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Appendices 1-3 to:

Campbell C, Hendry P, Delva D, Danilovich N, Kitto S. Implementing Competency-Based Medical Education in Family Medicine: A Scoping Review on Residency Programs and Family Practices in Canada and the United States. Fam Med. 2020;52(4):246-254. doi: 10.22454/FamMed.2020.594402

Supplemental Digital Content

Supplemental Digital Appendix 1

"Scoping Review Protocol"

Overview

The scoping review approach was used for this study. There are four common reasons for undertaking scoping studies: to examine the extent, range and nature of research activity, to determine the value of undertaking a systematic review, to summarize and disseminate research findings, and to identify research gaps in the existing literature.[32] The scoping review was guided by the rigorous methodological approach[32,42] and included the six following stages: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) collating, summarizing and reporting results and (6) consultation (optional). Our application of this approach is described in the following sections. Some improvements were introduced to increase methodological rigor, most notably making consultation the first, and an ongoing, step.

Ongoing Consultation

This was both a mandatory and ongoing process within this scoping review. The scoping review protocol draft was circulated for feedback from experts in the following four domains: CPD, residency education, knowledge translation, and Family Medicine. The experts were formally engaged in providing references about potential studies to include in the review as well as valuable insights into issues relating to the implementation of CBME practices in Family Medicine residency training and CPD.

Complete Search Strategy

Our search strategy involved searching for evidence via different sources (electronic databases, bibliographies, hand-searching of key journals, relevant organizations, and experts' recommendations). As Arksey & O'Malley[32] note, the adoption of this strategy helps in achieving the goal of a comprehensive scoping of the field through identifying primary studies (published and unpublished). The main search strategy developed by the University of Ottawa senior librarian, was circulated to the project team and revised, as necessary.

We searched the five electronic databases MEDLINE, ERIC, PsycINFO, EMBASE, and EdSource using the ***following search terms****:*

"competency-based medical education" OR "CBME" OR "competency-based education" OR "competence," OR "CanMEDS" OR "the Institute of Medicine competencies" OR "ACGME competencies" OR "outcomes project" OR "ACGME"

AND
"continuing professional development" OR "CPD" OR "continuing medical education" OR "CME" OR "education, medical, continuing" OR "continuing education"

AND

"residency" OR "residency program" OR "residency programme" OR "residency training" OR "postgraduate medical education" OR "PGME" OR "postgraduate training" OR "graduate medical education" OR "GME" OR "education, medical, graduate" OR "internship and residency" OR "medical residency"

AND
"family medicine" OR "family practice" OR "general practice" OR "family physician(s)" OR "general practitioner(s)" OR "primary care physician(s)"

AND
Canada OR Canadian OR CanMEDS OR United States OR American OR North America

The search strategy also included **manual selection of key journals, bibliographies of identified articles and the Web sites of relevant organizations:**

- Contacting ***relevant national and/or local organizations*** working in the field has been shown to be instrumental in generating information about primary research and included Accreditation Council on Graduate Medical Education, American Academy of Family Medicine, American Academy of Family Physicians, American Board of Family Medicine, Association of Family Medicine Residency Directors, College of Family Physicians of Canada**,** Resident Doctors of Canada, Society of Teachers of Family Medicine, and the Alliance for Continuing Education in the Health Professions.

- The project team and expert panel identified the following journals for ***hand-search:*** *Academic Medicine, Canadian Family Physician, Family Medicine,* and *Journal of Continuing Education in the Health Professions.*

Charting the Data

To extract data from each article a standardized data extraction form (a data charting form) was developed using a Microsoft Excel spreadsheet. For ensuring the rigor of the process and the credibility of the findings, we followed Reeves et al.'s protocol[43] for two or more independent reviewers with quality checks from a third party. **While piloting the use of the extraction form** (data charting form), the expert panel (CC, DD, PH) independently coded the charted data from 5 articles using a customized coding manual. The entire team, including the project group (SK, ND) and the coders met and, refined, through an iterative process, the definitions of each type of data to be extracted and created a second version of the extraction /data charting form. Five more articles were further reviewed by the expert panel using the second version of the extraction form. Another team meeting was held during which complete agreement was achieved on all data extraction items. The coding manual was also revised during the coding process based on input from the expert group (CC, DD, PH) and specific coding decisions. Coding rules were added to the manual to ensure the consistent coding of the dataset.

