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Nurse practitioner clinical decision-making and evidence-based practice

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Abstract: Evidence-based practice is key to improving patient outcomes but can be challenging for busy nurse practitioners to implement. This article describes the process of critically appraising evidence for use in clinical practice and offers strategies for implementing evidence-based innovations and disseminating the findings.

Although the concept of evidence-based practice (EBP) is not new, it has been gaining momentum in recent years.[1] Spurred by the Institute of Medicine's report, "To Err is Human," many in healthcare began championing standards of care that stemmed from scientific evidence rather than tradition and individual clinical experience.[2,3] Other factors that have driven the EBP movement include wide geographical variations in practice patterns, strong evidence that a lot of care is either ineffective or even harmful, rising costs, and reimbursement trends, such as "pay for performance."[3,4] Nevertheless, wide variations in the uptake of EBP still exist.

Keywords: critical appraisal, dissemination and implementation, evidence-based practice, implementation science

Determining barriers to care

It has been estimated that patients receive evidence-based care only 55% of the time.[5] If that estimate is accurate, it is crucial to determine what barriers exist for providing evidence-based care. Some barriers to the use of evidence in clinical practice have been well documented and include lack of: awareness, agreement or familiarity, time, access to information, and confidence in critically appraising the evidence and translating it into care of individual patients. Additional barriers are inertia, familiarity with previous practices, lack of access to library services, and lack of a supporting organizational culture.[6,7] In addition, determining how to remove harmful practices from care has received less attention but is equally important.

Originally proposed by Sackett and colleagues, EBP is a problem-solving approach to patient care that integrates the strongest research evidence, clinician expertise, and patient values/preferences.[8-10] Searching for the strongest evidence to support best care practices can be overwhelming, and busy clinicians may not have the time or the confidence to sort through and select evidence suitable for individual practices. Numerous models have been proposed for the implementation of EBP and all share common core elements. These elements include asking a searchable clinical question, finding the evidence to answer the question, appraising that evidence, and applying/evaluating the evidence for effectiveness and efficiency.[9]

This article specifically targets the nurse practitioner (NP) in clinical practice and offers strategies for critically appraising the evidence, factors to be considered in implementing EBP, and disseminating the findings to enhance the sustainability of an innovation.

EBP

EBP has been shown to improve patient outcomes, reduce healthcare costs, and lead to greater clinician satisfaction.[11,12] However, Bucknell argues that clinical decisions are often not based on explicit, robust evidence.[13] Rather, many clinical decisions are undergirded by value judgments, tradition or habit, and a mixture of evidence from a variety of sources that may or may not include robust research.[13] Indeed, EBP is as much about removing harmful or ineffective practices as it is about implementing strong evidence into practice. This is a crucial point, as the negative ramifications of continuing to engage in ineffective or harmful practices for patients and the healthcare system are vast.[14]

Science is fluid, and care practices may need to change as new evidence emerges. A case in point is a recent, well-conducted, large randomized study that followed nearly 90,000 Canadian women for 25 years to compare those who did or did not undergo mammography screening and the incidence and mortality of breast cancer. Findings strongly suggested that screening mammograms had no effect on breast cancer deaths and held no advantage over clinical examination. Mammography also resulted in overdiagnosis with 20% of those diagnosed by mammogram receiving unnecessary radiation, chemotherapy, or surgery.[15]

Following publication of this study, social media exploded with passionate voices to retain current mammography screening despite the evidence. Financial incentives (which encourage continued mammography practices) and failure to understand the study design and analysis are among the possible reasons for outright rejection of the findings. The negative ramifications, including exorbitant costs, require reconsideration of science that challenges or changes long-held clinical practices.

