

Supplemental Data S1 - Preliminary Domains, Competencies and Indicators of Clinical Effectiveness Education

Domain 1: Evidence Based Practice Core Competencies 2018 © Albarqouni L et al. *JAMA Network Open.*

Introductory

1. Understand EBP defined as the integration of the best research evidence with clinical expertise and patient's unique values and circumstances
2. Recognize the rationale for EBP
3. For each type of clinical question, identify the preferred order of study designs, including the pros and cons of the major study designs
4. Practice the 5 steps of EBP: ask, acquire, appraise and interpret, apply, and evaluate
5. Understand the distinction between using research to inform clinical decision making vs. conducting research

Ask

1. Explain the difference between the types of questions that cannot typically be answered by research (background questions) and those that can
2. Identify different types of clinical questions, such as questions about treatment, diagnosis, prognosis, and etiology.
3. Convert clinical questions into structured, answerable clinical questions using PICO

Acquire

1. Outline the different major categories of sources of research information, including biomedical research databases or databases of filtered or pre-appraised evidence or resources
2. Construct and carry out an appropriate search strategy for clinical questions.
3. State the differences in broad topics covered by the major research databases
4. Outline strategies to obtain the full text of articles and other evidence resources

Appraise and Interpret

1. Identify key competencies relevant to the critical evaluation of the integrity, reliability, and applicability of health-related research
2. Interpret different types of measures of association and effect, including key graphical presentations
3. Critically appraise and interpret a systematic review
4. Critically appraise and interpret a treatment study
5. Critically appraise and interpret a diagnostic accuracy study
6. Distinguish evidence-based from opinion-based clinical practice guidelines
7. Identify the key features of, and be able to interpret, a prognostic study E
8. Explain the use of harm and etiologies study for (rare) adverse effects of interventions

Apply

1. Engage patients in the decision making process, using shared decision making, including explaining the evidence and integrating their preferences
2. Outline different strategies to manage uncertainty in clinical decision making in practice
3. Explain the importance of baseline risk of individual patients when estimating individual expected benefit
4. Interpret the grading of the certainty in evidence and the strength of recommendations in health care

Evaluate

1. Recognize potential individual-level barriers to knowledge translation and strategies to overcome these
2. *Recognise* the role of personal clinical audit in facilitating evidence based practice.

Domain 2: Quality Improvement Processes

Competency statement: Learners/ Practitioners understand and apply quality improvement processes to achieve clinical effectiveness in the context of healthcare systems (adapted - Cronenwett et al., 2009).

Introductory

1. *Understand* the principles of quality improvement, including for example healthcare audit, clinical audit and adverse incident reporting (Tomorrow's Doctors, 2009).
2. *Describe* models and methods for continuous quality improvement e.g. the Plan-Do-Check- Act cycle (Czabanowska et al., 2012).
3. *Recognise* the importance of cost- appropriateness, balancing effectiveness, efficiency and access with optimal patient care (Frank et al 2005, 2015).
4. *Understand* the use and importance of performance measurement data in monitoring patient and health system outcomes (Czabanowska et al 2012).

Appraise

1. *Appraise* the care setting for gaps between local and best practice standards to identify areas for improvement and appropriate change (Crownenwett & Sherwood, 2011; GMC 2017).
2. *Identify* information about outcomes of care and quality improvement projects in the care setting (Crownenwett & Sherwood,(QSEN) 2011; Australian Commission on Safety and Quality in Health Care, 2010).

Engage

1. *Take part* in regular reviews and audits of your work and that of your team (GMC 2013).
2. *Apply* a process of continuous quality improvement to disease prevention, health promotion, and health surveillance activities (Frank et al, 2015).
3. *Use* measures to evaluate the effect of change and impact of quality improvement interventions (Cronenwett & Sherwood, QSEN 2011; GMC 2017).

Reflect

1. *Recognise* the role of personal clinical audit in facilitating evidence based practice.

