Critically Appraised Topics

A Tool for Evidence-Based Practice

EACE
Extremity Trauma and Amputation Center of Excellence

THE ACADEMY AAOP

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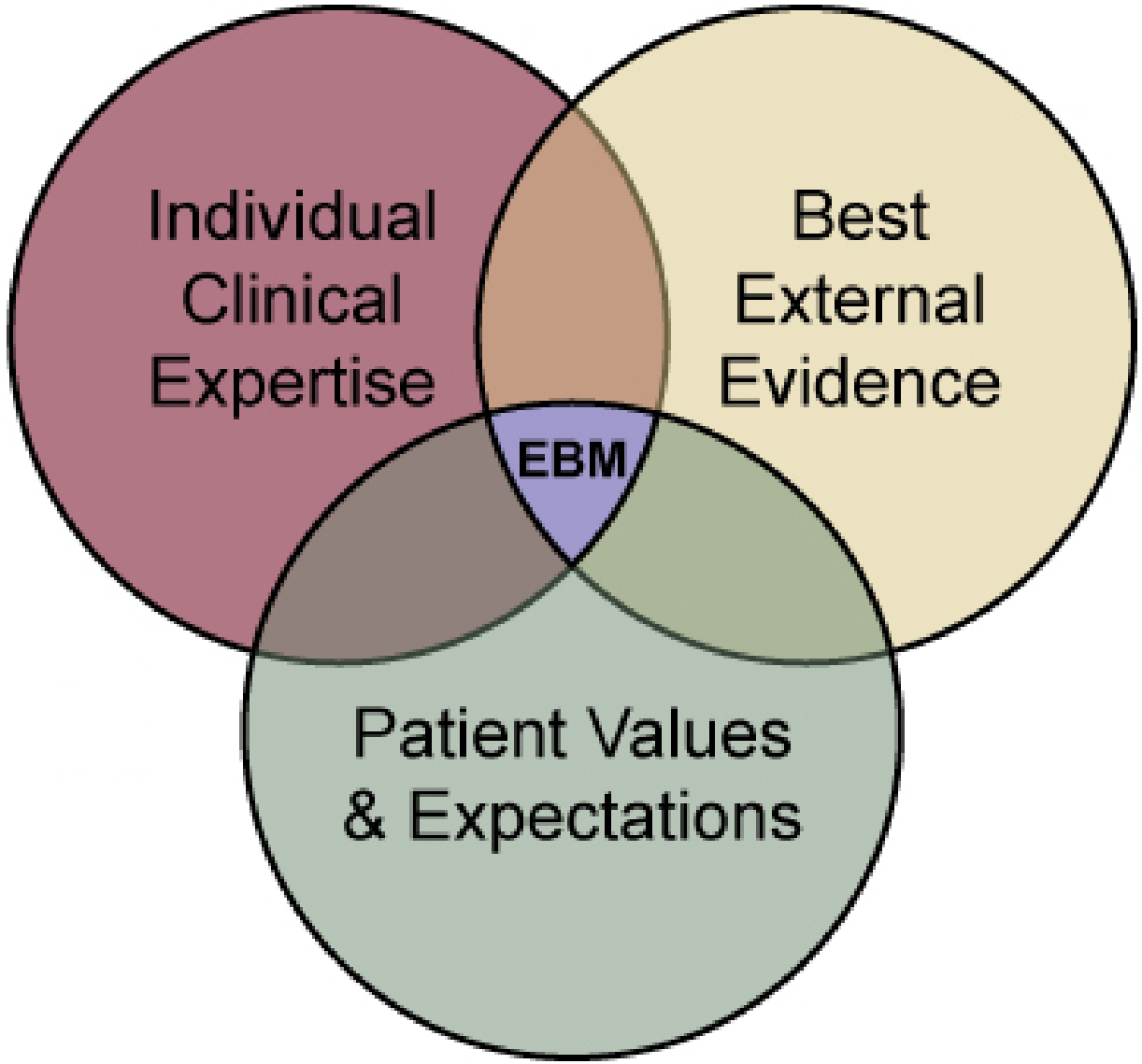
Evidence-Based Practice

"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"

- Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't. BMJ. 1996 Jan 13;312(7023):71–2.


