Practice-based Evidence in Nutrition-*PEN*

PEN Writer's Guide

January 2011

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1.0   Forward

PEN has a series of manuals or "How-To" Guides for new and seasoned PEN users and administrators, each designed as a comprehensive reference on a specific application. Each document provides the foundation for developing a common understanding and approach that maintains the integrity, consistency and excellent standards required for the PEN service. This Writer's Guide is one in a series of guides including:

- Content Management Guide
- Cross Portal Resource Sharing Guide
- Cute Editor Style Guide
- Fact Sheet Style Guide
- Copyright Management Guide
- Glossary Management Guide
- PEN Corporate Identity Style Guide
- PEN Portal Handouts – Administrator's Guide

- PEN Style Guide
- PEN Standard Entry Guide
- PEN Writer's Guide
- Portal Consumer Resource Development Guide
- Resource Distribution Fulfillment Guide
- Search Management Guide

What is PEN?

Practice-based Evidence in Nutrition [PEN] is an evidence-based decision support service developed by Dietitians of Canada [DC] and launched in the fall of 2005. Thought leaders from the dietetic profession, knowledge translation and evidence-based decision-making and technology were consulted and engaged in the conceptualization, design and implementation of PEN. Review the impressive list of contributors at http://www.pennutrition.com.

Designed to support busy dietitians and other health professionals to keep pace with the vast amount of food and nutrition research available, PEN enables them to be knowledge managers through ready on-line access to trusted and credible practice guidance based on questions arising in everyday nutrition practice.

Recognized authorities on each topic addressed in PEN, identify the relevant literature from filtered and original sources and critically appraise, grade and synthesize that literature into key practice points which answer the practice questions. Additionally, client resources and other tools that are congruent with the evidence, are included in PEN to support practice, along with backgrounders, evidence summaries and practice guidance summaries.

The database in PEN is dynamic, constantly being updated in response to new practice questions submitted by users and new evidence that directs a change in current practice. The PEN service is available as an individual or group license or through a site license for larger groups. A customized application has also been designed to support dial-a-dietitian contact centres [CC-PEN]. PEN currently serves as the knowledge repository for three provincial dietitian contact centres [British Columbia, Manitoba and Ontario; each providing support to PEN through contractual collaborative agreements] and is now a global resource for nutrition practice through a collaboration with the British Dietetic Association.

How Does Contact-Centre PEN [CC-PEN] Differ from PEN?

PEN uses a powerful search engine designed to retrieve search results quickly and efficiently. This quick response is needed to support the busy practitioner and dietitians in contact centres who are working under even more limited time constraints, often with only a few minutes to identify a caller's needs and answer their questions. CC-PEN provides access to all the regular PEN content and tools as well as counselling tools and standardized responses for quality assurance. The PEN database has an impressive track-record, meeting over 90% of caller inquiries.

Other unique features of CC-PEN include customization of advice according to geographical jurisdiction, branding of client materials, automated resource distribution and tracking, community referrals using geo-mapping, alert management and data collection and reports.

Unique Views of PEN

PEN has three unique "views" providing access to differing tool sets based on one's security permission:
- a tool set to access the knowledge base and customize, print and email client/professional resources - applies to individual, group and site licensees
- a tool set to support CC-PEN users – for contact centre applications
- a tool set to manage the content of the knowledge base – for administrators.

You will find out more about these unique views and how to use the customized tools in each of the User/Administrator Guides.

Supporting Dietitians' professional development and providing access to evidence-based standards and tools to sustain the profession and promote sound decision-making is one of the priorities articulated by the DC Board of Directors for the organization's strategic plan. It remains a key direction today and has been reaffirmed in the Preferred Futures work plan currently underway by DC.

2.0   Introduction to Practice-based Evidence in Nutrition – PEN

2.1   What is a Knowledge Pathway? – Definition and Scope

The *PEN* service was designed using a knowledge path approach, each knowledge pathway (**KP**) related to a topic from the broad scope of the dietetics field (clinical, consulting, education, food service management, community nutrition, professional issues etc). Experts are appointed to develop each knowledge pathway according to a prioritized list and time line.

A knowledge pathway consists of succinct guidance statements and practice recommendations synthesized from the literature, supported by more detailed levels of carefully selected references, practice guidelines, position papers, and links to websites, electronic publications, databases and discussion groups as well as client education tools when applicable. While some of the evidence-based content, care maps, tables, etc from the former Manual of Clinical Dietetics were used, they were reviewed and updated as necessary. Tables, calculators, algorithms are also included. Each knowledge pathway grows in breadth and depth over time as evidence that informs practice changes. In addition, new knowledge pathways can be easily added as the need and interest for those topics arises.

A knowledge pathway provides the flexibility to enable the busy practitioner to quickly find the short answer to a specific question, as well as to "drill down" to review the evidence in more detail, when time permits. The breadth and depth of a knowledge pathway will vary depending on the topic.

A template has been developed to provide a framework from which to begin developing your knowledge pathway. (**Appendix 1 a and b**) In addition, guiding principles regarding evidence-based decision making and tools such as the Evidence-based Tutorial will also assist you in selecting and synthesizing the information for the knowledge pathway. [See *Getting Started* - page 5 for more information].

2.2　Criteria for Inclusion of Materials in a Knowledge Pathway

To be included in a knowledge path, materials must meet the following criteria:
- Accuracy - Information contained in the knowledge path selections must be accurate, verifiable, and peer reviewed.

- Authority - selections must be from an authoritative source. Where recommendations rely on expert opinion this too must be clearly stated so that practitioners understand the strength of the evidence supporting a particular guidance statement.

- Objectivity – selections must be science-based, evaluated and graded according to recognized standards of evidence. See **Appendix 2**

- Currency – the most recent evidence from peer reviewed articles or websites where content is reviewed at least annually should be used. An older item may be considered if no newer information or research exists or it sets the foundation for future research (e.g., a Surgeon General's report) or stands the test of time. Knowledge pathways will be reviewed and updated on a regular basis which ensures the PEN service is dynamic and up-to-date.

- Scope - selections must specifically address the knowledge path topic and, where appropriate, should encompass the continuum of health promotion/protection; disease prevention; treatment/intervention; rehabilitation and support. Resources that describe and/or evaluate programs and/or discuss "lessons learned" are particularly helpful to the professional community of practice and should be included in each knowledge path. Succinct practice statements will have embedded links to more detailed information allowing users to dig into the information for more detail.

- Access - websites and other electronic resource selections must be easily accessible (i.e. no charge) and navigable. If not and the selection is essential to the path, we'll add navigational tips for the user. Any instance where a web site or reference requires a fee to access it, it must be discussed with the project coordinator and every effort will be made to identify an alternate resource.

- Language – while the content of PEN is available only in English, if there are resources available in other languages that meet the above criteria and are in accordance with the evidence then they should also be included as a link or a PDF file.

2.3　Selecting Topics for Knowledge Pathway Development

The number of knowledge pathways continues to grow over time. The PEN team uses member input from the "submit a practice question" feature on the PEN site, feedback from the dietitian call centers which utilize PEN as their database (Dial-a-Dietitian in BC and Dietitian Advisory Service in Ontario), and the criteria adapted from a practice guideline scorecard developed by P Splett ([1]) to help establish which pathways or questions will receive immediate priority.

To what degree would the knowledge path:
- Improve client outcomes
- Affect a large patient/client population
- Affect high incidence condition or problem
- Affect vulnerable population groups

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[1] Splett, PL. Developing and Validating Evidence-Based Guides for Practice. Chicago, IL: American Dietetic Association; 2000.

- Reduce costs
- Build scientific bases linking nutrition to positive outcomes
- Improve performance or enhance confidence of practitioners
- Affect policy decisions

3.0 Getting Started

3.1 Introduction to the Evidence-based Tutorial

Evidence-based Decision Making Tutorial – Centre for Health Evidence and DC have partnered to produce an Evidence-based Tutorial which will assist you in:
- Developing a common understanding of what is evidence-based practice,
- How to use effective search strategies to find the best evidence in the food, nutrition, and medical literature for addressing new and emerging practice issues
- How to appraise it once you find it
- How to determine its applicability to your practice (perhaps this is part of the appraisal step)

We encourage all knowledge pathway writers to sign up for the course prior to beginning to develop your knowledge pathway. DC will arrange for complimentary access to the course for 2 lead writers of the knowledge pathway. **Contact Lisa Koo to make these arrangements lisa.koo@dietitians.ca.**

3.2 Understanding an Evidence-based Approach

The concept of knowledge pathways is relatively new and strives to broaden our thinking about information; how we obtain it, evaluate it and use it.

We know there is **NO shortage of information!** PEN is designed to distill the mountains of information into digestible bottom line practice guidance statements or key practice points that have been developed based on a critical appraisal of **relevant** studies, or evidence. Users can click on links to obtain more information on the evidence supporting the key practice points.