Domain 3: Implementation of clinical effectiveness into practice

Competency statement: Learners/ Practitioners integrate evidence based practice and quality improvement processes into healthcare to achieve clinical effectiveness (adapted Fixsen et al, 2005).

Introductory

1. *Understand* models/theories of implementation science to promote translation of knowledge to practice (Gonzales et al. 2012).
2. *Understand* that translating best evidence into practice lies at the intersection of a variety of disciplines (e.g. epidemiology, health policy, and biostatistics) (Gonzales et al 2012).
3. *Recognise* the importance of using a behaviour change theory driven approach to implement evidence into practice, policy, and public health improvements (Gonzales et al 2012).
4. *Recognise* the importance of integrating a thorough understanding of local context and culture into design of the research question and intervention (Gonzales et al 2012).
5. *Outline* creative ways of transmitting evidence- based interventions to policy makers in order to gain interest, political support and funding (Brownson et al, 2009).

Apply

1. *Identify* and develop sustainable partnerships with individuals, organizations and communities that are targeted for health care interventions aimed to achieve clinical effectiveness (Gonzales et al 2012).

2. *Develop* a cyclical approach for translating evidence into practice. This approach considers that real-world settings involve contextual variables and barriers which require strategies to overcome them (Gonzales et al., 2012).

3. *Demonstrate* a ‘just-in-time’, pragmatic approach, in which feasible strategies for clinical effectiveness are adopted (e.g. using trusted online sources of pre-appraised evidence, rather than conducting a systematic review amidst a busy working day) (Galbraith et al., 2017).

Reflect

1. *Recognise* potential individual, healthcare system and stakeholder organisation level barriers to knowledge translation and strategies to overcome these.

Domain 4: Professional Practice in the context of Clinical Effectiveness

Competency statement: Learners/Practitioners understand their role and responsibilities, as well as the roles and contributions of other professionals, and use this knowledge appropriately to establish and achieve a culture of clinical effectiveness.

Collaborate

1. *Recognise* your personal responsibility to promote clinical effectiveness, by having an awareness of personal perspectives and biases that can influence one’s assessment and decisions (Czabanowska et al., 2012; Cubic & Gatewood, 2008; Ireland, 2008; Galbraith et al., 2017; NMC standards, 2013; GDC 2015; HCPC 2013).

2. *Demonstrate* collaboration with patients, colleagues and stakeholder organisations to address patients’ needs, ensuring implementation of best evidence into practice and quality improvement (GMC 2013; Frank et al 2015; Czabanowska et al., 2012).

3. *Contribute* to the development of students, peers, colleagues and others through consultation, education, leadership and mentorship to embed a culture of clinical effectiveness (Frank et al 2015).

4. *Exhibit* interprofessional team behaviours by fostering open communication, mutual respect, and shared decision-making to improve patient outcomes and achieve clinical effectiveness (Frank et al, 2005; 2015; Cronenwett & Sherwood, QSEN 2011; GDC 2015; Czabanowsk et al 2009).

Communicate

1. *Demonstrate* oral and written skills for explaining complex information to a diverse range of individuals, groups and communities to promote clinical effectiveness (Frank et al 2015; HCPC 2013; PSI 2016; GMC 2013; Czabanowska et al., 2012).

2. *Communicate* effectively using a wide range of strategies and interventions to overcome potential communication barriers to clinical effectiveness, including the effective use of communication technologies (NMC 2010; Weber et al. 2012; Crownenwett & Sherwood (QSEN) 2011).

3. *Cultivate* a culture and policy of openness in disclosing the potential and actual benefits and harms associated with interventions.

Lead

1. *Recognize* the importance of effective leadership from health professionals when making decisions in the midst of ever changing environments (Brownson et al., 2009).

2. *Demonstrate* leadership by example through acting as a change agent / champion through delivering and sustaining clinical effectiveness processes (NMC, 2010; Acton et al 2017).