Many innovations commonly used in clinical practice have not been evaluated for effectiveness or potential harmful outcomes. Prasad and colleagues reviewed 2,044 original articles regarding medical practice and were published in the *New England Journal of Medicine* over the last decade.[16] Of the articles reviewed, only 27% evaluated established medical practices, and 40% of those examined were found to be ineffective practices. These findings are similar to those by Villas Boas and colleagues in a study of the 2011 Cochrane Database of Systematic Reviews.[17] This study found that in 45% of systematic reviews, there was insufficient evidence to endorse the interventions in the clinical trials and nearly 1 in 10 was likely to be harmful.[17]

Discarding harmful clinical practices, known as exnovation (a term adopted from business) is as important as innovation.[18] NPs must know how to access the literature and be able to critically appraise it for innovative practices that may benefit patients. Similarly, any harmful practice should be eliminated from the NP's armamentarium.

Finding the evidence

With well over 50 million published papers and an annual projected growth rate of approximately 2.57%, it is difficult to keep up with current evidence.[19] It is useful to consider approaches that can keep the NP up-to-date with literature in a given specialty (see *Strategies for maintaining currency in research and clinical literature*). Academic librarians are an important resource in tailoring an individual plan for accessing up-to-date evidence, with much of the evidence available through electronic feed.

To engage in EBP, the nature and quality of evidence and its relevancy to the clinical question should be assessed as well as the suitability of the evidence for application in individual patients or settings. While there is a plethora of research on innovations to improve patient care, not all of these innovations are suitable for use in every clinical

Strategies for maintaining currency in research and clinical literature

Sources	Comments
E-mail alerts Journal table of contents (TOC), PubMed, Web of Science, Google Alerts	E-mail or Journal alerts allow: • users to receive e-mail notification when new data are available • notification for new journal issues • Google Alerts—monitor specific search terms and phrases on the Web
RSS feeds Journal TOC, PubMed, Web of Science, Medline, PubMed	Really Simple Syndication (RSS) feeds are: • similar to e-mail alerts • can be read using an RSS feed aggregator rather than e-mail inbox • updated continuously • used by many databases, journals, blogs, and news sites.
RSS feed aggregators Feedly, FeedBurner, NetVibes	RSS feed aggregators: • organize all RSS subscriptions into one place • provide convenience of centralized location for all continuously updated subscribed news sites, databases, and journals
Specialty Practice Briefs American Association of Nurse Practitioners AANP SmartBrief	Specialty briefs are: • electronic newsletters • deliver targeted healthcare news and information from media sources around the country
Mobile Apps Mendeley, Pulse, Flipboard Feedly	Mobile applications: • specifically designed for small mobile screens • streamline navigation on mobile devices • many are "cross-platform," meaning they run on a variety of different platforms
Listservs/Electronic mailing lists U.S. National Library of Medicine	Listservs are: • e-mail lists, hosted by an organization that focus on a specific topic
Social Media Linkedin, Twitter	Linkedin and Twitter allow: • users to follow experts and organizations in their field • join discussion forums such as Linkedin Groups
Journal Clubs	Journal clubs provide: • a forum for members to discuss the literature related to their area of study • forums may be face-to-face or virtual
iPad	The iPad device is: • a convenient tool to connect teams • allows for conferencing and viewing videos • fosters easy access to evidence and clinical guidelines

Table developed by the authors.

setting.[13] A critical appraisal of the evidence can help the clinician discern which innovations have potential for improving patient outcomes in the clinician's practice setting.

Clinical questions may arise from everyday practice situations or from reading or discussing problems or issues with colleagues. The literature is rife with discussions of how to develop a clinical question that can potentially be answered through a critical appraisal of the literature. Perhaps the most common method is known as the PICOT question, which is a systematic way to identify various components of a clinical issue. These components include: patient population (P); intervention or issue of interest (I); comparison of innovations (C); the desired outcomes (O); and the time (T) involved to achieve those outcomes.[20]

As an example, the NP may use the PICOT question method to address the issue of how best to help Mexican-American patients who are at risk for developing diabetes to lose weight. In this case, a PICOT question might be "In Mexican-Americans (P), how effective is a culturally tailored weight loss program (I) compared to a standard weight loss program (C) in reducing weight (O) over the course of six months (T)?" There may not be a comparator in a quality improvement project, but a PICOT question can still be used. For example, a clinic wants to improve its adherence to the adult immunization schedule recommended by the CDC. In this case, a PICOT question might be "How has the introduction of a reminder system impacted (I) provider (P) adherence (O) to the CDC guidelines for immunizations?" The development of a PICOT

question has been well described in other journal articles.[20-22] Once an NP has developed a suitable PICOT question, it is time to search for the best evidence.