3.3 Review of the Evidence-based Practice Cycle

The Evidence-based Practice Cycle is: Assess, Ask, Acquire, Appraise and Apply. To help you construct your knowledge pathway using this evidence-based approach, we will go through each part of the Evidence-based Practice Cycle 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 Content Manager 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 knowledge pathway 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 3** 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.
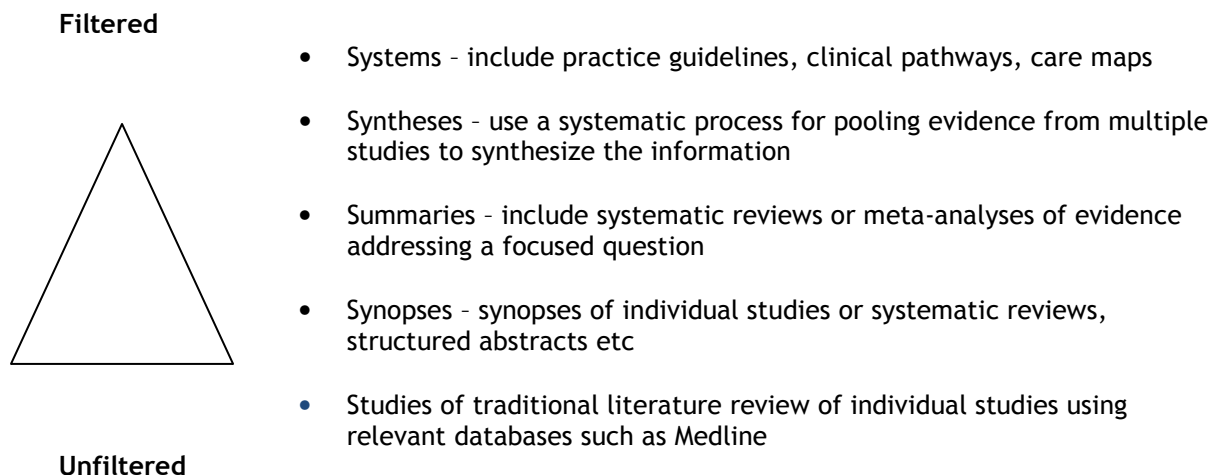
Foreground questions are usually answered with reviews of studies or individual studies. The type of question (e.g. a treatment, prognosis or diagnosis question) will determine the evidence you use to answer the question. For example, treatment questions are best answered using systematic reviews of 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 3**).

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 3** for more about clinical queries in PubMed or visit 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*.

More information on this approach is contained in an article entitled: *When less is more: A practical approach to searching for evidence-based answers*" in **Appendix 4**.

Hierarchy of Evidence (CHE – Evidence-Based Decision Making Tutorial 2006)

Filtered

- Systems – include practice guidelines, clinical pathways, care maps

- Syntheses – use a systematic process for pooling evidence from multiple studies to synthesize the information

- Summaries – include systematic reviews or meta-analyses of evidence addressing a focused question

- Synopses – synopses of individual studies or systematic reviews, structured abstracts etc

- Studies of traditional literature review of individual studies using relevant databases such as Medline

Unfiltered

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.

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.

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 NICE, 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 **Appendix 5** for worksheets on recording your systematic search strategy.

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://library.brooklyn.cuny.edu/access/greyliter.htm and "Grey-Matters: A Practical Search Tool for Evidence-Based Medicine" available from:
http://www.cadth.ca/index.php/en/cadth/products/grey-matters (accessed 2009 22 Sept).

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.

NB – 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 Evidence Checklist in Appendix 2 and the worksheets in Appendix 6, 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 Evidence-based Tutorial or Tutorial content. 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
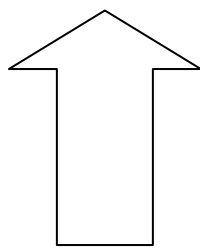
- N of 1 randomized controlled trials
- Randomized control trials
- Cohort studies
- Case-Control studies
- Cross-sectional analytic studies
- Ecological studies
- Case series
- Case reports

Results may be less valid or believable

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.

STEP 5 – **Apply**

Summarize the results of your reviews into key practice points and integrate them and the practice question into the appropriate sections of the knowledge pathway 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 **Appendix 11** for further information on plagiarism.

Authors should review the PEN site to see examples of well written key practice points. www.pennutrition.com.

Here are some examples to get you started:

http://www.pennutrition.com/KnowledgePathway.asp?kpid=3043&pqcatid=144&pqid=3092

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

3.4   Revising Knowledge Pathways

On a regular basis, frequency depends on volume of new research on the topic, or at least every two years each Knowledge Pathway (KP) is revised. Revision involves:
- reviewing existing questions, **Note:** if an author would like to eliminate a PQ or change the wording of the PQ (the question itself, not the content), there needs be dialogue and approval from the PEN team member who is mentoring them in revising the KP. Some questions are linked to more than one KP.
- searching for and incorporating new literature on the topic into the Key Practice Points and Evidence Statements
- answering new questions on the topic
- updating the Background document and Practice Guidance Summary
- reviewing tools and resources, recommending removal of those that no longer match the evidence and recommending new ones

4.0 Organizing Your Material into the Knowledge Pathway Template

The **PEN Style Guide** has been developed to help you create your content in a standardized way. It includes a Knowledge Pathway template, plain language tips, acceptable fonts, key grammar tips, spelling and the correct way to cite pathway references among many other important format issues. **As you review the following section you'll find it makes more sense to have the template, found at the end of the PEN Style Guide, handy to refer to.**

4.1   Practice Categories

Think about your knowledge pathway topic and which practice category it fits into:
- Population Health / Lifecycle
- Health condition / Disease
- Food / Nutrients
- Professional Practice

Some topics may fit into more than one practice category e.g., Healthy Weights / Obesity will likely fit into both the Population Health / Lifecycle (obesity prevention) and the Health Condition / Disease (treatment of obesity). Contrast this with Celiac Disease. Here, there is likely not a Population Health / Lifecycle component and screening, therapy and counseling etc. could all be addressed under the Health Condition / Disease practice category. To view the current PEN knowledge pathways classified under the 4 practice categories, go to http://www.pennutrition.com/TOC.aspx. Select the practice category that most closely suits your knowledge pathway and focus on the sub-categories to organize your questions.

4.2   Question Sub-Categories

Health Promotion / Prevention – questions in this category relate to efficacy of health promotion or disease prevention activities or interventions; content may define or illustrate population health approaches including capacity building social marketing, etc.

Surveillance/Screening - who should be screened, when, how, and why are the types of questions addressed here (they should be grounded in evidence and ideally tied to outcomes, not simply common or desirable practice)

Planning – questions relating to effective program planning as well as nutrition interventions or therapy would be addressed in this sub-category

Evaluation / Outcome Indicators – questions in this section might relate to cost effectiveness, best practices, evaluation strategies, outcomes of interventions or validity of particular outcome measures

Education – questions addressing effectiveness of specific types of education/counselling or education programming would be addressed in this sub-category

We encourage you to think about the simplest, most time effective way of presenting the practice guidance for busy dietitians to use. How do dietitians look for information, what kinds of things do they need? Remember, dietitians don't necessarily need more information; they need it organized, prioritized, evaluated, synthesized and accessible!

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4.3   Key Practice Points

Authors are encouraged to carefully develop the key practice points. This section is very important because it is where the synthesis of the evidence will be presented in short clear practice guidance statements or answers to specific questions with additional details regarding rationale and the supporting research or evidence provided in the body of the question. When crafting your key practice point, consider including information pertaining to:
Study design
Population studied
Limitations/confounders
Future research
Practice recommendation(s)
While it may not always be appropriate to include all of this information, study design and population studied should generally be included.

When discussing specific nutrient requirements in a key practice point, authors are reminded that using the DRI values to assess or recommend nutrient intakes for individuals can be challenging. When stating nutrient target intakes based DRIs word the recommendations as follows:

"On average, individuals should aim for an intake of (RDA or AI)"
"On average, an individual's intake should be (RDA or AI)"

Do not say…

"Consumers *need to obtain* (RDA or AI) every day
"*requirement* is…(RDA or AI)"

Note that some nutrients that have an AI established (notably: water, sodium, potassium and fibre) do not have a strong evidence base for the values. Recommended goal should likely be to "move towards" the AI, and to use them as 'directional' values rather than concrete goals. Authors are encouraged to review the relevant sections of the DRI report to assist them in understanding the various issues and caveats surrounding certain nutrient recommendations.

4.4   Evidence
When summarizing the evidence (systematic reviews, primary research etc.) include the following information in your evidence points:
- type of review or study
- date
- population studied
- main findings
- limitations
- author's conclusions
- conflict of interest

It is recommended that you tour the PEN site www.pennutrition.com to see more examples of this practitioner friendly evidence-based approach. If you are not a PEN subscriber, a guest pass can be arranged for you. Some pathways to consider as you familiarize yourself with the PEN style include: Sports Nutrition, Cardiovascular Disease and Nephrology.

<u>Examples:</u>
The following illustrates an example where the filtered literature (i.e. a Cochrane Review) has addressed the question.

Question
Is there evidence to indicate that vitamin supplements (e.g. antioxidant vitamins, vitamin D or vitamin B$_{12}$) may slow disease progression in individuals with multiple sclerosis (MS)?

Click on the url to go the this Practice question in PEN:
http://www.pennutrition.com/KnowledgePathway.asp?kpid=7261&pqcatid=146&pqid=7180

Another example from the Multiple Sclerosis pathway illustrates how to address the question when filtered literature is not available. Here, more than one key practice point is necessary to address the question. The author also uses the Rationale and Comments sections to provide additional information which offers further clarity or detail for the key practice point. **Please note the referencing style**. Time will be saved by incorporating the correct reference style as you begin building your knowledge pathway.

Question
Do individuals with multiple sclerosis (MS) who follow popular diets for MS (e.g. Swank diet, gluten-free diet, allergen-free diet, MacDougal diet, Kousmine diet) experience a reduction in the frequency of exacerbations and progression of disability?

Click on the url to go the this Practice question in PEN:
http://www.pennutrition.com/KnowledgePathway.asp?kpid=7261&pqcatid=146&pqid=7174

4.5   Evidence Summary

For **each** Knowledge Pathway there will be, when applicable, a brief summary / overview / roll-up of the key practice points in each of the four levels of evidence. Authors are encouraged to spend a little time viewing a variety of evidence summaries in *PEN* so that they can familiarize themselves with the style required. To save time, you may want to write this tool after you receive feedback from the reviewers to ensure you are working with final approved content.