Supplemental Digital Appendix 2

"Coding Manual"

CODING MANUAL

Table of Content

GENERAL INFORMATION

OVERVIEW

The Coding Manual is divided into two major parts:

1. **Coding Book for Data Abstraction (pages 7-9)** lists and defines the major categories to be coded.
2. **Data Charting Form (pages 10-15)** describes how to use the provided Excel Workbook.

DATA ABSTRACTION

Research Questions

- What is the range and prevalence of CBME implementation practices in family medicine residency programs and family practices across Canada and the USA?
- What are similarities and differences in the CBME implementation practices between residency and CPD?

Concepts to Be Coded

- *Foundation for implementation activity* - defined by study authors as documents that serve to support teachers and other educators as they implement the competency-based curriculum framework, including outcomes and standards;

- *Implementation activity* - defined by Fixsen et al,[46, p. 5] as "a specified set of activities designed to put into practice an activity or program of known dimensions";

- *Level of implementation practice (individual, program, and organization/institutional)* - defined as "target" or "action target" of interventions.[47,48]

Coding Book for Data Abstraction

Coding Categories	Corresponding Columns in Excel File	Description
Foundation for implementation activity(s)	Column M	Indicate the foundation for implementation activity described in the article by choosing from the list below.[1-3] Enter *"not applicable"* if foundation for implementation activity was not described. If multiple foundations for implementation activities were described in the article, choose one of the specified activities from the dropdown list in Column M and enter any additional foundation for implementation activity(s) indicated in the article in Column N "Other Foundation(s) for Implementation Activity". • designing competency-based curriculum • reviewing competency-based curriculum • developing competency-based assessments • defining competency-based curriculum outcomes that reflect CanMEDS-FM • developing competency-based evaluation objectives • describing how evaluation/review of competency-based educational program has to be done • other • not applicable
Other foundation for implementation activity	Column N	If you selected "other" in the previous Column M, list other foundation for implementation in Column N.
Evidence from article	Column O	Copy and paste an excerpt that describes the foundation for implementation activity from the article. That is, provide a few words or a sentence and the page number to justify your choice of implementation activity(s).
Implementation activity	Column P	Specify the implementation activity described in the article by choosing from the list below.[1,2] Enter *"not applicable"* if implementation activity was not described. If multiple implementation activities were described in the article, choose one of the specified activities from the dropdown list in Column P and enter any additional implementation activity(s) indicated in the article in Column Q "Other Implementation Activity(s)". • training of the faculty and the curriculum planners about CBME • training of the curriculum planners about CBME • designing, reviewing competency-based curriculum • developing competency-based assessments/evaluation objectives • program evaluation

		• didactic session (lecture, videotape and handouts) • workshop • online course • reflection on physicians' own practice • clinical supervision • lecture at a conference • educational outreach visits • one-to-one training sessions • training program • a "role playing" intervention • practice facilitation • educational meetings • interprofessional education • other • not applicable
Other implementation activity(s)	Column Q	If you selected *"other"* in the previous Column P, list other implementation activity(s) in Column Q.
Evidence from article	Column R	Copy and paste an excerpt that describes implementation activity(s) from the article. That is, provide a few words or a sentence and the page number to justify your choice of implementation activity(s).
Level of implementation practice(s)	Column S	Indicate the level of implementation practice(s) discussed in the article by choosing from the list below.[1,3] Enter *"not applicable"* if level(s) of implementation practice(s) was not described. If multiple levels of implementation practice(s) were described in the article, choose one of the specified levels from the dropdown list in Column S and enter any other level(s) indicated in the article in Column T "Other Level(s) of Implementation Activity(s)": • individual • program • institutional/organization • not applicable
Other level(s) of implementation practice(s)	Column T	If you selected *"other"* in the previous Column S, list other level(s) of implementation practice(s) in Column T.
Evidence from article	Column U	Copy and paste an excerpt that describes level(s) of implementation practice(s) from the article. That is, provide a few words or a sentence and the page number to justify your choice of a level of implementation practice(s).

1. Milat AJ, Li B (2017). Narrative review of frameworks for translating research evidence into policy and practice. *Public Health Research & Practice* **27**(1):e2711704.
2. Sajdlowska J, Grant RE, Van Hoof TJ, Kitto S (2015). Context and terminology in continuing education: Improving the use of interventions in quality improvement and research. *J Contin Educ Health Prof* **35**(S1):S27–S28.
3. Tricco et al, 2016 Tricco AC, Ashoor HM, Cardoso R, MacDonald H, Cogo E, Kastner M, Perrier L, McKibbon A, Grimshaw JM, Straus SE (2016). Sustainability of knowledge translation interventions in healthcare decision-making: a scoping review. *Implement Sci* **11**:55.

