
<td>2-4pg</td>
<td>1-3pg</td>
<td>3000-5000wds*</td>
<td>3000-5000wds*</td>
<td>3000-5000wds*</td>
<td>3000-5000wds*</td>
</tr>
<tr>
<td>Basis for product</td>
<td>Synopsis of a piece of evidence</td>
<td>Answers a clinical question</td>
<td>Assists to appraise suitability of a body of knowledge to support an SSC</td>
<td>Assesses body of knowledge to support an intervention. Ideally culminates in a clinical recommendation based on the strength of the evidence</td>
<td>Assesses body of knowledge to support an intervention. Ideally culminates in a clinical recommendation based on the strength of the evidence</td>
<td>To inform users that practice will include a basis in the knowledge provided within the primary (and its supporting) documents</td>
</tr>
<tr>
<td>Source Document(s)</td>
<td>The piece of evidence in question (e.g., SSC)</td>
<td>Multiple articles; 2-5 for most topics</td>
<td>Multiple articles</td>
<td>Multiple articles</td>
<td>Multiple articles</td>
<td>Multiple articles, including literature reviews and meta-analyses</td>
</tr>
<tr>
<td>Dissemination/Access</td>
<td>Disseminated straight to clinicians (e.g., magazines)</td>
<td>Users come to a centralized source (CAThouse)</td>
<td>Internal document not commonly disseminated widely.</td>
<td>Peer-reviewed dissemination routinely in a journal.</td>
<td>Peer-reviewed dissemination routinely in a journal.</td>
<td>Peer-reviewed dissemination routinely in a journal. May also be incorporated within an organizational or policy document.</td>
</tr>
</tbody>
</table>

*Typical length; document lengths may vary.
†A primary difference between the literature review and meta-analysis is that in the meta-analysis, methods and data are similar enough to be able to be pooled and collectively analyzed.
What is a Critically Appraised Topic (CAT)?

• One-page summary of a search and critical appraisal of the literature with an evidence table

• Created to answer a **focused clinical question**.

• Synthesizes three or more primary sources

• Shorter than a systematic review, and designed for quick consumption

http://ebem.org/; http://www.cebm.net/?o=1116
What is a CAT?

- Dental: https://cats.uthscsa.edu/search.php
- OT: http://www.otcats.com/
- Orthotics and Prosthetics: https://www.oandp.org/general/custom.asp?page=CATs
Why do we need CATs?

- Evidence-based decisions are necessary in today’s healthcare culture
- Healthcare clinicians and practitioners encounter up to 5 “knowledge needs” for every in-patient, and about 2 “needs” for every 3 out-patients
- Not feasible for busy clinicians to read and remember multiple primary knowledge sources to answer clinical questions
- Evidence-based decision-making in clinical scenarios demands time-efficient, up-to-date evidence review

Why do **YOU** need CATs
Parts of a CAT

- Title and author
- Date written, recommended date for reassessment
- Focused clinical question
- Background
- Databases, search strategy, article eligibility criteria
- Appraisal and synthesis of the evidence
- Clinical message
- Evidence table
- References
How to Write a CAT
Step 1
Focused Clinical Question

- Identify a “knowledge need”
- Turn it into a focused question using the PICO method
  - Patient or Problem being addressed
  - Intervention being considered
  - Comparison/Control if applicable
  - Clinical Outcome(s) of interest
- You may need to broaden the question/topic due to insufficient available evidence
  - For example, some patient populations small/understudied (upper limb, partial foot)

**PICO Example**

**Knowledge Need**
What are benefits of hydraulic prosthetic ankles?

- **Patient/population:** Individuals with transtibial amputation
- **Intervention:** Hydraulic prosthetic ankle—Passive hydraulic prosthetic ankle
- **Comparison:** Non-hydraulic prosthetic ankles
- **Outcome:** Benefits—Walking mechanics and distal tibial stress

**PICO Question**
Do passive hydraulic ankles improve walking mechanics and reduce distal tibial stress in individuals with transtibial amputation compared to non-hydraulic ankles?
**PICO Question**
Is use of lateral shoe wedging effective in reducing knee pain in people with medial knee osteoarthritis when compared with non-wedged shoes?