4.6   Practice Guidance Summary

For **each** Knowledge Pathway there will be a brief summary / overview / roll-up of the key practice points and relevant background material, written as educational guidelines for the practitioner to use with clients / consumers. Again, authors are encouraged to spend a little time viewing a variety of practice guidance summaries (see Screen Shot below) so that they can familiarize themselves with the style required. A template has been created to assist you in developing your practice guidance summary. See **Appendix 10**.

To save time, you may want to write this tool after you receive feedback from the reviewers to ensure you are working with final approved content.

4.7 Background

PEN subscribers have indicated they find background materials very valuable especially if they are new to the topic area. Templates have been developed to guide the development of backgrounders depending on whether the topic is clinical, lifecycle or other. See **Appendix 8 and 9.**

There is a section in the Background for definitions. These should be definitions that we don't want in the glossary e.g. if there is one definition in one disease and a slightly different one in another or if the term is commonly used in another topic we don't want a multitude of underlining in a Knowledge Pathway. Please check the glossary before adding words to the Background as we don't want to duplicate definitions. Even if a term is in the Glossary you may have a better or different reference for the term which could be useful to add to the Glossary. Make certain to include the complete reference for the definition.

4.8 Related tools and resources

These can include a number of different kinds of materials (see below). For each tool and resource included in the pathway provide the following information. If there is are versions of the same tool / resource in other languages please include links to these as well:

> **Tool name**
> **Description**
> **URL**
> **Key words**
> **Developer/Publisher**
> **Author**

- **DC Tools / Resources** - on the DC website, on both the public side and the member-only side, can be linked in PEN. For tools / resources on the member-only side a note must be included in the tool / resource description that **DC membership is required to access**. If the tool / resource is no longer available on the DC website but is evaluated to still be a relevant resource – a PDF of the tool / resource will be made by the PEN Resource Manager and attached to the description.

- **Consumer information sheets** – In addition to being consistent with the evidence described in the knowledge pathway, the consumer tools should not promote any specific products or include corporate logos or promotion. Ideally, the handout should be visually appealing, plain language should be used and the reading level should be between grade 5 and 9. See PEN pathway Nutrition Education Print Resource Development for more details.

- **Policy/Advocacy / \Discussion Papers** - This section should identify key policy documents that exist relative to the topic i.e. school food policy; national nutrition recommendations; food safety standards; public health nutrition staffing policies per population group; etc.

- **Position Papers -** provide links to relevant position papers. Consider using Users' Guide worksheets (**Appendix 6**) to evaluate them.

- **Practice Guidelines / Protocols -** provide links to relevant clinical practice guidelines and protocols. Consider using Users' Guide worksheets (**Appendix 6**) to evaluate them.

- **Tables, questionnaires, forms**

- **Calculators (e.g., nomograms, BMI)**

- **Food Product Sources (retail, wholesale)**

- **Community Resources**

4.9   Related Knowledge Pathways

Provide a list of PEN topics or KPs that may contain additional information that is related to this issue/topic.

4.10 Other links (websites, DC Networks, DC courses)

These would be links that are relevant to the topic e.g. in the Food Safety KP a link to Health Canada's Advisories and Warnings page: http://hc-sc.gc.ca/ahc-asc/media/advisories-avis/index-eng.php.

4.0   Glossary

Provide definitions of key terminology used in the pathway that a dietitian may be unfamiliar with. Include the reference used for the definition.

5.0   Appendices

Appendix 1a   Practice Categories and Knowledge Pathway Template

(Practice Categories and Sub-Categories)

Population Health/ Lifecycle	Health Condition/ Disease	Food / Nutrients	Professional Practice
Health Promotion / Prevention - key practice points	Health promotion/ Prevention - key practice points	Health promotion / Prevention - key practice points	Not applicable
Surveillance / Screening - key practice points	Surveillance / Screening - key practice points	Surveillance / Screening - key practice points	Not applicable
Planning within different settings (workplace; community; school, etc) - key practice points	Planning (Nutrition care plan – assessment and implementation) - key practice points	Planning (Legislative and other frameworks - key practice points	Not applicable
Evaluation / Outcome Indicators - key practice points	Evaluation / Outcome Indicators - key practice points	Evaluation / Outcome Indicators - key practice points	Evaluation / Outcome Indicators - key practice points
Education - goals - key practice points - client education tools - health intermediary tools	Education - goals - -key practice points - client education tools (links to handouts; food lists; recipes) - other resources i.e., counseling / education techniques or strategies	Education - goals - key practice points - client education tools(links to handouts; food lists; recipes) other resources i.e., counseling / education techniques or strategies	Education - goals - key practice points - client education tools(links to handouts; food lists; recipes) - other resources i.e., counseling / education techniques or strategies
RESOURCE LINKS			
Summary of Evidence	Summary of Evidence	May not be applicable	May not be applicable
Practice Guidance Summary	Practice Guidance Summary	Practice Guidance Summary	Practice Guidance Summary
Background	Background	Background	Background / Relevance to Practice
Policy/Advocacy/Discussion Papers	Policy/Advocacy/ Discussion Papers	Policy/Advocacy/Discussion Papers	Policy/Advocacy/Discussion Papers
Position Papers	Position Papers	Position Papers	Position Papers
Practice Guidelines / Protocols	Practice Guidelines / Protocols	Practice Guidelines / Protocols	
Tables, questionnaires, forms	Tables, questionnaires, forms	Tables, questionnaires, forms	Tables, questionnaires, forms
Calculators (e.g. nomograms; BMI)	Calculators (e.g. nomograms; BMI algorithms; PDA resources)	Calculators (e.g. nomograms; BMI algorithms; PDA resources)	
Food Product Sources (retail, wholesale)	Food Product Sources (retail, wholesale)	Food Product Sources (retail / wholesale)	
Community Resources	Community Resources	Community Resources	
Related Knowledge Pathways	Related Knowledge Pathways	Related Knowledge Pathways	Related Knowledge Pathways
Other links (websites; DC Networks and courses)	Other links (websites; DC Networks and courses)	Other links (websites; DC Networks and courses)	Other links (websites; DC Networks and courses)
Glossary	Glossary	Glossary	Glossary

Appendix 1 b Knowledge Pathway Template

Category:
Sub-Category:
KP Topic:

Question (repeat format for each question)
Key Practice Point (repeat format for each practice point)
   1.
Grade of Evidence ([A], [B], [C] or [D]
Evidence
   a.
   b…..
Comments
Rationale
References
   1.
   2…..
Key Practice Point
   2.
Grade of Evidence ([A], [B], [C] or [D])
Evidence
   a.
   b……
Comments
Rationale
References
   1.
   2…..

Question Key Words

Evidence Summary
[A] The following conclusions are supported by good evidence:
[B] The following conclusions are supported by fair evidence:
[C] The following conclusions are supported by limited evidence or expert opinion:
**[D] A conclusion is either not possible or extremely limited because evidence is unavailable
   and/or of poor quality and/or is contradictory.**

Practice Guidance Summary

Background

Related tools and resources
Tool name
Description
URL
Key words
Target Country
Developer/Publisher
Author

Glossary

Pathway Key Words

Appendix 2   Evidence Grading Checklist

The conclusion is supported by GOOD evidence. (A)

	√
1. Evidence The results are from studies of strong research design for answering the practice question, clear methodology and sufficient sample size. Supporting studies might consist of: Treatment / Intervention Studies • good quality systematic review (SR) of randomized controlled trials (RCTs) with consistent findings[i] and a low risk of bias[ii] • SR including several trials combined in a single well-done meta-analysis with consistent findings[i] • two or more high quality randomized, controlled trials with a low risk of bias[ii]. Etiology / Prognosis Studies • SR of cohort studies (with homogeneity) or two or more independent well-done prospective cohort studies with consistent results in the absence of evidence to the contrary, where treatment/exposure effects are sufficiently large and consistent and a more rigorous study design is not feasible Note: Evidence might also be in a position statement or practice guideline from a national body or organization reporting results of research studies based on the aforementioned types of research • Additionally, a statement that does not fit into any of the above categories but is considered a "truism"[iii] could warrant a grade of A.	
2. Consistency[iv] - results are consistent with minor exceptions at most	
3. Clinical impact[v] - results are clinically important	
4. Generalizability[vi] - results are free of any sufficient doubts about generalizability	
5. Applicability[vii] - results are directly applicable to practice setting	

The conclusion is supported by FAIR evidence. (B)

	√
1. Evidence: The results are from studies of strong design with minor methodological concerns or from studies with weaker designs for answering the practice question, but results have been confirmed in separate studies and are generally consistent. Supporting studies might consist of: Treatment / Intervention Studies • systematic review (SR) of RCTs with heterogeneity although overall the results support the conclusion • a single RCT with low risk of bias[ii] • two or more RCTs with a clinically significant conclusion and unclear risk of bias[ii] Etiology / Prognosis Studies • SR of cohort studies (with homogeneity) or two or more well-done prospective cohort studies with consistent findings[i]. • SR of case-control studies (with homogeneity) or several independent case-control studies with similar conclusions Note: Evidence might also be in a position statement or practice guideline from a national body or organization reporting results of research studies based on the aforementioned types of research	
2. Consistency[iv] - there is some uncertainty attached to the conclusion because of minor inconsistencies among the results from the studies but inconsistencies can be explained	
3. Clinical impact[v] - minor doubt about clinical significance of benefits or harms	
4. Generalizability[vi] - there is minor doubt about generalizability	
5. Applicability[vii] - generally applicable to practice setting with few exceptions	

The conclusion is supported by LIMITED evidence or expert opinion. (C)