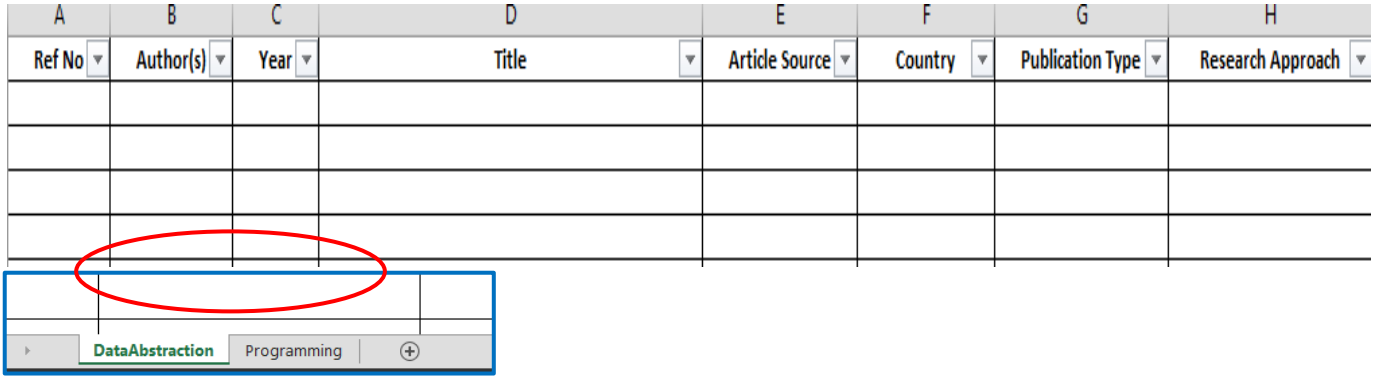
DATA CHARTING FORM

OVERVIEW

- **The Data Charting Form** is the Excel file that we will be using to conduct data abstraction by extracting data from each article and entering the extracted data into specific cells in Excel spreadsheet.

- Each coding group will have a separate **Data Charting Form (Workbook)** customized to their group and containing the same coding categories as those included in the Coding Book **(page 9).**

- The **Data Charting Form** (below) will have some information already filled in by the Project Team (Columns A through K), namely, general characteristics (e.g., title, author(s), country, publication year, publication type, research approach, target population, sample size, and practice setting).

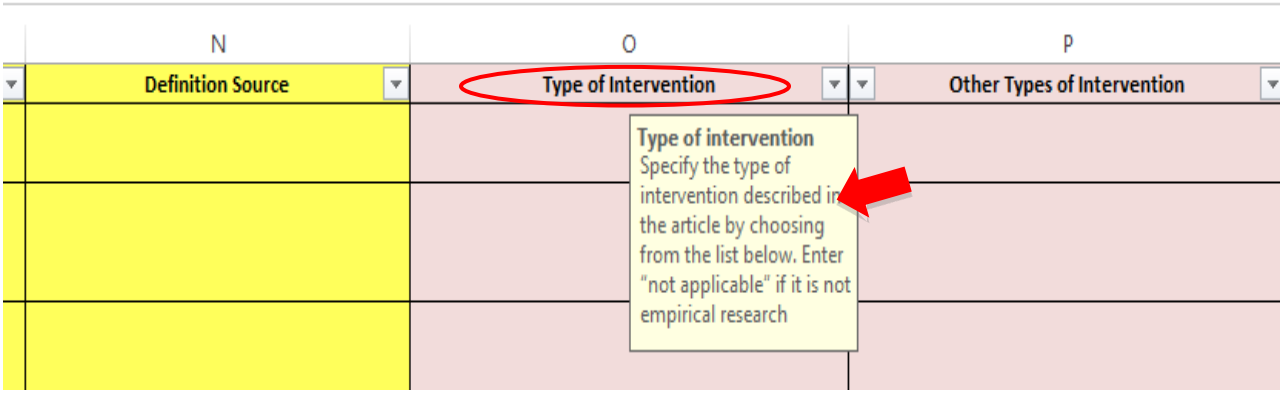


- *Note:* in the bottom left corner there are tabs for two workbooks. *"DataAbstraction"* is the workbook where the coding is to be done, and *"Programming"* contains the programming for the dropdown menus. Please avoid altering anything in the Programming workbook, as it may interfere with the dropdown menus.