**Knowledge Need**
Does in-shoe wedging work for knee pain?

**Patient/population:** People with medial knee osteoarthritis

**Intervention:** In-shoe wedging—Lateral shoe wedging

**Comparison:** Non-wedged shoes

**Outcome:** Knee pain
Knowledge Need
What suspension would work best for this patient?

Patient/population:
Intervention:
Comparison:
Outcome:

PICO Question
# Background

<table>
<thead>
<tr>
<th><strong>Provide</strong></th>
<th>Provide a brief overview of the clinical topic and how knowledge in this area can inform practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus</strong></td>
<td>Focus toward the knowledgeable practitioner</td>
</tr>
<tr>
<td><strong>Provide</strong></td>
<td>Provide sources as appropriate</td>
</tr>
<tr>
<td></td>
<td>• Additional sources beyond those used to answer the clinical question</td>
</tr>
</tbody>
</table>
Passive hydraulic ankles may improve walking for people with an amputation by enabling a smoother transition from initial contact through midstance.

This transition may be measured as the movement of the center of pressure. During walking with passive prosthetic feet, the center of pressure stops moving anteriorly and briefly moves posteriorly during loading response/midstance, different from what is seen in able-bodied individuals.1

On decline surfaces in particular, transmission of these center of pressure deviations through the lower limb may contribute to the increased stresses at the distal residual limb relative to level ground walking,2 increasing risk of skin breakdown,3 and deep tissue injury.4

Increased energy dissipation via passive hydraulic ankle systems mounted in series to passive energy storing and returning feet may address these concerns.

Outcome measures which could characterize improvement in walking mechanics and distal tibial stresses with use of passive hydraulic ankles include: minimizing posterior center of pressure displacement,1,5,6 increasing self-selected walking speed, increasing prosthetic ankle-foot negative work, and minimizing peak internal stress at the distal tibia.7

The purpose here was to evaluate research studies that characterized these four outcome measures between prosthetic ankle-feet with and without passive hydraulic damping on various slopes.

Golyski, Spencer, Childers, 2017, oandp.org


Golyski, Spencer, Childers, 2017, oandp.org
Literature Search

**Databases**
(Use at least 2)
- PubMed
- Web of Science
- *CINAHL
- *Google Scholar

**Search Terms**

**Inclusion/Exclusion Criteria**
- Date range ("most current" literature may be old)
- Language
- Primary vs Secondary Knowledge Source

*Use these databases to find articles from the Journal of Prosthetics and Orthotics (JPO)*
PICO for Search

**Patient:** Individuals with transtibial amputation

**Intervention:** Passive hydraulic prosthetic ankle

**Comparison:** Non-hydraulic prosthetic ankles

**Outcome:** Walking mechanics and distal tibial stress

**PubMed search** (keep broad to find all articles):

- ("transtibial" OR "trans-tibial" OR "Below-Knee" OR "below knee" OR "BK") AND (ankle) AND (hydraulic)
Search results

Items: 10

   Askew GN, McFarlane LA, Minetti AE, Buckley JG.
   PMID: 30871573   Free PMC Article
   Similar articles

2. Design of a power-asymmetric actuator for a transtibial prosthesis.
   Bartlett HL, Lawson SE, Goldfarb M.
   PMID: 28814037   Free PMC Article
   Similar articles

3. The influence of a hydraulic prosthetic ankle on residual limb loading during alighted walking.
   Koehler-McNicholas SR, Nickel EA, Medvec J, Barrons K, Mion S, Hansen AH.
   PMID: 28278172   Free PMC Article
   Similar articles

4. Biomechanics of ramp descent in unilateral transtibial amputees: Comparison of a microprocessor controlled foot with conventional ankle-foot mechanisms.
   Struchkov V, Buckley JG.
   PMID: 26888864   Free Article
   Similar articles

Filters: Manage Filters

Sort by: Best match   Most recent

Find related data

Database: Select

Search details

Search: ["("transstibial"[All Fields] OR "trans-tibial" OR "Below-Knee" OR "below knee" OR "BK") AND (ankle) AND (hyd)"