Individual
Clinical
Expertise
Best
External
Evidence
EBM
Patient Values
& Expectations

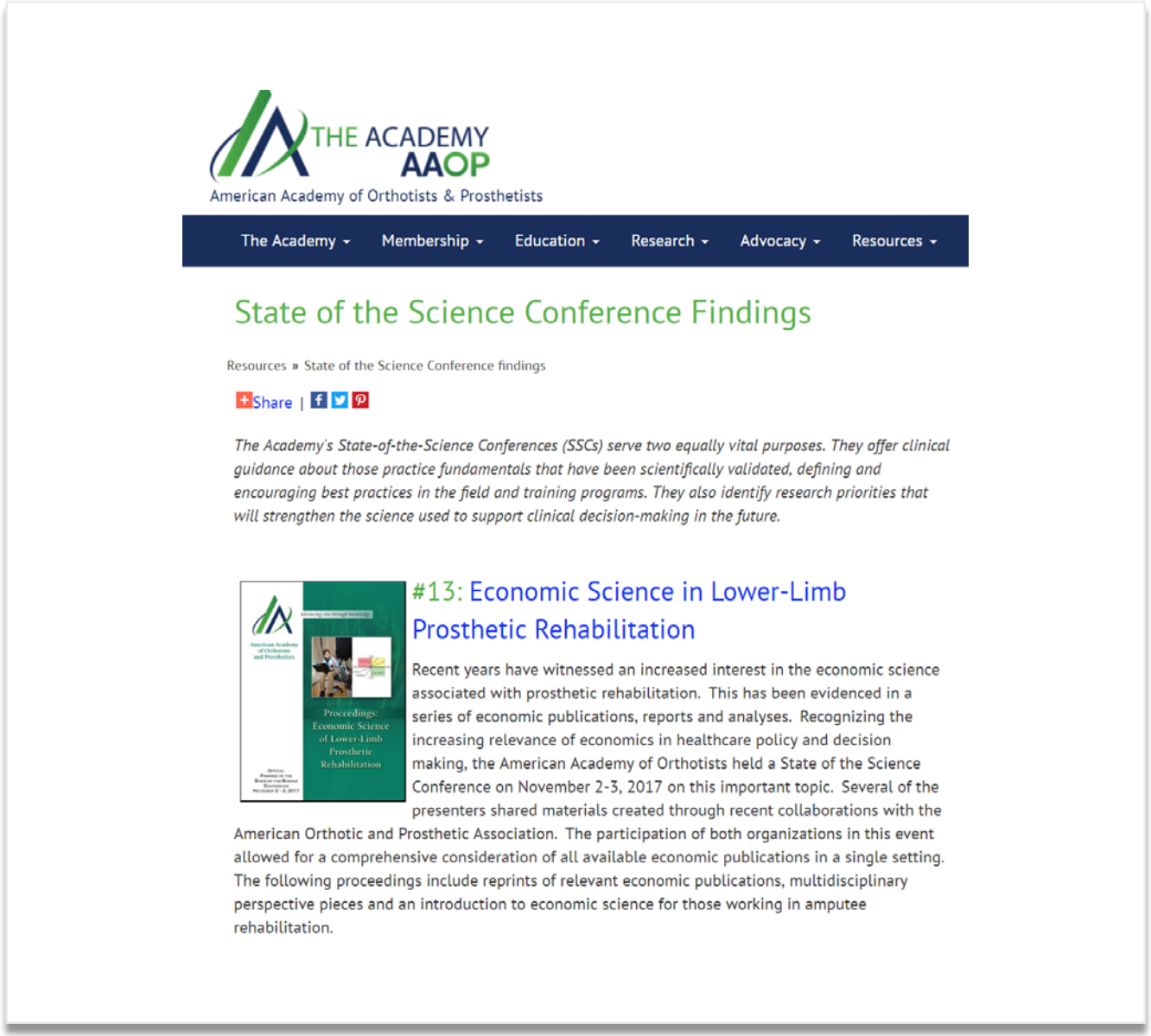
External Clinical Evidence

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 Conferences (SSCs)

oandp.org/page/SSCs

Secondary Knowledge Sources

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

*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?