USING THE DATA CHARTING EXCEL WORKBOOK

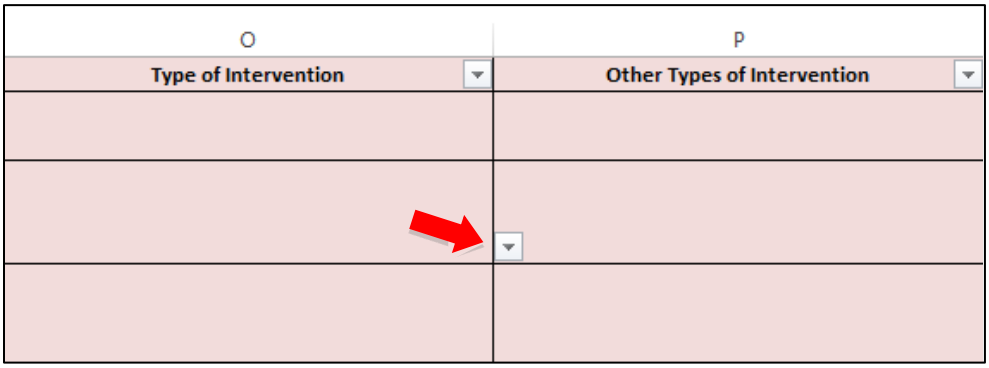
IN-DOCUMENT CODING DESCRIPTIONS

When a title (coding category) for any column (e.g., *Type of Intervention*) is selected, a brief explanation (a pop-up) of the coding category will appear (see below).

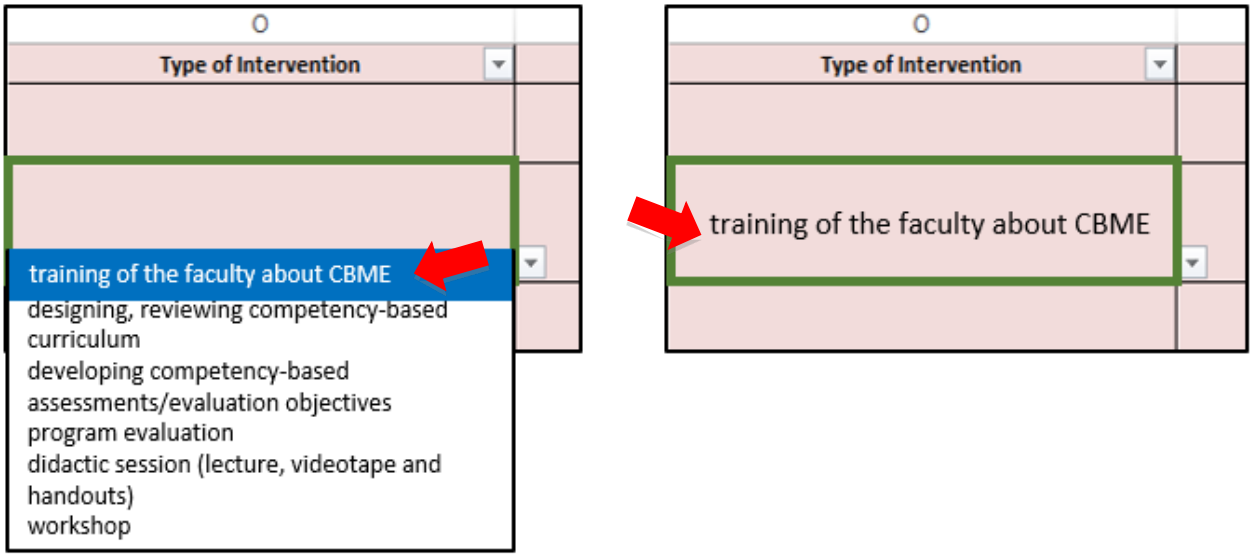


DROPDOWN VERSUS FREE-TEXT

- Some of the cells have ***dropdown lists*** for you to select from, while others require ***free-text.***
- If a dropdown list is available, the symbol ▼ will appear to the ***right outside of the cell*** when you click on it.



Click on ▼ and the ***dropdown list*** will appear. Select your answer and it will automatically populate the cell.



- If you want to change your answer:
  - Simply repeat this process above, or;
  - Select the cell and hit “delete” on your keyboard.