Recent Activity
PICO for Search

YOU TRY
## Literature Search Record Keeping

<table>
<thead>
<tr>
<th>Databases and Sites Searched</th>
<th>Search Terms or Phrases</th>
<th>Yield</th>
<th>Obtained</th>
<th>Reviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>PubMed</td>
<td>(&quot;transtibial&quot; OR &quot;trans-tibial&quot; OR &quot;Below-Knee&quot; OR &quot;below knee&quot; OR &quot;BK&quot;) AND (ankle) AND (hydraulic)</td>
<td>10</td>
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<td></td>
</tr>
<tr>
<td>Google Scholar</td>
<td>(&quot;transtibial&quot; OR &quot;trans-tibial&quot; OR &quot;Below-Knee&quot; OR &quot;below knee&quot; OR &quot;BK&quot;) AND (ankle) AND (hydraulic)</td>
<td>1800</td>
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<td></td>
</tr>
<tr>
<td>CINAHL</td>
<td>(&quot;transtibial&quot; OR &quot;trans-tibial&quot; OR &quot;Below-Knee&quot; OR &quot;below knee&quot; OR &quot;BK&quot;) AND (ankle) AND (hydraulic)</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearling</td>
<td>Review of obtained articles’ reference lists</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Summary**
Creating the Evidence Table

Extract relevant information from each article:

- Study population
- Study design
- Intervention condition
- Comparison condition
- Methodology
- Outcomes
- Key findings
- Study limitations

Customize extracted information based on the topic
## Evidence Table Example

<table>
<thead>
<tr>
<th>Population</th>
<th>De Asha et al., 2013&lt;sup&gt;8&lt;/sup&gt;</th>
<th>De Asha et al., 2013&lt;sup&gt;5&lt;/sup&gt;</th>
<th>De Asha et al., 2014&lt;sup&gt;6&lt;/sup&gt;</th>
<th>Ko et al., 2016&lt;sup&gt;9&lt;/sup&gt;</th>
<th>Portnoy et al., 2012&lt;sup&gt;7&lt;/sup&gt;</th>
<th>Struchkov and Buckley, 2015&lt;sup&gt;11&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Design</td>
<td>Crossover</td>
<td>Crossover</td>
<td>Crossover</td>
<td>Crossover</td>
<td>Crossover</td>
<td>Crossover</td>
</tr>
<tr>
<td>Intervention</td>
<td>Echelon™ PHA-foot &amp; habitual MA/ESR foot with rigid or elastic ankle</td>
<td>Echelon™ PHA-foot &amp; rigidly attached habitual Esprit™ ESR foot</td>
<td>Echelon™ PHA-foot &amp; rigidly attached habitual MA/ESR foot</td>
<td>Elan™ microprocessor hydraulic ankle foot &amp; Echelon™ PHA-foot &amp; microprocessor</td>
<td>Echelon™ PHA-foot &amp; habitual ESR foot (3 Trias, 1 Venture, 2 TruStep, 1 C-Walk, 1 Pathfinder, 1 Esprit)</td>
<td>Active &amp; Inactive (PHA) Echelon™ microprocessor hydraulic ankle foot &amp; habitual elastic ankle Esprit™ ESR foot</td>
</tr>
<tr>
<td>Comparison</td>
<td>People with TTA using a PHA-foot v. habitual prosthetic ankle-foot</td>
<td>People with TTA using a PHA-foot v. habitual prosthetic ankle-foot</td>
<td>People with TTA using a PHA-foot v. microprocessor ankle-foot v. microprocessor ankle-foot v. microprocessor</td>
<td>People with TTA using a PHA-foot v. habitual prosthetic ankle-foot</td>
<td>People with TTA using an active microprocessor hydraulic v. PHA-foot v. habitual prosthetic ankle-foot</td>
<td>People with TTA using an active microprocessor hydraulic v. PHA-foot v. habitual prosthetic ankle-foot</td>
</tr>
<tr>
<td>Subjects walked</td>
<td>Subjects walked</td>
<td>Subjects walked</td>
<td>Subjects walked</td>
<td>Subjects walked</td>
<td>Subjects walked</td>
<td>Subjects walked</td>
</tr>
</tbody>
</table>

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Golyski, Spencer, Childers, 2017, oandp.org
Synthesize the Results