:

https://cats.uthscsa.edu/search.php

http://www.otcats.com/

http://bestbets.org/database/browse-critical-appraisals.php

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

Sauvé S, Lee HN, Meade MO, Lang JD, Farkouh M, Cook DJ, & Sackett DL. (1995). The critically appraised topic: A practical approach to learning critical appraisal. Annals of the Royal College of Physicians and Surgeons of Canada, 28(7), 396-398.

Why do **YOU** need CATs

National Commission on Orthotic and Prosthetic Education

Parts of a CAT

1 page

- Title and author
- Date written, recommended date for re-assessment
- 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
  - **P**atient or **P**roblem being addressed
  - **I**ntervention being considered
  - **C**omparison/**C**ontrol if applicable
  - Clinical **O**utcome(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)

Richardson WS, Wilson MC, Nishikawa J, Hayward RS. The well-built clinical question: a key to evidence-based decisions. ACP J Club. 1995 Nov–Dec;123(3):A12–3.

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 Example

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

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?

PICO Example

Knowledge Need

What suspension would work best for this patient?

Patient/population:

Intervention:

Comparison:

Outcome:

PICO Question

Background

Provide	Provide a brief overview of the clinical topic and how knowledge in this area can inform practice
Focus	Focus toward the knowledgeable practitioner
Provide	Provide sources as appropriate • Additional sources beyond those used to answer the clinical question

Background Example

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.

Background Example References

1. Ranu HS. An evaluation of the centre of pressure for successive steps with miniature triaxial load cells. J Med Eng Technol. 1988;12(4):164-166.
2. Dou P, Jia X, Suo S, Wang R, Zhang M. Pressure distribution at the stump/socket interface in transtibial amputees during walking on stairs, slope and non-flat road. Clin Biomech. 2006;21(10):1067-1073.
3. Sanders JE, Goldstein BS, Leotta DF. Skin response to mechanical stress: Adaptation rather than breakdown - A review of the literature. J Rehabil Res Dev. 1995;32(3):214-226.
4. Mak AFT, Zhang M, Tam EWC. Biomechanics of Pressure Ulcer in Body Tissues Interacting with External Forces during Locomotion. Annu Rev Biomed Eng. 2010;12(1):29-53.
5. De Asha AR, Munjal R, Kulkarni J, Buckley JG. Walking speed related joint kinetic alterations in trans-tibial amputees: impact of hydraulic "ankle" damping. J Neuroeng Rehabil. 2013;10(1):107.
6. De Asha AR, Munjal R, Kulkarni J, Buckley JG. Impact on the biomechanics of overground gait of using an "Echelon" hydraulic ankle-foot device in unilateral trans-tibial and trans-femoral amputees. Clin Biomech. 2014;29(7):728-734.
7. Portnoy S, Kristal A, Gefen A, Siev-Ner I. Outdoor dynamic subject-specific evaluation of internal stresses in the residual limb: Hydraulic energy-stored prosthetic foot compared to conventional energy-stored prosthetic feet. Gait Posture. 2012;35(1):121-125.

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)