	∫
1. Evidence The results are from studies of weak design for answering the practice question or there is substantial uncertainty attached to the conclusion because of inconsistencies among the results from different studies. Supporting studies might consist of: Treatment / Intervention Studies • several RCTs with inconsistent results or high risk of bias[ii] • non-randomized trial or trial that used historical controls • systematic review (SR) of cohort or case-control studies (with homogeneity) or two or more well-done prospective cohort studies with consistent findings[i] Etiology / Prognosis Studies • SR of cohort and case-control studies (with heterogeneity) or several studies with some inconsistent results • results from a single cohort study or two or more case-control studies, unconfirmed by other studies • results from a number of high quality cross-sectional studies, well described case reports or case series Note: Evidence might also be in a consensus report, a position statement or practice guideline from a national body or organization reporting results of research studies based on the aforementioned types of research.	
2. Consistency[iv] - inconsistencies among the results from different studies leads to substantial uncertainty about conclusions	
3. Clinical impact[v] – uncertain or moderate	
4. Generalizability[vi] - there is substantial uncertainty about the generalizability	
5. Applicability[vii] - likely applicable to practice setting with some exceptions	

A conclusion is either not possible or extremely limited because evidence is unavailable and/or of poor quality and/or is contradictory. (D)

	∫
1. Evidence: The results are from a single study with major design flaws or from studies with such contradictory results that conclusions can't be drawn. Alternatively, evidence is lacking from either authoritative sources or research involving humans. Supporting studies might consist of: • a very poorly designed and executed trial or intervention • evidence from a single case report, case series, case-control study or ecological study unconfirmed by other studies • anecdotal reports • evidence from a small number of similar quality studies that report contradictory results (e.g. two cohort studies that report opposite associations) • research in the *in vitro, ex vivo* or animal model	
2. Consistency[iv] – usually highly inconsistent	
3. Clinical impact[v] - difficult to assess or minimal	
4. Generalizability[vi] – not generalizable or very limited generalizability	
5. Applicability[vii] – not applicable or very limited applicability to the practice setting	

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[i] A meta-analysis of RCTs should undergo a statistical analysis of heterogeneity that shows consistency (or homogeneity) between studies.

ii Risk of bias is an assessment of the validity of studies included in a review (i.e. the risk that they over- or underestimate the true effect of the intervention). Low risk of bias includes studies that demonstrate adequate sequence generation, allocation concealment, blinding, completeness of outcome data and no other sources of bias (Cochrane Handbook for Systematic Reviews of Interventions; 2009, Chapter 8. Available from: http://www.cochrane-handbook.org/)

iii A truism 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.

iv Consistency considers whether findings are consistent across studies, considering the range of study populations and study designs, including the direction and size of the effect or degree of association, and the statistical significance.

v Clinical impact considers the potential benefit of applying the recommendation to a population, including: the relevance of the outcomes to the clinical question, the magnitude of the effect, the length of time to achieve the effect, and the risks versus the benefits. (NHMRC additional levels of evidence and grades for recommendations for developers of guidelines. Available from: http://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/Stage%202%20Consultation%20Levels%20and%20Grades.pdf).

vi Generalizability considers how well the population, the intervention and the outcomes in the evidence match the population in the practice question being asked. It considers factors such as gender, age, ethnicity, health status, and how the treatment is delivered.

vii Applicability considers whether the evidence is relevant to the practice / health care setting. It considers such factors as access, cost issues etc.

Note: The quality of the evidence is a major factor determining the grade; however consideration is given to factors that influence findings, including: consistency, impact, generalizability and applicability. In some cases these factors can supersede the evidence base.

Description of Study Designs

Review Articles
A systematic review is "a critical assessment of existing evidence that addresses a focused clinical question, includes a comprehensive literature search, appraises the quality of studies, and reports results in a systematic manner. If the studies report comparable quantitative data and have a low degree of variation in their findings, a meta-analysis can be performed to derive a summary estimate of effect." (Ebell et al, 2004).

The evidence cited in the systematic review is what should govern the assignment of the grade. The conclusions generated from a systematic review are only as strong as the research studies included in the review. However, a good quality systematic review should also be well designed and executed. It should describe or include the following:
- search strategy used to locate relevant studies
- study inclusion / exclusion criteria
- an appraisal of the quality and validity of the studies included
- process for data abstraction, synthesis and analysis
- any bias, funding sources or author conflict of interest (authors of the included studies and the systematic review).

A narrative review is a nonsystematic overview of a topic. It generally is not an exhaustive or structured review of the literature, it is more susceptible to bias and does not systematically evaluate the quality of included studies according to any pre-determined criteria. It can be used to identify original studies that can be evaluated and reported as evidence. Generally conclusions from narrative reviews are not reported in the evidence; however in some situations (for example, no recent studies are identified or the compiled studies consist of C- or D-Level evidence), the narrative review can be described in the evidence. In this case, the studies cited should be described and used to assign the evidence grade.

Randomized Controlled Trials
They usually demonstrate whether therapeutic agents are beneficial but can also, less frequently, demonstrate harm. The exposed and unexposed groups should be similar in all respects other than intervention and this balance should be maintained throughout. A high quality randomized controlled trial exhibits the following

characteristics: allocation concealed, blinding if possible, intention-to-treat analysis, adequate statistical power, adequate follow-up (>80%).

Observational studies

Observational studies are studies in which investigators do not intervene, but observe the course of events and record changes or differences in one characteristic (e.g. whether they received the exposure of interest such as smoking, exercise or vegetable intake) in relation to changes or differences in other characteristics (e.g. disease development, progression or death).

Observational studies include: cohort studies (prospective or retrospective), case-control studies, cross-sectional studies, case reports and case series.

A cohort study follows a defined group of people (the cohort) over time. Outcomes observed in subsets of the cohort who were exposed to a particular factor are compared to outcomes in those not exposed to a particular factor. A prospective cohort study follows participants into the future; a retrospective cohort study identifies subjects from past records and follows them from the time of those records to a certain point in time. A high quality cohort design exhibits the following characteristics: prospective design, adequate size, adequate spectrum of patients, blinding, a consistent well-defined reference standard, good follow-up, and appropriate adjustment for confounders.

A case-control study compares people with a specific disease or outcome of interest (cases) to people without the disease or outcome (controls) to find associations between the outcome and prior exposure to particular risk factors.

A cross-sectional study measures the distribution of a characteristic in a population or sample at a certain point in time (for example: a survey).

A case report or case study describes observations among a single individual.

A case series study describes observations among a series of individuals usually all subject to the same intervention or exposure, though there is no control group.

Expert Opinion

If there is no critical appraisal or supporting evidence to support statements and conclusions it should not be used as evidence unless it is the only reference you have. In such cases it should be disclosed that the statement is based on unsubstantiated expert opinion.

Consensus Reports, Position Statements, Practice Guidelines

If research studies are cited in a consensus report, position statement or practice guideline from a national or international body or organization, the research studies should govern the grade assignment.

References

Ebell MH, Siwek J, Weiss BD, Woolf SH, Susman J, Ewigman B et al. Strength of recommendation taxonomy (SORT): a patient-centered approach to grading evidence in the medical literature. J Am Board Fam Pract. 2004 Jan-Feb [cited 2009 4 Aug];17(1):59-67. Abstract available from: http://www.ncbi.nlm.nih.gov/pubmed/15014055

Glossary of Cochrane Collaboration and research terms: http://www2.cochrane.org/resources/glossary.htm

Greer N, Mosser G, Logan G, Halaas GW. A practical approach to evidence grading. Jt CommJ Qual Improv. 2000 Dec [cited 2010 25 Oct];26(12):700-12. Abstract available from: http://www.ncbi.nlm.nih.gov/pubmed/11143209

NHMRC: NHMRC levels of evidence and grades for recommendations for developers of guidelines. Canberra, ACT: National Health and Medical Research Council, Commonwealth of Australia; December, 2009 [cited 2010 25 Oct]. Available from: http://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/evidence_statement_form.pdf

Appendix 3

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 site: http://www.hc-sc.gc.ca/
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://www.nal.usda.gov/fnic/foodcomp/search/

Be sure to check disease-related association websites as they often publish or provide links to important guidelines or reports. Some examples include:
Canadian Diabetes Association http://www.diabetes.ca/
Canadian Celiac Association http://www.celiac.ca
Heart and Stroke Foundation of Canada http://www.heartandstroke.ca
National Kidney Foundation: http://www.kidney.org
The Kidney Foundation of Canada: http://www.kidney.ca

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/
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
Cochrane Collaboration http://www.cochrane.org/index.htm
Evidence Updates 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 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/
Prodigy Clinical Knowledge Summaries http://cks.nhs.uk/home
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
UpTo Date http://www.uptodate.com/index.asp

When less is more: a practical approach to searching for evidence-based answers

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The information needs of practicing clinicians are distinct from the needs of students, researchers, or nonclinical personnel. Clinicians seek information to stay current with new relevant medical developments and to find answers to patient-specific questions. The volume of available information makes clinicians' tasks of rapidly identifying high-quality studies daunting. New tools evaluate the rigor and relevance of information and summarize it in the form of synthesized clinical answers. These sources have the opposite focus of many other information tools in that they strive to provide *less* information rather than more. With the development of these sources of validated and refined information, a new search approach is needed to locate clinical information in which speed is the benchmark. The existing medical literature, including these new refinement tools, can be conceptualized as a pyramid, with the most useful information, based on validity and relevance, placed at the apex. Use of this hierarchy allows searchers to drill down through progressive layers until they find their answers. Librarians can play a significant role in evaluating the ever-increasing variety of these synthesized resources, placing them into the searching hierarchy, and training clinicians to search from the top down.

INTRODUCTION

The type, format, and sources of information in medicine are undergoing significant and rapid change. The increasing number and diversity of useful medical electronic databases and Internet sites owe their existence in large part to the growing body of evidence-based literature that seeks to connect clinicians with systematic observations from medical research. Medical librarians, in addition to their role in archiving information, are now focusing on providing more effective methods of information retrieval, usually through electronic means.