References:

1. Acton C, Farus-Brown S, Alexander C, Morrow L, Ossege J, Tovar E. Quality and Safety Education for Nurses Competencies in Doctor of Nursing Practice Education: Exemplars from Education and Practice. *Nurse Educator*. 2017;42(5S):S44-S8.
2. Albarqouni L, Glasziou P, Hoffmann T, et al. Core competencies in evidence-based practice for health professionals: consensus statement based on a systematic review and Delphi survey. *JAMA Netw Open* 2018;1(2):e180281.
3. Australian Commission on Safety and Quality in Health Care. The National Safety and Quality Health Service (NSQHS) Standards 2010 .Available from: <https://www.safetyandquality.gov.au/our-work/assessment-to-the-nsqhs-standards/>. (accessed March 13th 2020) Google Scholar.
4. Brownson RC, Ballew P, Kittur ND, Elliott MB, Haire-Joshu D, Krebill H, et al. Developing competencies for training practitioners in evidence-based cancer control. *Journal of Cancer Education*. 2009;24(3):186
5. Cronenwett L, Sherwood G, Pohl J, Barnsteiner J, Moore S, Sullivan DT, et al. Quality and safety education for advanced nursing practice. *Nursing outlook*. 2009;57(6):338-48.
6. Cubic BA, Gatewood EE. ACGME core competencies: helpful information for psychologists. *Journal of clinical psychology in medical settings*. 2008;15(1):28-39
7. Czabanowska K, Klemenc-Ketis Z, Potter A, et al. Development of a competency framework for quality improvement in family medicine: a qualitative study. *Journal of Continuing Education in the Health Professions* 2012;32(3):174-180.
8. Fixsen, D. L., Naoom, S. F., Blase, K. B., Friedman, R. M., & Wallace, F. (2005). *Implementation research: A synthesis of the literature*. Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, National Implementation Research Network.
9. Frank JR, Snell L, Sherbino J, editors. *CanMEDS 2015 Physician Competency Framework*. Ottawa: Royal College of Physicians and Surgeons of Canada; 2015.
10. Frank JR. 2005 The CanMEDS 2005 physician competency framework. http://rcpsc.medical.org/canmeds/CanMEDS2005/CanMEDS2005_e.pdf.
11. Galbraith K, Ward A, Heneghan C. A real-world approach to Evidence-Based Medicine in general practice: a competency framework derived from a systematic review and Delphi process. *BMC Medical Education* 2017;17(1):78.
12. General Dental Council. *Preparing for practice; Dental team learning outcomes for registration (2015 revised edition)*. 2015.
13. General Medical Council (GMC) *Tomorrow's Doctors; Outcomes and standards for undergraduate medical education; 2009* https://www.gmc-uk.org/-/media/documents/tomorrows-doctors-supplementary-guidance_pdf-81919983.pdf (Accessed 13th March 2020) Google.
14. General Medical Council. 2017 *Generic professional capabilities framework*. https://www.gmc-uk.org/-/media/documents/generic-professional-capabilities-framework--0817_pdf-70417127.pdf (accessed March 13th 2020) Google Scholar

15. General Medical Council. Generic professional capabilities framework. 2017.
16. General Medical Council. Good Medical Practice 2013 [Available from: <https://www.gmc-uk.org/ethical-guidance/ethical-guidance-for-doctors/good-medical-practice>].
17. Gonzales R, Handley MA, Ackerman S, et al. Increasing the translation of evidence into practice, policy, and public health improvements: a framework for training health professionals in implementation and dissemination science. *Academic Medicine* 2012;87(3):271.
18. Health Care Professions Council. Standards of proficiency 2013 [Available from: <http://www.hcpc-uk.org/publications/standards/index.asp?id=43.7>].
19. Ireland M. Assisting students to use evidence as a part of reflection on practice. *Nursing Education Perspectives*. 2008;29(2):90-3
20. Nursing & Midwifery Council. Standards for competence for registered nurses 2010 [Available from: <https://www.nmc.org.uk/globalassets/sitedocuments/standards/nmc-standards-for-competence-for-registered-nurses.pdf>].
21. PSI. Future Pharmacy Practice in Ireland. 2016
22. Weber M, Delaney KR, McCoy KT, Snow D, Scharf MR, Brackley MH. Quality and safety graduate competencies in psychiatric mental health nurse practitioner education. *Archives of psychiatric nursing*. 2012;26(5):350-7