01 Use the information from the Evidence Table to write a brief synthesis of results

02 Synthesize evidence with regards to:
   - Quantity of evidence (number of studies, total participants)
   - Quality of evidence (study designs, limitations)
   - Consistency of evidence (similarity/differences in study methods and findings)

03 Do not summarize each study, the reader can turn to the Evidence Table for individual study details
Knowledge Products

- Knowledge products (KPs) are tailored to meet end user needs in a format that resonates with them.
- Knowledge Readiness Level (KRL) metrics assess and quantify KP readiness to be transitioned to stakeholders, academia, product developers and researchers.
Knowledge Translation

Knowledge Translation (KT) is the process of moving knowledge from research to product development, dissemination and implementation and program evaluation. Program evaluation feeds into research requirement development, closing the loop.

- Continually measure impact/effectiveness to improve outcomes and inform requirements
- Drive evidence-based practice, policy, and behavior changes, ultimately improving Warfighter care

Sources: Canadian Institutes of Health Research, National Center for the Dissemination of Disability Research, Agency for Healthcare Research and Quality, National Institutes of Health, The Substance Abuse and Mental Health Services Administration
Clinical Message

Answer
- Answer your clinical question

Format in
- Format in a way that facilitates clinical implementation

Acknowledge
- Acknowledge key limitations in the literature that may affect use of the findings
Findings suggest passive hydraulic ankles may improve smoothness of foot rollover and reduce risk of stress related residual limb injury, potentially mediated by increased energy dissipation.

Such behavior may be especially important for walking on declines, but perhaps less so for uphill walking, where energy generation is a primary goal. The influence of passive hydraulic ankles on SSWS is likely not clinically significant.

Irregularities in statistical analysis, lack of walking speed normalization, lack of blinding to prosthetic ankle-foot type, there being only two studies on sloped surfaces, and the fact that 4 of the 6 articles evaluated were from the same research group are major limitations.
**Clinical Question:**

Is the C-Leg microprocessor knee bioenergetically more efficient than other prosthetic knees during gait in unilateral transfemoral amputees?

**Clinical Message:**

The C-Leg improves bioenergetic efficiency during ambulation compared to other knees; however, in most cases, the increased efficiency does not reach the point of statistical significance (Grade D Recommendation). Utilization of the C-Leg for the sole purpose of decreasing ambulatory energy cost may not yet be justifiable given the current available data. However, in combination with other primary benefits (e.g., safety), improving ambulatory efficiency is a potential supporting indication for use.

Highsmith, 2016, oandp.org
Assessing a CAT

<table>
<thead>
<tr>
<th>Question</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the CAT focused into a relevant PICO question?</td>
<td>• Is it repeatable? Was the best available evidence selected?</td>
</tr>
<tr>
<td>Was the search well conducted?</td>
<td>• Was the evidence described in terms of quantity, quality, and consistency?</td>
</tr>
<tr>
<td>Is the synthesis clinically relevant and accurate?</td>
<td>• Does the clinical message accurately reflect the literature findings? Is it applicable to my practice?</td>
</tr>
<tr>
<td>How strong is the clinical message?</td>
<td></td>
</tr>
<tr>
<td>Is the evidence table well-organized and complete?</td>
<td></td>
</tr>
<tr>
<td>Is there a potential conflict of interest?</td>
<td></td>
</tr>
</tbody>
</table>
**CAT Thoughts**

<table>
<thead>
<tr>
<th>Strengths</th>
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<tbody>
<tr>
<td>Quick read</td>
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<tr>
<td>Clinical applicability</td>
<td></td>
</tr>
<tr>
<td>Synthesis of primary sources</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Limitations</th>
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</tr>
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<tbody>
<tr>
<td>Peer Review</td>
<td></td>
</tr>
<tr>
<td>Expiration date</td>
<td></td>
</tr>
<tr>
<td>May be too focused to see the whole picture</td>
<td></td>
</tr>
<tr>
<td>Busy clinical practices</td>
<td></td>
</tr>
<tr>
<td>Lack of education on formulating questions, lit search and critical appraisal</td>
<td></td>
</tr>
<tr>
<td>CATs are only useful if the available list is comprehensive</td>
<td></td>
</tr>
</tbody>
</table>

**Will it help the clinician manage patients?**
Questions?