To meet the growing demand for electronic "just-in-time" information, many librarians are encouraging their users to build their own personalized portals to library home pages for quick access to the resources and services they use the most. Librarians are also looking to handheld computers to provide this information in a clinical setting.

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* Drs. Slawson and Shaughnessy receive royalties from the sale of InfoRetriever software and the newsletter *Evidence Based Practice: POEMs for Primary Care.*

These new retrieval systems also have the potential to provide new types of information, information that synthesizes "raw" information originating from original research findings into summaries and conclusions. Librarians are increasingly being asked to provide information that is filtered by scientific rigor and relevance to the clinical practice of medicine [1–4]. Information sources that evaluate the rigor and relevance of information and then summarize it in the form of synthesized answers to clinical questions can be very helpful in meeting this goal.

Summary sources of information have existed for some time, usually in the form of books, reviews, consensus reports, and expert statements from professional organizations. This new type of information differs from these older sources in that it strives to provide information that is more useful to clinicians in the day-to-day care of patients.

The needs of clinicians in practice are quite distinct from the needs of students, researchers, or nonclinical hospital or university personnel [5]. Clinicians usually seek information for two reasons: to stay current with new developments in medicine relevant to their practice or to find answers to patient-specific questions [6]. Different tools and methods are required for these different information needs. Clinicians need to be told about new information but also need a tool for quickly finding the information again when they need it.

Due to the time constraints imposed by medical practice, the usefulness of information retrieval systems and the information they provide are critical to busy clinicians. Clinicians generate highly specific patient-related questions at a rate of about one to three questions for every three patient visits [7, 8]. Of every ten questions posed, they only look up the answers to four and only find the answers to three [9]. Of those they do not look up, they estimate at least half are important. Thus, clinicians are guessing at seven of ten questions, due in large part to the amount of work it takes to find valid and reliable information that applies to their patients.

The traditional evidence-based medicine (EBM) approach focuses mainly on the critical evaluation of original research and other sources of primary information. Over the past several years, many librarians have become active partners in the EBM process by expanding their skills to include a better understanding of clinical research and its resulting literature [10]. Librarians are now teaching targeted searching techniques, quality filtering, and critical appraisal skills in their organizations [11]. However, this approach—the evaluation of the validity of medical information by individuals using it, whether by librarians or clinicians—is not as useful as it could be because of the excessive time involved and difficulty of integrating it into clinical medical practice at the point of need. Original research, as typically published, is not useful

Table 1
Assessing the validity of information sources

- Does the information translate to the needs of the user?
— Is the patient population similar to the patients they treat?
— Is the intervention feasible?
— What did they compare in the study?
— Did they study outcomes patients would care about?
- Does the study evaluate what it is really trying to evaluate?
- Does the review, book, or Website present all of the information and is this information correct?

in the care of patients until it has been transformed in some manner.

The "usefulness" of any information source rests on the three characteristics outlined in this equation [12]:

$$\text{Usefulness} = \frac{\text{validity} \times \text{relevance}}{\text{work}}$$

The validity of information refers to its scientific rigor (Table 1). A hierarchy exists of research study design, with some methodologies having greater scientific strength. The randomized controlled trial is the strongest type of design in clinical medicine. Even randomized trials may have design faults, and critical appraisal techniques have been developed to evaluate the validity of this type of research [13].

Information in the medical literature also has various levels of relevance to practitioners of clinical medicine. The goal of medical practice is to help patients live long, healthy, functional, and symptom-free lives [14]. The most relevant information is research that *directly* evaluates the effectiveness of medical care on these outcomes that matter the most to patients.

This type of information is called "patient-oriented evidence that matters" (POEMs) [15]. This type of evidence evaluates the effectiveness of interventions that patients care about and that, as a result, clinicians care about as well. Most information in medicine, including most research, is preliminary in that it does not directly address the question of whether a particular medical approach is in the best interest of patients. POEMs contains information that directly tells clinicians that what they do for patients has been shown to make them live longer or live better.

For example, for many years anti-arrhythmic drugs were used to treat patients with asymptomatic cardiac ventricular arrhythmias because of their demonstrated effect on diminishing the frequency of arrhythmia. The supposition was that decreasing these arrhythmias would decrease patients' risk of sudden death, frequently the result of uncontrolled arrhythmic activity. After six years of use, the first study was performed to determine whether mortality was decreased in these patients. Much to everyone's surprise, mortality was actually significantly increased compared with untreated patients. This study was replicated several

times, with the same results, and these drugs are used much less today.

This is just one example in which the preliminary information is not supported by research evaluating patient-oriented outcomes. There are many instances in which the early, "makes sense" data did not translate into benefits to patients. While this preliminary information is necessary to increase our knowledge of disease, it is "not ready for prime time" in the sense that clinicians should not base changes in practice on it. While this type of disease-oriented evidence (DOE) research is crucial to the development of better medical practice, it is not sufficient, in itself, for clinical decision making.

The goal of this new approach to medical information is to provide highly valid and relevant information while requiring the least amount of time and effort to locate and apply it to practice. To meet this goal, these new information sources have the opposite focus of many other information tools in that they strive to provide *less* information rather than more.

NEW INFORMATION SOURCES

Even with the development of electronic archiving and searching, the corpus of the medical literature is still so large as to effectively prevent its integration into clinical medicine. Since its inception, MEDLINE has been the database of choice for clinicians and librarians seeking medical information. One of this comprehensive biomedical database's strengths is its size, with over eleven million journal citations, but this size also makes it more challenging to search, and the burden of determining the validity and relevance of its articles is up to users.

In 1996, the National Library of Medicine addressed the need for clinicians to refine their MEDLINE search retrieval in PubMed by applying proven clinical filters. Clinical Queries [16] provide a way to limit search retrieval to articles about the four types of clinical research: diagnosis, etiology, therapy, and prognosis, as well as options to direct the emphasis of the search to be more sensitive or more specific.

Even information that can be rapidly retrieved must be evaluated for validity, and irrelevant information must be removed. Following retrieval and evaluation for relevance and validity, research findings must be compared and combined in ways that can be used to influence patient care.

Methods have been developed for combining research findings in an explicit and reproducible manner. Systematic review and meta-analysis are two such methods. Research findings are obtained in a comprehensive manner, evaluated for scientific rigor, and combined in a way that makes both clinical and scientific sense. In this way, a vast amount of medical literature can be summarized in a single document,

"refining" the raw information into a finished product ready for clinical application.

"REFINED" SOURCES OF INFORMATION

In 1972, Archie Cochrane, a British epidemiologist, decried the unorganized way in which research findings were communicated to clinicians and stimulated thinking about ways to sift through the medical literature to find the nuggets of clinically relevant information and synthesize them [17]. In honor of his pioneering efforts, the Cochrane Collaboration [18] was set up in 1992 to make his vision real.
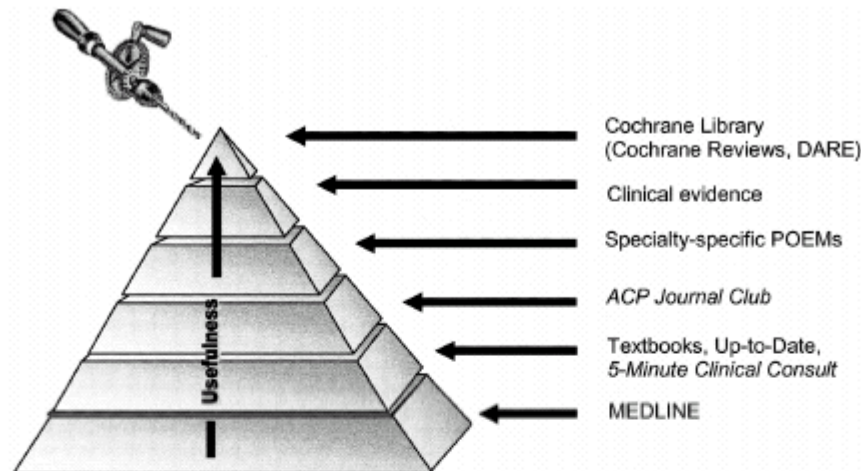
The Cochrane Collaboration is a mixture of volunteer and supported efforts from around the world. Its aim is to provide a clearinghouse for the best clinically relevant research information. By putting this information all in one spot, clinicians can quickly access this information to make decisions based on the best available evidence.

The Cochrane Database of Systematic Reviews is the flagship of the Cochrane Library [19]. Each of the reviews is aimed at answering a particular question (e.g., "are antibiotics effective in the treatment of otitis media in children?"). The methods used to identify all relevant research on a question are outlined in the review. Only results of randomized controlled trials, the most rigorous type of research, are used in the reviews. If possible, the authors of studies try to combine all of the study results (meta-analysis), trying to treat all of the separate studies as one big study to answer the question. The results and an answer to the question are provided in the review. These reviews are updated regularly.

Another approach to refining medical information is The Database of Abstracts of Reviews of Effectiveness (DARE) [20]. DARE, prepared by the National Health Centre for Reviews and Dissemination (CDR) at the University of York, England, United Kingdom, complements the Cochrane Database of Systematic Reviews by offering an annotated bibliography of quality-assessed reviews, primarily meta-analyses, in those subjects for which there is currently no Cochrane Review.

Practice guidelines are also designed to refine medical information into practical ways that can be used by clinicians. Not all practice guidelines, though, are based on the best clinical evidence. Guidelines can be categorized as either consensus-based (e.g., the National Institutes of Health Consensus Guidelines on osteoporosis prevention, diagnosis, and therapy [21]), evidence-based (American Heart Association Guidelines on pacemaker implantation [22]), or evidence-linked (e.g., American Gastroenterology Association Guidelines on management of intestinal ischemia [23]) [24]. The last group is the most useful, because the guidelines are stated and recommendations are linked in the

Figure 1
Drilling down for information

Cochrane Library
(Cochrane Reviews, DARE)

Clinical evidence

Specialty-specific POEMs

ACP Journal Club

Textbooks, Up-to-Date,
5-Minute Clinical Consult

MEDLINE

guidelines to specific, graded evidence supporting the evidence. In this way, readers can see for themselves the strength of the evidence, rather than relying on the opinion of the authors of the guidelines for interpretation.