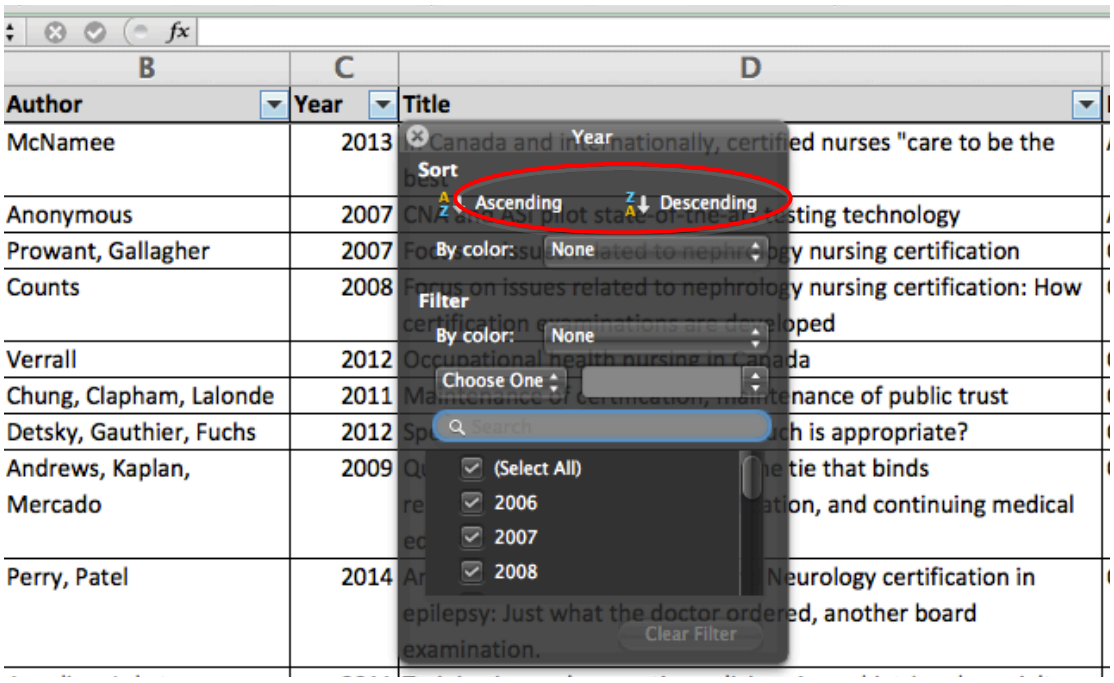
REORDERING YOUR DATA

- The information in your **Data Charting Form** can be reorganized (alphabetically or numerically) by any of the categories.
    - *For example, you can organize your dataset by year, title, article source, country, etc.*

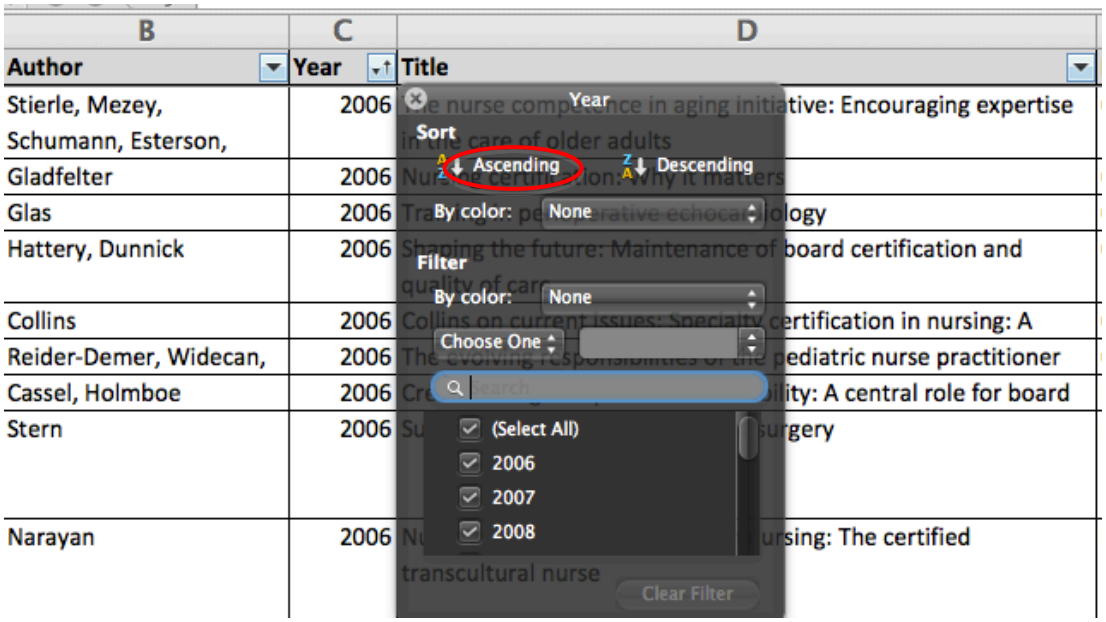
- Go to the first row, which is ***grey*** and contains the titles for each column. Select the arrow on the bottom right corner of the box.