In searching for evidence, a good place to start is with resources that have already sifted through many studies and included only those of high quality. There are many preappraised resources such as the Cochrane Reviews, but even the results from these resources must be assessed for quality and suitability (see *Sources for preappraised evidence*).[23] To aid the busy NP to discern the strength and quality of various preappraised resources, DiCenso and Haynes have developed a hierarchy.[23] At the top is the systems layer or computerized decision models, in which an evidence-based clinical information system assimilates and summarizes relevant research evidence and links it through the use of an electronic medical record to a specific patient's situation.[23] While this is the ideal, many practices do not have access to computerized decision models.

In that case, the next step in using preappraised evidence would be to look for summaries, such as evidence-based clinical guidelines or evidence-based textbooks. If there are no summaries of evidence for a particular clinical question, then the NP would look for synopsis of synthesis in evidence-based abstraction journals, such as those in the Database of Abstracts of Reviews of Effects or systematic reviews, such as those found in the Cochrane Library or EvidenceUpdates. The lowest level of the preappraised hierarchy includes single, original articles published in journals. EvidenceUpdates and Nursing+ are two resources that provide a synopsis of single studies that have been critically appraised and have met minimum criteria.[23]

Critically appraising the evidence

In the event that none of these resources address the particular clinical question, NPs may need to conduct their own critical appraisals. When critically appraising the literature, several factors must be assessed in deciding which innovation is suitable for a particular patient or a particular setting. These factors include level, strength, quality of the evidence, suitability for the setting and patient, complexity of the innovation, and cost.

Level of evidence

Level of evidence is often represented by a hierarchy that is based on the research design employed. There are many different hierarchies addressed in the literature, but the Melnyk and Fineout-Overholt is the only one, to the authors' knowledge, that includes both clinical practice guidelines and criteria for assessing qualitative studies.[10,24] The highest levels of evidence (those at the top of the hierarchy) are systematic reviews and meta-analysis. Evidence from expert opinion and/or reports from expert committees are considered to be the lowest or have the least strength of evidence.[10] Clinicians must be competent in assessing all types of practice evidence but Level 1 evidence (systematic reviews and meta-analysis), and national clinical practice guidelines are probably the most relevant types of evidence for the average clinician.[25]

Finally, it is important to note that qualitative evidence may be useful in providing context for quantitative evidence and identifying patient experiences with treatments. There is increased evidence available from meta-synthesis in which multiple qualitative studies on the same topic are combined, synthesized, and critically analyzed to reveal the best evidence.[26] Such evidence is important to consider but requires

Sources for pre-appraised evidence

Sources	Comments
Cochrane Review www.cochrane.org/cochrane-reviews	• Systematic reviews of primary research evidence. • Process for review is explicit. Regularly updated.
BMJ Clinical Evidence www.clinicalevidence.com Dynamed www.ebscohost.com/dynamed/default.php	• International database of preappraised systematic review summaries on wide variety of clinical issues. • Review process is explicit. • Regularly updated.
UpToDate www.uptodate.com	• Summaries of preappraised evidence about specific clinical issues. • Review criteria not explicit. • Updated daily.
National Guideline Clearinghouse www.guideline.gov	• Freely accessible, comprehensive practice guidelines based on full range of evidence. Not regularly updated. • Some guidelines not accompanied by levels of evidence.