Supplemental Data S2 - Final Domains, Competencies and Indicators of Clinical Effectiveness Education Competency Framework

Domain 1: Evidence Based Practice Core Competencies 2018 © Albarqouni L et al. *JAMA Network Open.*

Introductory

1. *Understand* EBP defined as the integration of the best research evidence with clinical expertise and patient's unique values and circumstances
2. *Recognize* the rationale for EBP
3. For each type of clinical question, *identify* the preferred order of study designs, including the pros and cons of the major study designs
4. *Practice* the 5 steps of EBP: ask, acquire, appraise and interpret, apply, and evaluate
5. *Understand* the distinction between using research to inform clinical decision making vs. conducting research

Ask

1. *Explain* the difference between the types of questions that cannot typically be answered by research (background questions) and those that can
2. *Identify* different types of clinical questions, such as questions about treatment, diagnosis, prognosis, and etiology
3. *Convert* clinical questions into structured, answerable clinical questions using PICO

Acquire

1. *Outline* the different major categories of sources of research information, including biomedical research databases or databases of filtered or pre-appraised evidence or resources
2. *Construct and carry out* an appropriate search strategy for clinical questions.
3. *State* the differences in broad topics covered by the major research databases
4. *Outline* strategies to obtain the full text of articles and other evidence resources

Appraise and Interpret

1. *Identify* key competencies relevant to the critical evaluation of the integrity, reliability, and applicability of health-related research
2. *Interpret* different types of measures of association and effect, including key graphical presentations
3. *Critically appraise and interpret* a systematic review
4. *Critically appraise and interpret* a treatment study
5. *Critically appraise and interpret* a diagnostic accuracy study
6. *Distinguish* evidence-based from opinion-based clinical practice guidelines
7. *Identify* the key features of, and be able to interpret, a prognostic study E
8. *Explain* the use of harm and etiologies study for (rare) adverse effects of interventions

Apply

1. *Engage* patients in the decision making process, using shared decision making, including explaining the evidence and integrating their preferences
2. *Outline* different strategies to manage uncertainty in clinical decision making in practice
3. *Explain* the importance of baseline risk of individual patients when estimating individual expected benefit
4. *Interpret* the grading of the certainty in evidence and the strength of recommendations in health care

Evaluate

1. *Recognise* potential individual-level barriers to knowledge translation and strategies to overcome these
2. *Recognise* the role of personal clinical audit in facilitating evidence based practice.

Domain 2. Quality Improvement processes

Competency Statement: Learners/Practitioners understand and apply quality improvement processes to achieve clinical effectiveness in the context of healthcare

1. To understand fundamental or core concepts associated with quality improvement processes, learners/ practitioners demonstrate **introductory** competencies, and are able to:
 - Outline* the rationale and principles of continuous quality improvement.
 - Describe* models and methods for continuous quality improvement specific to their practice setting.
 - Describe* appropriate and up to date performance measurement data in monitoring patient/service user outcomes.
2. To identify areas for quality improvement, by analysing the care setting for gaps between local and best practice standards, learners/practitioners demonstrate **appraise** competencies, and are able to:
 - Appraise* the care setting for gaps/differences between local and best practice standards in ascertaining areas of excellence or for improvement.
 - Critically analyse* information about outcomes of care and quality improvement projects in the care setting.
 - Analyse* healthcare resources, considering effectiveness, efficiency, cost and access to provide optimal healthcare.
3. To apply quality improvement processes into practice, learners/ practitioners demonstrate **engage** competencies, and are able to:
 - Undertake* regular reviews for continuous quality improvement of their work and that of their team.
 - Apply* the processes of continuous quality improvement to professional practice.

- *Involve* patients/service users in continuous quality improvement processes to contribute to clinical effectiveness.
- *Measure and evaluate* the effect of change and impact of quality improvement interventions.
- *Disseminate* outcomes of quality improvement to inform practice.