NEW APPROACHES TO INFORMATION RETRIEVAL

With the development of these sources of validated and refined information, a new approach is needed to access clinical information in which speed is the new benchmark. The existing medical literature, including these new refinement tools, can be conceptualized as a pyramid, with the most useful information, based on validity and relevance, placed at the apex (Figure 1). The Cochrane Library is placed at the top of the pyramid, because it provides the best evidence, synthesized and presented in a highly usable format. At the bottom of the pyramid are sources that are either expert based, and thus difficult to validate, or raw information that has not yet been synthesized into usable forms [25].

Use of this hierarchy allows searching to begin at the level of information with the highest usefulness. Starting at the top, searchers "drill down" through the progressive layers, encountering information along the way that is either less valid, less relevant, or harder to use. Rather than focusing on comprehensiveness, which would be the goal when preparing for a grant or clinical trial approval, searchers search only until finding the answer to a specific clinical question. The value of the hierarchy is that the best information is searched first, reducing the need for comprehensiveness.

This approach to the medical literature is similar to the tertiary-secondary-primary literature pyramid used by information specialists. What is different, though, is that searchers more sharply focus on information of greater usefulness (both valid and relevant), rather than treating each gradation of literature as being essentially equivalent.

CURRENT AWARENESS AND SEARCHING TOOLS FOR INFORMATION MASTERY

To help clinicians efficiently navigate the information pyramid and identify information of high relevance and validity, two specific tools are needed. Clinicians need a "first alert" method, a specialty-specific "POEM Bulletin Board," for relevant new patient-oriented information as it becomes available. The myriad newsletters, Web-based systems, and other "current awareness" services attempt to fill this need. One recently released Daily POEM newsletter sends primary care based POEMs from a monthly database to subscribers via email. With few exceptions [26], these sources do not filter information based on relevance and validity and thus may not provide clinically useful information.

Clinicians also need a source for rapid retrieval of the information to which they have been alerted but that has not yet been integrated into their daily medical practice [27]. Computer-based sources are available that can provide information in less than thirty seconds [28]. Medical InfoRetriever is a tool developed

by a family practice physician to meet the needs of busy clinicians in practice. It is a search engine with eight databases of information available on platforms for Web, desktop, and handheld computer access.

The aim of InfoRetriever is to provide "just-in-time" information to clinicians that they can retrieve while practicing, rather than putting off their information search for another time. The goal is to provide answers to search queries in less than one minute. All the information presented by InfoRetriever is highly filtered for relevance and validity. In addition, using Info-Retriever to answer questions forces clinicians to search the information pyramid from the "top down," thus resulting in the highest-quality, evidence-based answer to each specific question. The databases searched by InfoRetriever are:

■ The Cochrane Database of Systematic Reviews presents only the abstracts and not the complete reviews.
■ POEMs abstracts from the *Journal of Family Practice* [29] are 700-word, structured, critically appraised abstracts and commentaries of original research articles published in 102 clinical medicine journals. Only research that provides patient-oriented evidence that matters is abstracted; preliminary research or research not meeting the criteria for validity from the Evidence-Based Medicine Working Group is not included.
■ Synopses from Evidence-Based Practice [30] is a monthly abstracting service that includes only articles meeting the POEMs criteria outlined above. These synopses are short (fewer than 300 words) and present unstructured abstracts and commentaries. This database presents information highly filtered for validity and clinical relevance [31]. This culled information is much more valuable than unfiltered sources of information, because the useless information has been removed.
■ Monographs from *Griffith's 5-Minute Clinical Consult* [32] present brief overviews of the diagnosis and management of about 1,000 topics. While not an evidence-based resource, it provides basic information that can be used to supplement the better sources of information also included in the database and allows clinicians to find an answer to almost all of their clinical questions.
■ Practice Guidelines: Summaries of evidence-linked and validated practice guidelines are provided in the guidelines. The desktop and Web-based versions also include links to "evidence-linked" practice guidelines available on the Internet.
■ Family Practice Inquiries Network (FPIN) Answers is a nationwide project designed to develop a database of questions arising in primary care with evidence-based answers supplemented with expert commentary.
■ Clinical Rules and Calculators provides clinical prediction calculators based on published research data. For example, one clinical rule allows clinicians to es-

timate the probability of a deep venous thrombosis based on the clinical symptoms of the patient [33].
■ History and Physical Exam Diagnostic Calculator presents calculators to determine the sensitivity, specificity, predictive values, and likelihood ratios of various history and physical examination findings. Clinicians can enter the pretest probability, and the calculations will automatically be updated.
■ Diagnostic Test Calculators determine the test characteristics of laboratory and imaging procedures. Clinicians can change the pretest probability to determine how the predictive values of the test will change.
■ Drug Database lists more than 1,300 drugs with basic information, such as adult and pediatric doses, safety in pregnancy and lactation, relative price, and managed care formulary inclusion.

InfoRetriever places highly valid, highly relevant information "at the fingertips" of clinicians, while they practice. Searches can be performed simultaneously on all eight databases, searching by text word or keyword (general clinical categories based on the International Classification of Diseases). Each database also can be browsed separately.

The search results screen presents a list of "hits." The search findings are organized in order of decreasing quality of the evidence, based on criteria outlined by the Evidence-Based Medicine Working Group. In this way, clinicians can determine quickly what the information is and the degree of certainty.

Other tools are also being made available to provide clinicians with highly valid information. Ovid Technologies has developed an evidence-based medicine library that includes, in separate databases, the Cochrane Database of Systematic Reviews and Controlled Trials, the Database of Abstracts of Reviews of Effectiveness, and *ACP Journal Club* [34]. The *BMJ* Publishing Group produces Clinical Evidence, an updated paper, Web, or CD-ROM compilation of current evidence on the prevention and treatment of many common clinical conditions [35]. Clinical Evidence, also available by subscription from Ovid, is unique in that it details the gaps and uncertainties in the current medical knowledge. Knowing where the "holes" are in the evidence on a given subject is just as important as knowing what evidence is available.

THE LIBRARIAN'S ROLE

The growing number of evidence-based information sources, initially developed to streamline the information-gathering process for clinical decision making, are now in need of being managed themselves. Librarians—by virtue of their traditional roles in collection development, literature searching, and end-user training—are in a wonderful position to study the strengths and weaknesses of these new tools to deter-

mine whether they are truly evidence based and present patient-oriented evidence that matters.

If resources meet these criteria, librarians can place them into the proper level of the searching hierarchy. The placement of a resource into the EBM searching hierarchy is an attempt to balance the "usefulness equation" for that resource when compared to another. Librarians are uniquely aware of the intricacies of a broad range of search systems, allowing them to rank their usefulness more easily. For example, the simultaneous search feature in Ovid's evidence-based medicine library for searching Cochrane, DARE, and *ACP Journal Club* with one strategy enhances the overall usefulness of these products by lowering the work part of the equation.

Clinicians, who may not be aware of the variety of refined information sources and timesaving search features that exist, will benefit from librarians' organization of searching hierarchies. With such a framework in place, librarians can emphasize the location of relevant retrieval with minimal time and effort by training clinicians to search the usefulness pyramid from the top down

INFORMATION MASTERY

All information in medicine is not created equal: most of the currently available medical information either is too preliminary to warrant a change in clinical medicine or is otherwise not relevant to clinical medicine. The goal of clinicians is to rapidly identify and use high-quality information in the course of their practice. Unfortunately, the volume of information available to them makes this task daunting without specific tools. Further, information that is presented in its raw (i.e., originally published) form is not useful to clinicians, until they or someone else can evaluate and summarize it. A growing number and variety of new tools that are sources of highly filtered, highly relevant information are available. Librarians can play a significant role in helping clinicians evaluate the clinical value of these resources. These new tools, placed within a searching framework based on the usefulness equation, offer the promise that all clinicians can use resources that retrieve information with the highest relevance and validity with the lowest work, thereby becoming "information masters."

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Appendix 5   Search Strategy Worksheet

      a.   Define your topic (1 or 2 sentences in your own words, if possible, in the form of a well-built question – remember PICO)

      b.   Identify main concepts (come up with 2 to 4 keywords that define your topic, the keywords should all be separate terms that represent your main ideas)

      c.   Come up with as many synonyms for each main concept (first come up with the words you can think of, then use something like the MeSH dictionary to add to the list)

      d.   Combine your terms using AND and OR

      e.   Identify any inclusion/exclusion criteria or limits (language, human vs animal, time period, types of study, etc…)

      f.   Select databases that you want to search

      g.   Record search strategies for each database and approximate number of results
          Database   # of articles

      h.   List other methods used to find information and record strategies used (reviewing references lists from key articles, searching the web for grey literature, other sources)

Here are some examples of this kind of worksheet:
http://www.library.mun.ca/qeii/instruction/exercises/worksheet.php
http://library.humboldt.edu/infoservices/sstrawrksht.htm

Creating a Search Strategy

STEP 1: IDENTIFY THE TOPIC / ISSUE

STEP 2: KP CATEGORY

- ☐ Population Health
- ☐ Health Condition / Disease

- ☐ Food / Nutrient
- ☐ Professional Practice

STEP 3: DEFINE THE QUESTION

Population -

Intervention -

Comparison -

Outcome -

STEP 4: IDENTIFY THE SUB-CATEGORY

- ☐ Health Promotion / Prevention
- ☐ Surveillance / Screening
- ☐ Planning

- ☐ Evaluation / Outcome
- ☐ Education

STEP 5: IDENTIFY MAIN CONCEPTS

CONCEPT A   CONCEPT B   CONCEPT C

CONCEPT D   CONCEPT E

STEP 6: DEVELOP A LIST OF SEARCH TERMS

(PubMed Clinical Queries and MeSH Dictionary help to add to concepts)