C	D	E	F
Year	Title	Article Source	Country
2011	Integration of CanMEDS Expectations and outcomes	Members of the FMEC PG consortium;	Canada
2013	Plain Films of Dedication Free Documentaries, CanMEDS-FM, and a Commitment to the Person First	ANON	Canada
2014	Care of the Elderly Program: Training Future Physicians and Promoting Research and Clinical Excellence for the Medically Complex Senior	University of Alberat	Canada

- A new window will pop up. You can now choose to sort your data in ***ascending*** or ***descending*** order based on the information contained in that column.



- The information should automatically reorganize itself as soon as you make your selection. For example, below ***ascending*** was selected for publication year. As soon as ***ascending*** was clicked, the dataset reorganized itself from earliest to most recent publication.



- Click the X button in the top left corner of the pop-up window to exit it.

Publication types in the initial dataset

Publication Type	Definition	Numbers
Research Article	Original primary research (qualitative or quantitative) that contain sections recognizable as introduction, methods, results and discussion.[1]	**37**
Review	An article or book published after examination of published material on a subject. It may be comprehensive to various degrees and the time range of material scrutinized may be broad or narrow, but the reviews most often desired are reviews of the current literature. The textual material examined may be equally broad and can encompass, in medicine specifically, clinical material as well as experimental research or case reports.[2]	**5**
Commentary/Reflective Paper	Opinion papers, points of view, position papers, recommendations, "blueprints" for proposed action. Debates, interviews, panel discussions, questions and answers, dialogues, transcripts. Essays, short expository/speculatory papers, "think" pieces, philosophical pieces, criticism, interpretation, editorials, pros and cons.[3]	**26**
Editorial Opinion	Work consisting of a statement of the opinions, beliefs, and policy of the editor or publisher of a journal, usually on current matters of medical or scientific significance to the medical community or society at large. The editorials published by editors of journals representing the official organ of a society or organization are generally substantive.[2]	**1**
Regulatory	Regulations, regulatory agency materials. Codes, administrative codes, codes of student behavior, agreements, rules, policy statements, master plans, contracts (model), collective bargaining agreements, and other materials governing the behavior of various groups. Standards (e.g., ANSI, ISO, FIPS), specifications, accreditation standards, professional standards. Executive orders, Federal Register pronouncements. Does not include documents merely 'about' specific court cases or legal issues.[3]	**11**

1. American Psychological Association (APA) (2010). *Publication Manual of the American Psychological Association*. 6th ed. Washington, DC: APA.
2. U.S. National Library of Medicine (2016). Publication characteristics (publication types) with scope notes: 2016 MeSH edition. Available at: https://www.nlm.nih.gov/mesh/pubtypes.html. Accessed April 20, 2017.
3. ERIC: Publication Types (2016). Available at: http://proquest.libguides.com/eric/pubtypes. Accessed April 20, 2017.

Supplemental Digital Appendix 3

"Complete List of the 37 Articles Included in the Scoping Review"

