Section B

The Evidence-based Process

SECTION B – AT A GLANCE

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Evidence-based Process

Evidence-based Process Support and Training

PEN® will provide training on critical appraisal and evidence synthesis as needed. For those who are self-learners we have developed five training modules to help you learn about the evidence-based process used in PEN®. They are accessible on the PEN® Authors and Reviewers Resources page which is linked from the PEN Training Materials page which you can access the PEN® Home page – PEN Quick Links - or from the Menu - open About PEN.

PEN® Authors and Reviewers Resources

- Evidence-based Process Module
- Appraising the Literature Module
- Asking the Question Module
- Quick Review of Study Designs Module
- Searching PubMed Module

The Evidence-based Process Cycle

The Evidence-based Process is the 5 A's: Assess, Ask, Acquire, Appraise and Apply. To help you construct your knowledge pathway using this evidence-based approach, we will review each part of the Evidence-based Process with some examples and recommendations of evidence-based resources.

STEP 1 - Assess

Think about the topic, the knowledge pathway template and the kinds of information RD's will be looking for under each heading. Consider the types of decisions to be made, where there is controversy or new information. The PEN® Responsible Administrator may be able to assist you in soliciting feedback or input regarding desirable or important issues to be addressed within a particular KP.

STEP 2 - Ask

Frame the kinds of information you have identified in Step 1 into searchable questions. Taking time to develop a "good" question will help you define what to look for and where to look. There are two types of questions – *background* questions and *foreground* questions.

Background questions are often of a general nature and relate to a condition. Questions that pertain to a description of a disease, its etiology, prevalence, incidence, course etc. would be background questions.

Foreground questions generally relate to more specialized knowledge that addresses issues of care, or decision making. Foreground questions usually ask about treatment, prevention, prognosis or diagnosis. We would like writers to give more attention to *foreground* questions.

Here are some examples of practice-based questions that dietitians are seeking answers to. They would need to be refined in order to conduct an effective search of the literature to answer them (see **PICO** below)

- What is an acceptable gastric residual volume when tube feeding?
- Is it safe to use blue dye in enteral feeds?
- Should institutions still use meal patterns for diabetics?
- Closed versus open enteral systems – what is the best option?
- How does one implement a HACCP program in a tube feed area?
- Are disease-specific enteral products effective?
- What staffing models are available for dietitians?
- What equations should be used to calculate energy requirements (Harris Benedict, Mifflin)?
- What strategies are effective in reducing childhood obesity?
- Do patients with diabetes mellitus benefit from lower CHO/higher fat enteral formulas?

- What ethical guidelines on "artificial" feeding exist for helping decide whether to begin, withhold, or withdraw tube feeding?
- Does early tube feeding improve outcome from acute stroke?
- In the adult population with decubitus ulcers, does a zinc supplemented diet compared to a standard diet result in an improved rate of healing?
- In the critically ill adult population, does early enteral feeding compared to delayed feeding result in a shorter length of hospital stay?

Creating a clear structured question makes finding evidence easier. PICO is an often used format:

P Population - who are the relevant patients, clients or groups
I Intervention or exposure
C Comparison or control
O Outcome (what are the patient, client or group-relevant consequences of the exposure that we are interested in.)

Examples

P Do patients with ileostomies…
I who consume a high fibre diet (>20g)…
C compared to those who consume a low fibre diet (5-10g)…
O have a higher incidence of ostomy blockage?

P Do school-aged children
I who watch media (TV, computer) > 15hours/wk
C compared to children who watch media less than 15 hours/wk
O have a higher incidence of overweight (defined by BMI for age >95th percentile)?

Using PICO to create your question will also assist you in identifying the most relevant studies to summarize in the evidence statements. For instance, if your question relates to patients with ileostomies, including studies that only examined patients with colostomies may not be appropriate.

STEP 3 - Acquire

Background questions can be answered using existing materials and usually become part of the *PEN* Background document. Much of this material already exists in other tools and resources and we encourage you to link to these sources wherever possible for background material pertaining to your KP topic. In other words, you don't need to re-write this information where it already exists and is easily accessible at no cost. Note: It is still necessary to evaluate the reliability, currency and accuracy of resources providing background information. See **Appendix 1** for some examples to get you started. In rare cases where a topic is new to the profession, background questions may be part of the question and answer section of PEN®, once the topic is more familiar then these questions will be moved to the Background document.