CONCEPT A   CONCEPT B   CONCEPT C

CONCEPT D   CONCEPT E

STEP 7: CONNECT WORDS AND CONCEPTS

STEP 8: IDENTIFY INCLUSION/ EXCLUSION CRITERIA

Examples: timelines, languages, age, human vs. animal, types of studies or interventions etc

Limit:

STEP 9: SELECT DATABASES TO SEARCH

Question Type:
- Diagnosis, Harm and Prognosis: Best Evidence, UptoDate, MEDLINE
- Treatment: Cochrane Library, Best Evidence, UptoDate, MEDLINE

Pre-Filtered Information
- Best Evidence (ACP Journal Club, Evidence-based Medicine)
- Cochrane Library
- UpToDate
- Clinical Evidence (www.clinicalevidence.com)

Unfiltered Information
- MEDLINE
- Internet

STEP 10: RESULTS FROM DATABASE SEARCH

Database 1:
Results:

Database 2:

Results:

Database 3:

Results:

Systematic Reviews:

Practice Guidelines:

Case-Control Study:

Review Articles:

STEP 11: OTHER METHODS USED TO FIND INFORMATION

Appendix 6   Selected User Guides to the Medical Literature

Based on the "Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice", this worksheet can serve as an aid to the critical appraisal of **systematic reviews and summaries of evidence and Position Papers.**

Appraiser: [   ]

Date: [   ]

Citation: [   ]

Study Question: [   ]

Are the results valid?

✓✗ ? **Did the review explicitly address a sensible clinical question?**

[   ]

✓✗ ? **Was the search for relevant studies detailed and exhaustive?**

[   ]

✓✗ ? **Were the primary studies of high methodologic quality?**

[   ]

✓✗ ? **Were assessments of studies reproducible?**

[   ]

What are the results?

✓✗ ? **Were the results similar from study to study?**

[   ]

✓✗ ? **What are the overall results of the review?**

[   ]

What are the results?

✓✗ ? **How precise were the results?**

┌───┐
│   │
│   │
│   │
└───┘

How can I apply the results to patient care?

✓✗ ? **How can I best interpret the results to apply them to the care of patients in my practice?**

┌───┐
│   │
│   │
│   │
└───┘

✓✗ ? **Were all clinically important outcomes considered?**

┌───┐
│   │
│   │
│   │
└───┘

✓✗ ? **Are the benefits worth the costs and potential risks?**

┌───┐
│   │
│   │
│   │
└───┘

Additional Comments:

┌───┐
│   │
│   │
│   │
│   │
│   │
│   │
│   │
│   │
│   │
└───┘

Based on the "Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice", this worksheet can serve as an aid to the critical appraisal of an article about **therapeutic interventions.**

Appraiser:

Date:

Citation:

Study Question:

Are the results valid?

✓✗? **Did experimental and control groups begin the study with a similar prognosis?**

Were patients randomized?

Was randomization concealed?

Were patients analyzed in the groups to which they were randomized?

Were patients in the treatment and control groups similar with respect to known prognostic variables?

✓✗? **Did experimental and control groups retain a similar prognosis after the study started?**

Were patients aware of group allocation?

Were clinicians aware of group allocation?

Were outcome assessors aware of group allocation?

Are the results valid?

Was follow-up complete?	

What are the results?

✓✗? **How large was the treatment effect?**

What is the relative risk reduction?	
What is the absolute risk reduction?	

✓✗? **How precise was the estimate of the treatment effect?**

What were the confidence intervals or p-values?	

How can I apply the results to patient care?

✓✗? **Were the study patients similar to the patient in my practice?**

Does your patient match the study inclusion criteria?	
If not, are there compelling reasons why the results should not apply to your patient?	

✓✗? **Were all clinically important outcomes considered?**

What were the primary and secondary endpoints of the study?	
Were surrogate endpoints used?	

How can I apply the results to patient care?

✓✗ ? **Are the likely treatment benefits worth the potential harm and costs?**

What is the number needed to treat (NNT) to prevent one adverse outcome or produce one positive outcome?

Is the reduction of clinical endpoint worth the increase of cost and risk of harm?

Additional Comments:

Based on the "Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice", this worksheet can serve as an aid to the critical appraisal of an article about **qualitative research.**

Appraiser:

Date:

Citation:

Study Question:

Are the results valid?

✓✕ ? **Was the choice of participants explicit and comprehensive?**

✓✕ ? **Was data collection sufficiently comprehensive and detailed?**

✓✕ ? **Were the data analyzed appropriately and the findings corroborated adequately?**

What are the results?

How can I apply the results to patient care?

✓✗ ?　**Does the study offer helpful theoretical conclusions?**

✓✗ ?　**Does the study help me understand the context of my practice?**

✓✗ ?　**Does the study help me understand my relationships with patients and their families?**

Additional Comments:

Based on the "Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice", this worksheet can serve as an aid to the critical appraisal of an article about **harm.**

Appraiser:

Date:

Citation:

Study Question:

Are the results valid?

✓✗ ? **Did the investigators demonstrate similarity in all known determinants of outcome; did they adjust for differences in the analysis?**

Sub question 1?

Sub question 2?

✓✗ ? **Were exposed patients equally likely to be identified in the two groups?**

Sub question 1?

Sub question 2?

✓✗ ? **Were the outcomes measured in the same way in the groups being compared?**

Sub question 1?

Sub question 2?

✓✗ ? **Was follow-up sufficiently complete?**

Sub question 1?

Sub question 2?

What are the results?

✓✗ ? **How strong is the association between exposure and outcome?**

Sub question 1?

What are the results?

Sub question 2?

✓✗ ? **How precise is the estimate of the risk?**

Sub question 1?

Sub question 2?

How can I apply the results to patient care?

✓✗ ? **Were the study patients similar to the patient in my practice?**

Sub question 1?

Sub question 2?

✓✗ ? **Was the duration of follow-up adequate?**

Sub question 1?

Sub question 2?

✓✗ ? **What was the magnitude of the risk?**

Sub question 1?

Sub question 2?

✓✗ ? **Should I attempt to stop the exposure?**

Sub question 1?

Sub question 2?

Additional Comments:

Based on the "Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice", this worksheet can serve as an aid to the **critical assessment of recommendations.**

Appraiser:

Date:

Citation:

Study Question:

Are the recommendations valid?

✓✕ ? **Did the recommendations consider all relevant patient groups, management options, and possible outcomes?**

✓✕ ? **Is there a systematic review of evidence linking options to outcomes for each relevant question?**

✓✕ ? **Is there an appropriate specification of values or preferences associated with outcomes?**

✓✕ ? **Do the authors indicate the strength of their recommendations?**

Additional Comments:

Appendix 7   Guidelines for Knowledge Pathway Reviewers

These guidelines have been included so that PEN authors are familiar with the criteria that their peers will use to review the PEN knowledge pathways.

DC PEN (Practice-based Evidence in Nutrition)
GUIDELINES FOR KNOWLEDGE PATHWAY REVIEWERS

Role of the Reviewer

1. Your primary task is to determine the acceptability of the Knowledge Pathway (KP) content, for the total KP or for an answer to a specific practice question. You are providing feedback to the author(s) for the purpose of improving the quality of Knowledge Pathway content and it's usefulness to practitioners. Points to consider: scientific soundness, practice merit, interest, value, clarity and readability. See attached checklist.

2. The reviewer is not anonymous to the author(s). The review form contains your constructive feedback and questions directed to the author(s) and these go directly to them without editing or see **Note** below. Be as clear and concise as possible since these comments form the basis for their revision of the answer to the practice question / Knowledge Pathway.

3. Please number the points in your Comments for Authors to facilitate checking the author's rebuttals or explanation of revisions.

4. It is particularly helpful to the PEN Pathway Coordinator and the author if your comments differentiate clearly between:

   a. the need for clarification or improvement of a key practice point

   b. required additions to a Knowledge Pathway (i.e. additional resources, web links, client educations tools)

   c. scientific criticisms, including completeness of literature review or grading of the evidence

   Note: the easiest and most clear way to provide feedback to the author is to use Track Changes in the WORD document containing the PEN content – adding your comments and suggested wording changes. If you choose this method of providing feedback then you only need to complete Page 4 of this document and send it and the content document to the PEN Pathway Coordinator. Page 4 is not sent to the author so if you have comments that you would rather the author didn't see then put them on page 4.

5. Reviewers must respect DC's ownership of PEN content and authors' rights by not making copies of the PEN documentation or sharing it with others, except with the permission of the PEN Pathway Coordinator.

DC PEN (Practice-based Evidence in Nutrition)
CHECK LIST FOR REVIEWERS

Note: The principles relating to format, clarity, precision of language and logic apply to all answers to PEN practice questions and Knowledge Pathways.

Practice Question
Is the practice question written in a clear, concise manner? Is it suitable as a foreground practice question or should it be in Background information?

Key Practice Point
Are the Key Practice Points relevant to the question? Are they clearly written? Is the evidence complete and graded appropriately? Are there other practice points which should be made to answer this question? Are the practice points according to VIA?

> *Validity* – Can you trust the information? Are the source and level of evidence stated?
> *Importance* – Will the information make an important difference to practice? Are the outcomes are ones practitioners or clients would care about?
> *Applicability* – Can you use this information in practice settings? (consider access, practicality or cost issues etc)

Rationale and Comments
If these sections are included, are the remarks appropriate and do they add to the clarity of the knowledge pathway? If there is no rationale or are no comments provided, should there be?