No	Authors	Year	Title	Article Source
1	ANON	2014	Practice-Based Learning and Improvement	American Academy of Family Physicians (AAFP)
2	ANON	2015	Scholarly Activity and Information Mastery	American Academy of Family Physicians (AAFP)
3	Karen Schultz, Jane Griffiths	2016	Implementing Competency-Based Medical Education in a Postgraduate Family Medicine Residency Training Program: A Stepwise Approach, Facilitating Factors, and Processes or Steps That Would Have Been Helpful	Academic Medicine, 91:685–689
4	Patricia A. Carney, M. Patrice Eiff, Larry A. Green, Carol Carraccio, David Gary Smith, Perry A. Pugno, William Iobst, Gail McGuinness, Kathleen Klink, Samuel M. Jones, Leslie Tucker, Eric Holmboe	2015	Transforming Primary Care Residency Training: A Collaborative Faculty Development Initiative Among Family Medicine, Internal Medicine, and Pediatric Residencies	Academic Medicine, 90:1054–1060
5	Kathrine Lawrence, Tim Allen, Carlos Brailovsky, Tom Crichton, Cheri Bethune, Michel Donoff, Tom Laughlin, Stephen Wetmore, Marie-Pierre Carpentier and Shaun Visser	2011	Defining competency-based evaluation objectives in family medicine Key-feature approach	Canadian Family Physician October 2011, 57 (10) e373-e380
6	Ivy Oandasan	2011	Advancing Canada's family medicine curriculum: Triple C	Canadian Family Physician June 2011, 57 (6) 739-740;
7	RichardV. King, Cassie L. Murphy-Cullen, Martin Krepcho, Hershey S. Bell, Robert D. Frey	2003	Tying It All Together? A Competency-based Linkage Model for Family Medicine	Fam Med 2003;35(9):632-6
8	Therese Zink, Erik Solberg	2014	Development of a Global Health Curriculum for Family Medicine Based on ACGME competencies Qualitative	Teaching and Learning in Medicine, 26(2), 174–183

9	Redwood-Campbell L, Pakes B, Rouleau K, MacDonald CJ, Arya N, Purkey E, Schultz K, Dhatt R, Wilson B, Hadi A, Pottie K	2011	Developing a curriculum framework for global health in family medicine: emerging principles, competencies, and educational approaches Scoping review - qualitative	BMC medical education. 11 (pp 46), 2011. Date of Publication: 2011.
10	David Tannenbaum, Jill Konkin, Ean Parsons, Danielle Saucier, Liz Shaw, Allyn Walsh, Jonathan Kerr, Andrew Organek	2009	CanMEDS - Family Medicine	CFPC
11	ANON	2010	Defining competence for the purposes of certification by the College of Family Physicians of Canada: The evaluation objectives in family medicine	CFPC
12	Tim Allen, Carlos Brailovsky, Paul Rainsberry, Katherine Lawrence, Tom Crichton, Marie-Pierre Carpentier and Shaun Visser	2011	Defining competency-based evaluation objectives in family medicine Dimensions of competence and priority topics for assessment	Canadian Family Physician September 2011, 57 (9) e331-e340
13	M. Patrice Eiff, Elaine Waller; Colleen T. Fogarty, Susanne Krasovich, Erik Lindbloom, Alan B. Douglass, Perry Pugno, Larry A. Green, Patricia A. Carney	2012	Faculty Development Needs in Residency Redesign for Practice in Patient-centered Medical Homes: A P4 Report	Fam Med 2012;44(6):387-95
14	Saucier, Danielle; Paré, Line; Côté, Luc; Baillargeon, Lucie	2012	How core competencies are taught during clinical supervision: participatory action research in family medicine	Medical Education; Vol. 46 Issue 12, p1194-1205
15	Rourke, James; Frank, Jason R	2005	Implementing the CanMEDS™ physician roles in rural specialist education: The multi-specialty community training network	Education for Health: Change in Learning & Practice (Taylor & Francis Ltd), Vol. 18 Issue 3, p368-378

16	MacDonald Colla J, McKeen Martha, Wooltorton Eric, Boucher Francois, Lemelin Jacques, Leith-Gudbranson Donna, Viner Gary, Pullen Judi	2012	Striving for excellence: developing a framework for the Triple C curriculum in family medicine education	Canadian Family Physician. 58(10):e555-62, 2012 Oct
17	Oandasan Ivy, Wong Eric, Saucier Danielle, Donoff Michel, Iglar Karl, Schipper Shirley	2012	Triple C: linking curriculum and assessment	Canadian Family Physician. 58(10):1165-7, e608-10, 2012 Oct
18	Schultz Karen	2012	Teaching the Triple C curriculum	Canadian Family Physician. 58(10):1160-3, e605-7, 2012 Oct
19	Cubic Barbara A, Gatewood Edwin E	2008	ACGME core competencies: helpful information for psychologists Qualitative	Journal of Clinical Psychology in Medical Settings. 15(1):28-39, 2008 Mar
20	Kassam Aliya, Sharma Nishan, Harvie Margot, O'Beirne Maeve, Topps Maureen	2016	Patient safety principles in family medicine residency accreditation standards and curriculum objectives: Implications for primary care	Canadian Family Physician. 62(12):e731-e739, 2016 Dec
21	ANON	2007	ACGME Program Requirements for Graduate Medical Education in Family Medicine	Accreditation Council on Graduate Medical Education (ACGME)
22	Suzanne Allen et al	2015	The Family Medicine Milestone Project	Accreditation Council on Graduate Medical Education (ACGME)
23	David Tannenbaum, Jonathan Kerr, Jill Konkin, Andrew Organek, Ean Parsons, Danielle Saucier, Liz Shaw, Allyn Walsh	2011	Triple C Competency-based curriculum: Report Part 1	CFPC
24	David Tannenbaum, Jonathan Kerr, Jill Konkin, Andrew Organek, Ean	2012	Length of training in the core family medicine residency	CFPC