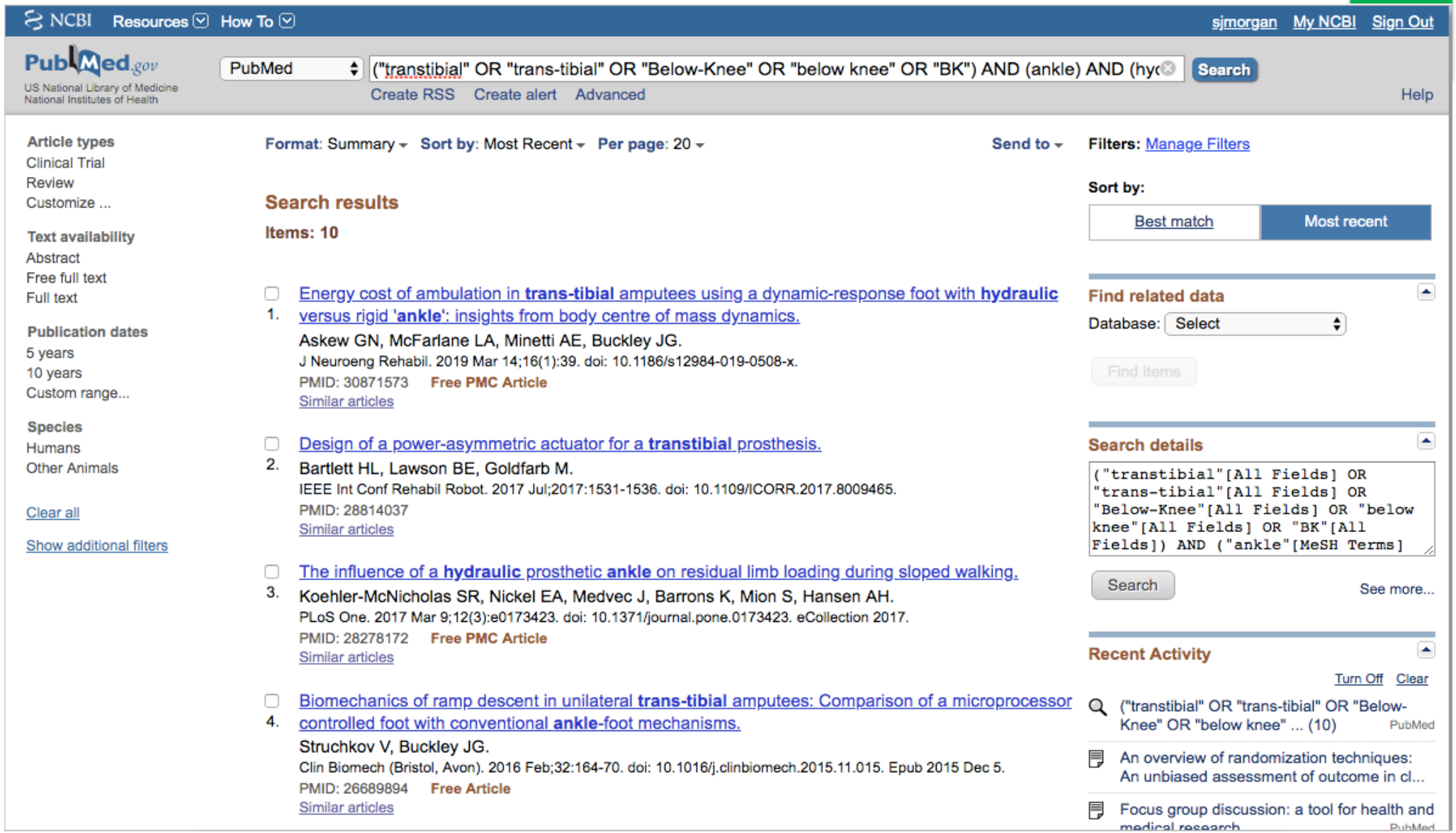
Inclusion/ Exclusion

Inclusion criteria

- Article is written or translated into English
- Article is published in a peer-reviewed journal
- Article describes an original research study
- Article published after 2000

Exclusion criteria

- Article is a form of grey literature (e.g., thesis, dissertation, or white papers)
- Article is a review or other secondary source of evidence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5 years
10 years
Custom range...
Species
Humans
Other Animals
Clear all
Show additional filters
Format: Summary Sort by: Most Recent Per page: 20
Send to
Filters: Manage Filters
Search results
Items: 10
1. Energy cost of ambulation in trans-tibial amputees using a dynamic-response foot with hydraulic versus rigid 'ankle': insights from body centre of mass dynamics.
Askew GN, McFarlane LA, Minetti AE, Buckley JG.
J Neuroeng Rehabil. 2019 Mar 14;16(1):39. doi: 10.1186/s12984-019-0508-x.
PMID: 30871573 Free PMC Article
Similar articles
2. Design of a power-asymmetric actuator for a transtibial prosthesis.
Bartlett HL, Lawson BE, Goldfarb M.
IEEE Int Conf Rehabil Robot. 2017 Jul;2017:1531-1536. doi: 10.1109/ICORR.2017.8009465.
PMID: 28814037
Similar articles
3. The influence of a hydraulic prosthetic ankle on residual limb loading during sloped walking.
Koehler-McNicholas SR, Nickel EA, Medvec J, Barrons K, Mion S, Hansen AH.
PLoS One. 2017 Mar 9;12(3):e0173423. doi: 10.1371/journal.pone.0173423. eCollection 2017.
PMID: 28278172 Free PMC Article
Similar articles
4. Biomechanics of ramp descent in unilateral trans-tibial amputees: Comparison of a microprocessor controlled foot with conventional ankle-foot mechanisms.
Struchkov V, Buckley JG.
Clin Biomech (Bristol, Avon). 2016 Feb;32:164-70. doi: 10.1016/j.clinbiomech.2015.11.015. Epub 2015 Dec 5.
PMID: 26689894 Free Article
Similar articles
Sort by:
Best match
Most recent
Find related data
Database: Select
Find items
Search details
("transtibial"[All Fields] OR "trans-tibial"[All Fields] OR "Below-Knee"[All Fields] OR "below knee"[All Fields] OR "BK"[All Fields]) AND ("ankle"[MeSH Terms]
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("transtibial" OR "trans-tibial" OR "Below-Knee" OR "below knee" ... (10) PubMed
An overview of randomization techniques: An unbiased assessment of outcome in cl...
Focus group discussion: a tool for health and medical research PubMed