Foreground questions are usually answered with reviews of studies or individual studies. The type of question (e.g. a treatment, prognosis or diagnosis question) will determine the evidence you use to answer the question. For example, treatment questions are best answered using systematic reviews of randomized controlled trials (RCTs) and if a systematic review has not been published, by single RCTs; while prognosis questions are best answered by systematic reviews of cohort studies than by a single cohort study (see http://www.cebm.net/index.aspx?o=1025 for more about levels of evidence to answer foreground questions).

To find the evidence, writers are encouraged to follow a hierarchy of evidence to answer questions.

1. Go to quality sources of pre-filtered or pre-processed information from 'system' resources or 'synopses' resources, such as National Guideline Clearinghouse, Clinical Evidence, HealthEvidence, Trip Database etc. (see **Appendix 1**).
2. If evidence cannot be found from these resources or the evidence is not current and needs to be updated, it is then recommended the writer search for systematic reviews or health technology assessments in databases, such as The Cochrane Library www.thecochranelibrary.com; or search in PubMed for systematic reviews using a 'clinical query' search (see **Appendix 1** for more about clinical queries in PubMed) or review the PubMed Tutorials at:

http://www.nlm.nih.gov/bsd/disted/pubmed.html).

3. If evidence can still not be found or needs to be updated, then a search in the 'traditional literature' for individual studies is necessary. RCTs can be found in CENTRAL: http://www.mrw.interscience.wiley.com/cochrane/cochrane_clcentral_articles_fs.html (a Cochrane database of clinical trials) or from a search in PubMed using a 'clinical query' for *therapy*. For *prognosis* or *diagnosis* questions, cohort and case control studies can be found in PubMed using the 'clinical queries' for *prognosis* or *diagnosis*.

As indicated above, if the pre-filtered information or systematic reviews are not current then a search for more recent articles should be conducted and the new studies reviewed and added to the pre-filtered or synthesized evidence. More information on this approach is contained in an article entitled: *When less is more: A practical approach to searching for evidence-based answers*"

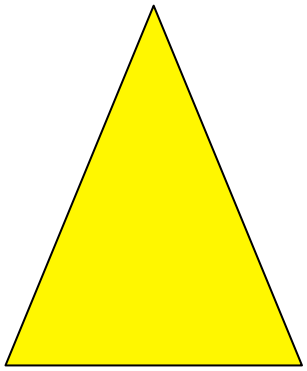
Grandage K, Slawason D, Shaughnessy A, When less is more: a practical approach to searching for the evidence-based answers. J Med Libr Assoc. 2002;90(3):298-304. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC116402/

Hierarchy of Evidence

It is important to follow the hierarchy of evidence for each type of foreground question to ensure a valid evidence-based answer and to avoid additional work. In the case of a therapy question, if you have a current systematic review that answers your question, then it is not necessary to look for individual studies. Also, if there are no systematic reviews but a well designed RCT (randomized controlled trial) answers the question then you will not need to look for other epidemiological studies, such as cohort studies to support the answer. For example, if a relationship between rheumatoid arthritis and omega-3s is suspected, and there is a large well-designed randomized controlled trial that shows that there isn't a relationship, there is no need to look at cohort or case control studies for evidence. If there is a good cohort study and a poor RCT – generally the evidence would still be according to the results of the RCT.

Hierarchy of Evidence (CHE – Evidence---Based Decision Making Tutorial 2008)

Filtered



Unfiltered

- Systems – include practice guidelines, clinical pathways, care maps; National Clearinghouse, N.I.C.E., NHMRC
- Syntheses – use a systematic process for pooling evidence from multiple studies to synthesize the information; Cochrane

1. Summaries – include systematic reviews or meta-analyses of evidence addressing a focused question; PEN®

- Synopses – synopses of individual studies or systematic reviews, structured abstracts etc; Trip database
- Studies of traditional literature review of individual studies using relevant databases; PubMed, CINHAL, EMBA

Searching multiple databases can be tedious; if you have access we would highly recommend using the TRIP database. The TRIP database is a large search engine that searches multiple databases, including guidelines from many international associations; synopses from many reputable services; health technology assessments and systematic reviews from N.I.C.E., Canadian Coordinating Office for Health Technology Assessment (CCOHTA) and The Cochrane Library; electronic textbooks; and, individual studies from PubMed. All search results are organized according the hierarchy of evidence. Searching this database can provide a 'one-stop-shopping site'.