	Parsons, Danielle Saucier, Liz Shaw, Allyn Walsh			
25	Oandasan I, Saucier D, eds	2013	Triple C Competency-based curriculum: Report Part 2 Advancing implementation	CFPC
26	ANON	2016	Specific standards for family medicine residency programs accredited by CFPC	CFPC
27	Puddester Derek, MacDonald Colla J, Clements Debbie, Gaffney Jane, Wiesenfeld Lorne	2015	Designing faculty development to support the evaluation of resident competency in the intrinsic CanMEDS roles: practical outcomes of an assessment of program director needs	BMC Medical Education. 15:100, 2015 Jun 05
28	Iglar Karl, Whitehead Cynthia, Takahashi Susan Glover	2013	Competency-based education in family medicine	Medical Teacher. 35(2):115-9, 2013
29	Saucier Danielle, Shaw Elizabeth, Kerr Jonathan, Konkin Jill, Oandasan Ivy, Organek Andrew J, Parsons Ean, Tannenbaum David, Walsh Allyn E	2012	Competency-based curriculum for family medicine	Canadian Family Physician. 58(6):707-8, e359-61, 2012 Jun
30	Organek Andrew J, Tannenbaum David, Kerr Jonathan, Konkin Jill, Parsons Ean, Saucier Danielle, Shaw Elizabeth, Walsh Allyn	2012	Redesigning family medicine residency in Canada: the triple C curriculum	Family Medicine. 44(2):90-7, 2012 Feb
31	Kerr Jonathan, Walsh Allyn E, Konkin Jill, Tannenbaum David, Organek Andrew J, Parsons Ean, Saucier Danielle, Shaw Elizabeth, Oandasan Ivy	2011	Renewing postgraduate family medicine education: the rationale for Triple C	Canadian Family Physician. 57(8):963-4, e311-2, 2011 Aug
32	Edwards Frederick D, Frey Keith A	2007	The future of residency education: implementing a competency-based educational model	Family Medicine. 39(2):116-25, 2007 Feb

33	Singh Ranjit, Naughton Bruce, Taylor John S, Koenigsberg Marlon R, Anderson Diana R, McCausland Linda L, Wahler Robert G, Robinson Amanda, Singh Gurdev	2005	A comprehensive collaborative patient safety residency curriculum to address the ACGME core competencies	Medical Education. 39(12):1195-204, 2005 Dec
34	Lesley Charles, Jean A.C. Triscott, Bonnie M. Dobbs, Rhianne McKay	2014	Geriatric Core Competencies for Family Medicine Curriculum and Enhanced Skills: Care of Elderly	CANADIAN GERIATRICS JOURNAL, VOLUME 17, ISSUE 2, JUNE 2014
35	Lesley Charles, Jean Triscott, Bonnie Dobbs, Jasneet Parmar, Peter George Tian, Oksana Babenko	2016	Effectiveness of a Core-Competency–based Program on Residents' Learning and Experience	CANADIAN GERIATRICS JOURNAL, VOLUME 19, ISSUE 2, JUNE 2016
36	David E. Kolva, Kathleen A. Barzee, Christopher P. Morley	2009	Practice Management Residency Curricula: A Systematic Literature Review	Fam Med 2009;41(6):411-19
37	Allyn E. Walsh, Jill Konkin, David Tannenbaum, Jonathan Kerr, Andrew J. Organek, Ean Parsons, Danielle Saucier, Elizabeth Shaw, Ivy Oandasan	2011	Comprehensive care and education	Canadian Family Physician 57:1475-1476, December 2011