PICO for Search

YOU TRY

Literature Search Record Keeping

Databases and Sites Searched	Search Terms or Phrases	Yield	Obtained	Reviewed
PubMed	("transtibial" OR "trans-tibial" OR "Below-Knee" OR "below knee" OR "BK") AND (ankle) AND (hydraulic)	10		
Google Scholar	("transtibial" OR "trans-tibial" OR "Below-Knee" OR "below knee" OR "BK") AND (ankle) AND (hydraulic)	1800		
CINAHL	("transtibial" OR "trans-tibial" OR "Below-Knee" OR "below knee" OR "BK") AND (ankle) AND (hydraulic)	18		
Pearling	Review of obtained articles' reference lists	2		
		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

Evidence Table

	De Asha et al., 2013[8]	De Asha et al., 2013[5]	De Asha et al., 2014[6]	Ko et al., 2016[9]	Portnoy et al., 2012[7]	Struchkov and Buckley, 2015[11]
Population	20 active people with unilateral TTA. >2 years post	8 active males with unilateral TTA. >2 years post	11 active people with unilateral TTA. >2 years post	3 males with unilateral TTA, all independent walkers	9 active males with unilateral TTA. >5 years post	9 males with unilateral TTA (>K2). >2 years post
Study Design	Crossover	Crossover	Crossover	Crossover	Crossover	Crossover
Intervention	Echelon™ PHA-foot & habitual MA/ESR foot with rigid or elastic ankle	Echelon™ PHA-foot & rigidly attached habitual Esprit™ ESR foot	Echelon™ PHA-foot & rigidly attached habitual MA/ESR foot	Elan™ microprocessor hydraulic ankle-foot & Echelon™ PHA-foot & microprocessor Proprio Foot™ & habitual ESR foot	Echelon™ PHA-foot & habitual ESR foot (3 Trias, 1 Venture, 2 TruStep, 1 C-Walk, 1 Pathfinder, 1 Esprit)	Active & inactive (PHA) Elan™ microprocessor hydraulic ankle-foot & habitual elastic ankle-Esprit™ ESR foot
Comparison	People with TTA using a PHA-foot v. habitual prosthetic ankle-foot	People with TTA using a PHA-foot v. habitual prosthetic ankle-foot	People with TTA using a PHA-foot v. habitual prosthetic ankle-foot	People with TTA using a PHA-foot v. microprocessor ankle-foot v. microprocessor hydraulic ankle-foot v. habitual prosthetic foot	People with TTA using a PHA-foot v. habitual prosthetic ankle-foot	People with TTA using an active microprocessor hydraulic v. PHA-foot v. habitual prosthetic ankle-foot
	Subjects walked	Subjects walked	Subjects walked	Subjects walked	Subjects walked at	Subjects walked