When searching for evidence, document your search strategy including:

- Inclusion and exclusion criteria (timelines, languages, age, human vs. animal, types of studies or interventions etc)
- Actual search terms or specific questions using "PICO" format
- See Documenting Your Search Strategy **in** Section C – Getting Started Writing.

Grey Literature

Determine which databases, websites, and approaches provide relevant **grey literature**. In this context, grey literature refers to non peer reviewed but still credible sources of information such as publications issued by government, academia, business, and industry, in both print and electronic formats, but not controlled by commercial publishing interests, and where publishing is not the primary business activity of the organization. Scientific grey literature comprises newsletters, reports, working papers, theses, government documents, bulletins, fact sheets, conference proceedings and other publications distributed free, available by subscription, or for sale.
For further info see: http://hlwiki.slais.ubc.ca/index.php/Grey_literature (accessed 2016 Apr 9) and "Grey-Matters: A Practical Search Tool for Evidence-Based Medicine" available from: http://www.cadth.ca/en/resources/finding-evidence-is/grey-matters (accessed 2016 Apr 9).

Writers are encouraged to limit themselves to government, research and credible non-government organization (NGO) websites (such as professional associations, universities, health organizations etc.) to locate pertinent grey literature.

Note: we generally recommend a focus on human studies, English language*, and current information. An older item may be considered if it sets the foundation for future research (e.g., a Surgeon General's report) or if no newer information on the issue is available. *If writer/contributor is bilingual, we encourage utilizing materials published in other languages, however, funding for translation is extremely limited.

STEP 4 – Appraise

Using the PEN Evidence Grading Checklist and the Center for Health Evidence User Guide worksheets, appraise your materials to establish the quality of the evidence related to your questions. If you are feeling your critical appraisal skills are rusty, or want to gain a better sense of how to effectively use the worksheets, review the relevant sections in the two Authors Training modules:

- Evidence-based Process Module
- Appraising the Literature Module

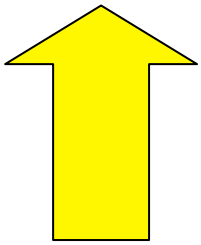
From time-to-time there may be a situation where there is no evidence to support a known fact. In this case we refer to the fact as a truism which is defined as "an un-doubted or self-evident truth" (Source: http://www.merriam-webster.com/dictionary/truism. An example may be "Boiling water coming into direct contact with human skin will burn the skin." Even though, the only evidence available for this may be case reports and anecdotes, the physiological rationale and basic science would support this as a truism and warrant a higher evidence grade.

Take the following scale into consideration when doing your appraisal:

Research Ratings Scale

Hierarchy of Study Designs (CHE - Evidence-Based Decision Making Tutorial 2009)

Results may be more valid or believable



- N of 1 randomized controlled trials
- Randomized control trials
- Cohort studies
- Case-Control studies
- Cross-sectional analytic studies
- Ecological studies
- Case series
- Case reports

Results may be less valid or believable

STEP 5 - Apply

Summarize the results of your reviews into key practice points and integrate them and the PQ into the appropriate sections of the KP template. Make each practice point relevant to our audience by using the concepts of validity, importance and applicability.

Validity – Can I trust the information? (state the source, level of evidence using PEN® grade levels)
Importance – Will the information make an important difference to my practice? (Are the outcomes ones practitioners or clients would care about?)
Applicability – Can I use this information in my practice setting? (consider access or cost issues etc) or with my patients/clients

Writing content for PEN® means following guidelines for professional ethics and integrity. One of the many aspects of professional integrity is acknowledging the work of others that one uses in their own written work. Lack of proper acknowledgement is plagiarism which is considered a serious misconduct both in the academic and scientific worlds. If you are not certain if something you have written could be considered as plagiarism, please discuss it with a member of the PEN® team.
See **PEN® Plagiarism Guidelines** for further information on plagiarism.

Authors should review the PEN® site to see examples of well-written key practice points (KPP). www.pennutrition.com.