4. In considering continuous quality improvement processes, learners/practitioners demonstrate **reflect** competencies, and are able to:

- *Critically reflect* upon their contribution in facilitating continuous quality improvement processes.
- *Respond*, as appropriate, to reflection outcomes, to support continuous quality improvement processes.

Domain 3. Implementation of clinical effectiveness into practice

Competency statement: Learners/Practitioners implement and integrate evidence-based practice and quality improvement processes into healthcare to promote clinical effectiveness.

1. To understand fundamental and core concepts associated with implementation science, learners/practitioners demonstrate **introductory** competencies, and are able to:

- *Describe* core elements of implementation science as they relate to promoting clinically effective practice.
- *Outline* the contribution that implementation science can make to supporting clinical effectiveness.
- *Examine* the role of interprofessional perspectives and the sharing of varied sources of expertise in optimising the integration of clinical effectiveness.
- *Examine* the role of fundamental change processes at different levels (individual, healthcare setting, organisational) in facilitating the integration of clinical effectiveness into practice.
- *Recognise* the importance of integrating an understanding of patient/service user perspectives, local context and organisational culture in adopting clinical effectiveness in practice.
- *Appreciate* the significance of influencing decision-makers at different levels (individual, healthcare setting, organisational) in adopting clinical effectiveness.

2. To identify challenges and enablers for operationalising implementation of best evidence and quality improvement processes into clinical practice, learners/practitioners demonstrate **appraise and engage** competencies, and are able to:

- *Adopt* robust, sustainable and pragmatic actions for the timely integration of best evidence decision-making into professional practice.
- *Identify* potential individual, healthcare setting and organisation level implementation barriers and enablers to optimise the application of clinical effectiveness.
- *Participate* in a planned approach to the integration of clinical effectiveness into practice through the measurement and evaluation of implementation plans and outcomes.

3. In considering implementation processes, learners/ practitioners demonstrate **reflect** competencies, and are able to:

- *Critically reflect*, using a structured framework(s), on the approach and strategies employed in integrating clinical effectiveness into practice.

- Respond* to reflection outcomes by modifying implementation plans as appropriate.

Domain 4. Collaborative Practice in the context of Clinical Effectiveness

Competency statement: Learners and Practitioners understand and can apply principles of interprofessional collaboration, communication and leadership to support collaborative practice towards clinical effectiveness processes which promote healthcare that is evidence based, effective and consistent.

1. To support interprofessional **collaboration**, learners/practitioners are able to:
 - Demonstrate* awareness of individual, collective and professional perspectives that influence an individual's behaviours and decisions.
 - Engage* in a collaborative learning environment to support clinical effectiveness as an integral part of the day-to-day provision of care.
 - Demonstrate* open communication, mutual respect, and team-based decision-making to improve patient/service users' outcomes.
 - Contribute* to collaborative practice through advancing the interdependent working relationships amongst health and social care professionals.
2. To **communicate** appropriately in professional practice, learners/practitioners are able to:
 - Demonstrate* effective oral, non-verbal and written skills for delivering and explaining complex data, information and evidence to a diverse range of individuals, including patients/service users and health and social care professionals.
 - Demonstrate* active listening skills to understand information from a variety of sources.
 - Demonstrate* openness in disclosing the potential benefits and risks associated with healthcare interventions.
 - Demonstrate* an ability to be attentive to patients/service users through careful analysis of their insights, concerns and expectations.
 - Negotiate* with patients/service users in a shared decision-making approach for clinically effective processes.
3. To determine best **leadership** approaches to achieve clinically effective processes, learners/ practitioners are able to:
 - Recognise* individual accountability within one's own scope of practice to promote clinical effectiveness.
 - Outline* leadership principles that support collaborative practice for clinically effective care.
 - Recognise* the importance of different leadership styles and commitment from health and social care professionals to support clinical effectiveness.
 - Act* as a change agent/champion in the implementation of clinical effectiveness processes.