Synthesize the Results

01

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

02

<u>Synthesize</u> 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

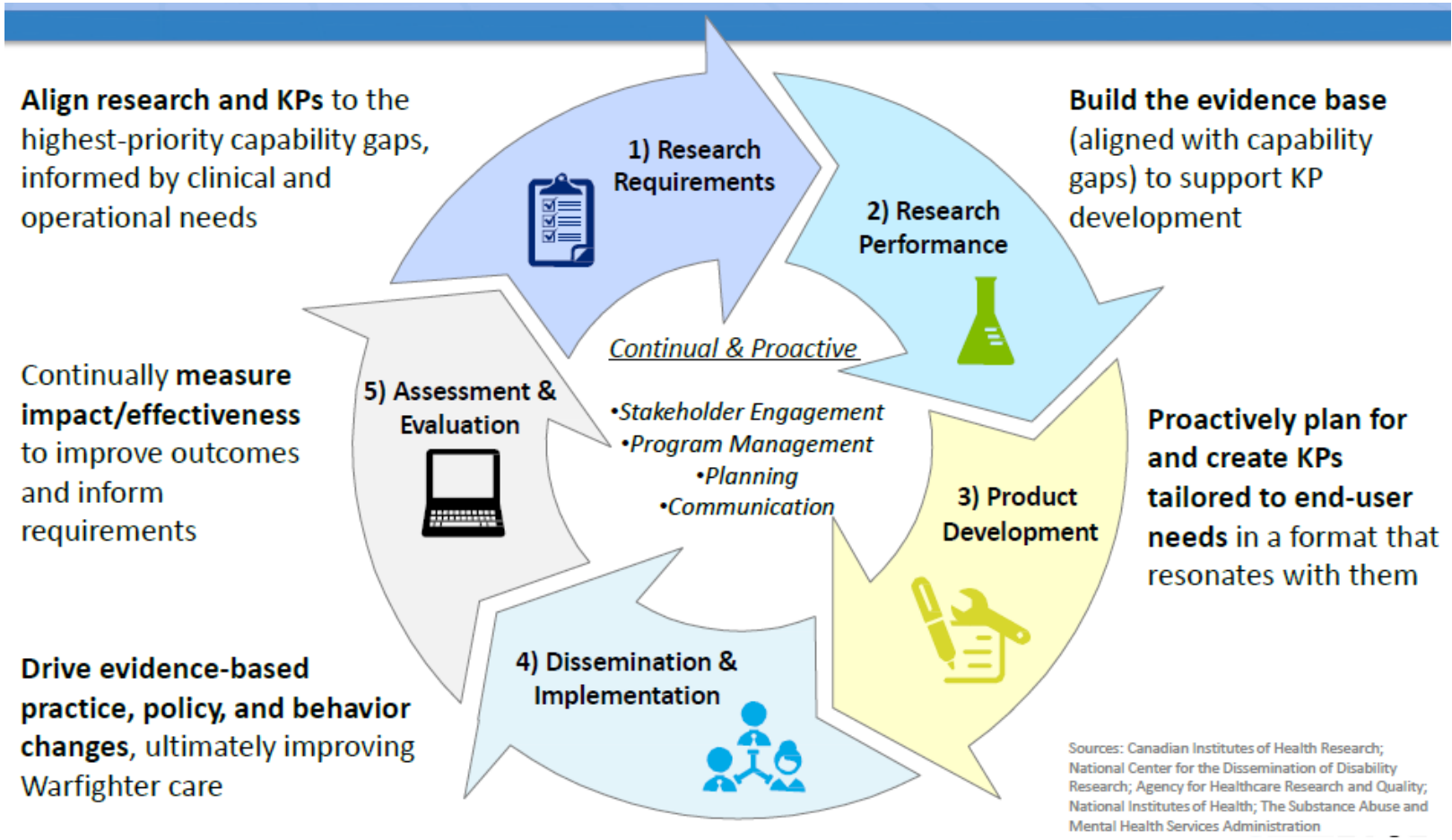
Do not summarize each study, the reader can turn to the Evidence Table for individual study details

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.



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

Clinical Message

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 Message
another example

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).[1] 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

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

CAT Thoughts

Strengths	Quick read
	Clinical applicability
	Synthesis of primary sources
Limitations	Peer Review
	Expiration date
	May be too focused to see the whole picture
	Busy clinical practices
	Lack of education on formulating questions, lit search and critical appraisal
	CATs are only useful if the available list is comprehensive

Will it help the clinician manage patients?

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Questions?