Here are some examples to get you started:
http://www.pennutrition.com/KnowledgePathway.aspx?kpid=3043&pqcatid=144&pqid=3092

http://www.pennutrition.com/KnowledgePathway.aspx?kpid=7406&pqcatid=144&pqid=7376

Appendix 1 Sources of Answers

Examples of Sources of Answers to Background Questions

Merck Manual: http://www.merck.com/pubs/
DRI reports which are online at the National Academies Press (NAP): http://www.nap.edu/
Health Canada Office of Nutrition Policy and Promotion http://www.hc-sc.gc.ca/fn-an/index-eng.php
Health Canada, Natural Health Products Directorate: http://www.hc-sc.gc.ca/dhp-mps/prodnatur/index_e.html
Public Health Agency of Canada: http://www.phac-aspc.gc.ca/
Canadian Food Inspection Agency: http://www.inspection.gc.ca
Statistics Canada: http://www.statcan.gc.ca
Dial-A-Dietitian Nutrition Information Society: http://www.dialadietitian.org/
Eat Right Ontario: http://www.eatrightontario.ca/Doorway.aspx
EMedicince from Medscape http://emedicine.medscape.com/
National Library of Medicine (contains Medline, Pubmed and more): http://www.nlm.nih.gov/
WebMD: http://www.webmd.com/
Department of Nutrition. Harvard School of Public Health: http://www.hsph.harvard.edu/nutritionsource/
The Stanford Health Library. Health Conditions: http://healthlibrary.stanford.edu/resources/bodysystems
Mayo Clinic: http://www.mayoclinic.com/
Medline Plus: http://www.nlm.nih.gov/medlineplus/healthtopics.html
National Center for Complementary and Alternative Medicine: http://nccam.nih.gov/
USDA nutrient database: http://ndb.nal.usda.gov/

Be sure to check disease-related association websites as they often publish or provide links to important guidelines or reports. See PEN International Guidelines Collection for more examples:
Canadian Diabetes Association: http://www.diabetes.ca/
Diabetes New Zealand: http://www.diabetes.org.nz/
National Kidney Foundation: http://www.kidney.org
The Cardiac Society of Australia and New Zealand: http://www.csanz.edu.au/
The Renal Association (UK): http://www.renal.org/home.aspx

Examples of Sources of Answers to Foreground Questions
Agency for Healthcare Research and Quality: http://www.ahrq.gov/
Bandolier, Evidence-based thinking about health care: http://www.medicine.ox.ac.uk/bandolier/
BestBETs, Manchester Royal Infirmary: http://www.bestbets.org/
Canadian Best Practice Portal for Health Promotion and Chronic Disease Prevention: http://cbpp-pcpe.phac-aspc.gc.ca/
Canadian Cancer Review – Cancer Guidelines Resource Center: http://www.cancerguidelines.ca/
CMA infobase - Clinical Practice Guidelines: http://www.cma.ca/infobase
Centre for Evidence-based Medicine: http://www.cebm.net/index.asp
Clinical Evidence: http://www.clinicalevidence.com/ceweb/conditions/index.jsp
Clinical Knowledge Summaries (CKS) services: http://cks.nhs.uk/home
Cochrane Collaboration: http://www.cochrane.org/index.htm
eLENA: http://www.who.int/elena/about/en/
EvidenceUpdates: http://plus.mcmaster.ca/EvidenceUpdates/Default.aspx
Health Evidence, Canada: http://health-evidence.ca/
Medline (besides PUBMED): http://gateway.nlm.nih.gov/gw/Cmd
National Guideline Clearinghouse, US Agency for Healthcare Research and Quality:http://www.guidelines.gov/
National Health and Medical Research Council: https://www.nhmrc.gov.au/
National Institute for Health and Clinical Evidence: http://www.nice.org.uk/
National Library of Medicine (contains Medline, Pubmed and more): http://www.nlm.nih.gov/
PubMed (access to MEDLINE): http://www.ncbi.nlm.nih.gov/sites/entrez

Note: for 'clinical queries', click on "Clinical Queries" in the sidebar under PubMed Services. Then enter the search words in the box under "Find Systematic Reviews"
TRIP Database, (Taking Research into Practice): http://www.tripdatabase.com/index.html
UpToDate®: http://www.uptodate.com/index.asp