Evidence
Are there key / important articles / studies which haven't been included as part of the evidence?
Are the references cited to ensure that they are current and appropriate in scope?
Are references:

• Accurate, verifiable, and peer reviewed?

• Authority - from an authoritative source - e.g. peer reviewed journal, RCT, systematic review or national guideline or policy? Where the recommendations rely on expert opinion this too must be clearly stated so that practitioners understand the strength of the evidence supporting a particular key practice point.

• Objective – science-based (evidence-based?) and evaluated according to recognized standards of evidence (peer reviewed) etc. See grading of evidence levels.

• Current - very recent (publications written in the last 2 years or websites where content is reviewed at least annually. An older item may be considered if no newer information or research exists or it sets the foundation for future research (e.g. NICE guidance, a Surgeon General's report) or stands the test of time e.g. a key document such as DRI's.

Key Words
Are suitable key words provided for each knowledge pathway / question? Do you disagree with any of the existing ones? Can you identify any additional ones? Have all UK / European spellings of the words been included?

Background
Is it complete, accurate? Is there other content that should be included in the Background document, including other links to background information?

Resources /Tools
The goal of PEN is to survey the landscape on a particular topic and provide a selection of the very best tools available that are consistent with the evidence. And where appropriate uses UK quality accredited items e.g. Information Standard, NHS evidence.

Has the author included the best tools to support this knowledge pathway? Are there any missing? Are there any that should be eliminated? Of those that are recommended for inclusion, are they:

• Accurate, verifiable, and peer reviewed?

• Authority - from an authoritative source? Where recommendations rely on expert opinion this too must be clearly stated so that practitioners understand the strength of the evidence supporting a particular key practice point.

• Objective – science-based and evaluated according to recognized standards of evidence.

• Current - very recent (publications written in the last 2 years or Web sites where content is reviewed at least annually. An older item may be considered if no newer information or research exists or it sets the foundation for future research (e.g. NICE guidance, a Surgeon General's report) or stands the test of time e.g. a key document such as DRI's.

• Scope – they must address the KP topic and, where appropriate, should encompass the continuum of health promotion/protection; disease prevention; diagnosis, treatment/intervention; rehabilitation and support. Resources that describe and/or evaluate programs and/or discuss "lessons learned" are particularly helpful to the professional community of practice and should be included in each knowledge path.

• Access – are websites and other electronic resource selections easily accessible (i.e. no charge) and navigable. If electronic access is not provided, does the information provided allow the user to easily locate the tool?

• PEN content is free from commercial bias and all linked tools and resources should be as well. If there is a particular commercial tool which you think is critical to have in the KP please discuss it with your PEN team contact

• Are suitable key words provided for each tool?

• If reviewing a specific consumer resource complete the DC Consumer's Resource Evaluation Tool

Reviewer's Report to PEN Pathway Coordinator

Title of Knowledge Pathway:
Key Practice Question (if applicable):

Reviewer's Name: **Due Date:**

Recommendations for this Knowledge Pathway / Key Practice Question:

_____ Accept as is
_____ Accept with minor revision (Unless notified otherwise by you, we will **not** circulate minor revisions for
           further review.)
_____ Accept with major revision (e.g. a major re-approach to analysis or new data
           incorporated)
_____ Reject

Confidential Comments to the PEN Pathway Coordinator: (Please support your recommendations and indicate
which comments you made to the author are critical, requiring corrections to make the practice answer or
Knowledge Pathway acceptable.)

If major revisions are recommended, would you be willing to review the revised practice answer / Knowledge
Pathway?
Yes _____   No_____

Do you agree to being listed as a reviewer in PEN?   Yes _____   No_____

If yes, please include your professional credentials as you would like them reflected in the Knowledge Pathway.

If you agree to be listed as a reviewer, do you agree to have your email address posted so PEN subscribers might
contact you if they want to discuss the content of the pathway?

Yes _____   N0 _____

Signature of Reviewer:

Date of Review:

PLEASE RETURN REVIEW TO:
Beth Armour
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DC PEN (Practice-based Evidence in Nutrition)
COMMENTS FOR AUTHORS
<mark>**(only complete if Track Changes was not used in the PEN content document**</mark>**)**

Title of Knowledge Pathway under review:
Practice Category:
Practice Sub-Category:
Key Practice Question (if applicable):

General Comments:

Specific Comments: (please number your comments, and identify the page, category, sub-category, practice question, key practice point, evidence, resource /tool etc. Alternatively, you may wish to make them in the WORD document using Track Changes.

Missing Key Practice Questions:

Missing Background Information:

Missing Resources / Tools:

    Policy/Advocacy/Discussion Papers

    Position Papers

Practice Guidelines / Protocols

Tables, questionnaires, forms

Calculators (e.g. nomograms; BMI)

Food Product Sources (retail, wholesale)

Community Resources

Other links (websites; DC Networks and courses)

Glossary

Do you have any suggestions for additional key words?

PLEASE RETURN REVIEW TO:
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Appendix 8   Background Template – Disease-Related Topic

Disease Etiology

Screening / Diagnosis

Prevalence

Symptoms

Co-Morbidities / Associated Diseases
Give basics but link to a website or an article if appropriate

Medical Treatment (medications, other health care professionals involved etc.)
Give basics but link to a website or an article if appropriate

Nutrition Diagnosis
A nutrition diagnosis describes a nutrition problem that nutrition intervention can resolve or improve.
It is written as a PES statement (P= problem; e= etiology; S= signs and symptoms).
Example of a nutrition diagnosis is:

- Inadequate nutrient absorption related to small intestinal villous atrophy evidenced by
  involuntary weight loss of x kg in x months, anemia and osteoporosis.

Nutrition Care Goals / Nutrition Care Basics
Link to PEN client handout if applicable
See Practice Guidance Summary – may be enough here

Food Service Implications

Definitions (check the PEN glossary prior to creating additional definitions or glossary terms)

Basic Resources for Professionals (key resources for the professional to understand the topic: links, books, DC Networks, Communities of Practice etc.)

Additional Resources / Readings for the Professional

Other (controversies, up-and-coming topics, economic considerations etc.)

References

Appendix 9   Background Template – Non Disease–Related Topic

Importance of Topic to Practice

Topic Overview (who, what, where, why and how of the topic)

Relevant basic information / background questions on the topic to support the PEN question content

Canadian Regulatory Issues (quality / safety monitoring, labeling, etc)

Definitions (check the PEN glossary prior to creating additional definitions or glossary terms)

Basic Resources for Professionals (key resources for the professional to understand the topic: links, books, DC Networks, Communities of Practice etc.)

Additional Resources / Readings for the Professional

Other (controversies, up-and-coming topics, economic considerations etc.)

References

Appendix 10   Practice Guidance Summary Template

Knowledge Pathway Name - Practice Guidance Summary

Table of Contents (Topics to be hyperlinked when posted)

Introduction
Description of the Knowledge Pathway Topic (include hyperlink to Background document and additional information as relevant)

Key Nutrition Issues (relevance of nutrition to health condition / lifecycle)

Nutrition Assessment (if relevant, include Nutrition Screening or when to refer to RD)

Nutrition Intervention (include relevant hyperlinked client handouts)
Goals

Recommendations

Food List (Allowed/Not Allowed)

Nutrition Monitoring / Evaluation (if relevant)

Other Nutrition Issues (Q & A format - from kp but not part of general nutrition recommendations)

Related Nutrition Questions (include relevant hyperlinked questions from kp)

Client Handouts (include relevant hyperlinked client handouts)

References (if content is quoted)

Note: See relevant practice questions in this knowledge pathway for references.

Appendix 11   Plagiarism Guidelines

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. Both plagiarism and self plagiarism are considered in relation to PEN.

There are many definitions of plagiarism, one is:
"taking over the ideas, methods, or written words of another, without acknowledgment and with the intention that they be taken as the work of the deceiver." (1)

If you are taking content word-for-word from someone else's work then quotation marks around the content with the appropriate reference is the most common way to acknowledge the work of others.

Copying text from another source and paraphrasing it or changing or adding a few words here or there or replacing words with synonyms does not constitute creation of original work. If you use part of an article or an abstract word-for-word you would need to put that content in quotation marks and reference it. This can become an issue when summarizing a study and the study results for the PEN evidence statements. When summarizing, one must also make certain that the exact meaning of the author's words has been reflected in your summary. In order to do this one needs to have a good understanding of the information presented, including the terms used in the original content.

A definition of self plagiarism in writing is:
"self-plagiarism occurs when authors reuse their own previously written work or data in a 'new' written product without letting the reader know that this material has appeared elsewhere." (2)

Self plagiarism is relevant to PEN if one were to publish essentially the same content you have written for PEN in more than place, without any indication that the content has been published in PEN.

For more information on this topic, including examples, you are encouraged to read the following document:
Roig M. Avoiding plagiarism, self-plagiarism, and other questionable writing practices: A guide to ethical writing. Office of Research Integrity, US Department of Health and Human Services. Available from: http://ori.dhhs.gov/education/products/plagiarism/

1. American Association of University Professors. "Statement on Plagiarism." Academe. September/October 1989;75(5):47-48. Not available on-line.
2. Roig M. Avoiding plagiarism, self-plagiarism, and other questionable writing practices: A guide to ethical writing. Office of Research Integrity, US Department of Health and Human Services. Pg 16. Available from: http://ori.dhhs.gov/education/products/plagiarism/

Appendix 12   Link to PEN Orientation Modules

http://www.dieteticsatwork.com/pen/module_library.asp

Appendix 13   Glossary

See relevant research-related glossary items in the Research Terms resource in the Research Methods – KP at:
http://www.dieteticsatwork.com/pen/KnowledgePathway.asp?kpid=14732