judicious evaluation, as the evidence is not the same as meta-analysis. Meta-analysis uses statistical methods to evaluate several quantitative studies, increasing the power of analysis and decisions about treatment effect. It is most often used to assess the clinical effectiveness of healthcare interventions.[27]

Systematic reviews and meta-analyses can generally be found in Cochrane Library, and many clinical guidelines have been developed by professional and government organizations. The National Guidelines Clearinghouse is one public source for evidence-based clinical practice guidelines.[28] Because not all clinical practice guidelines are of high quality, NPs should critically appraise any guideline for quality before selecting it for use in their clinical practices. The AGREE Collaboration (Appraisal of Guidelines for Research and Evaluation) uses an international team of practice guideline developers and researchers to develop a tool to aid practitioners in assessing the quality of a guideline and to provide a rigorous framework for developing guidelines.[29,30] The AGREE II instrument is comprised of 6 quality categories and 23 specific criteria for appraising guideline quality. The instrument can be found on the AGREE website at www.agreetrust.org.[30]

Strength of evidence

Once the evidence at the highest level has been found, the quality of the evidence must be critically appraised. Overall strength of evidence can only be determined by synthesizing both data on the level of evidence and the quality of evidence developed in each study. A critical appraisal is the process of systematically scrutinizing and evaluating research evidence to determine if it is reliable, clinically appropriate, and significant.[30]

Validity of results should be determined when critically appraising studies. This can be done by identifying any flaws in the study design and methods. At a minimum, the NP would want to identify the following: study design used, adequacy of sample size, the sampling plan, the reliability and validity of measures including questionnaires, appropriateness of data analysis, and the applicability of the findings to clinical practice. There are many sources for critical appraisal worksheets, including text books, journal articles, and websites such as the Center for Evidence-based Medicine.[10,30-32]

In addition, creating an evidence table can be useful in determining the overall strength of evidence because it facilitates the comparison and synthesis of all related evidence.[10] First, the NP would document the level and quality of evidence from each pertinent study and then proceed to synthesize evidence across these studies (see *Hypothetical evidence table*). Assessing the quality of evidence can be somewhat subjective. However, the Grading of Recommendations Assessment, Development and Evaluation (GRADE) is an international collaborative that has developed a common, practical approach to grade the quality of evidence.[30,33] The GRADE group has developed downloadable software and tutorials for those interested in assessing the quality of evidence. These are available at www.gradeworkinggroup.org/toolbox/index.htm.

Even high-quality evidence may not be suitable for use in every clinical setting. The NP must also critically appraise for cost and complexity. Some innovations may be too costly or too complex to be suitable for use in most clinical settings. For example, the Diabetes Prevention Program (DPP) clearly demonstrated that intensive lifestyle modification delays or prevents the progression of pre-diabetes to diabetes, but it required costly resources and was not easily replicable in clinical settings.[34] Recently several studies have translated the DPP into lower cost, less resource-intensive innovations that can be replicated in community or clinical settings.[34,35]

Implementation of EBP

The problem in healthcare is not only "what is the evidence?" but extends to the problem of inconsistent or inappropriate application of the evidence in real world practice.[36] The goal to deliver high-quality care that fits patient preferences may require adaptation of evidence-based innovations to suit the real world clinical settings in which they are applied. Evaluation of the implementation of an evidence-based innovation may be useful in assessing the degree to which the innovation was adapted, effect on patient outcomes, degree of adoption or uptake by clinicians, cost to the organization, and fit with organizational values and resources. An innovation that is highly acceptable to clinicians and the organization is easy to implement, requires few resources, and fits within the organization's budget is more likely to be implemented and sustained than is a complex, time-intensive, and costly innovation.[37]

To facilitate EBP on an organizational level may require system redesign, protected time to design, implement, and evaluate, as well as incentives for participants to continue this important work.[38] Administrative support is particularly important for evidence-based innovations that rely on consistent delivery by a variety of clinicians.[38] The use of local change champions has been shown to enhance enthusiasm for the evidence-based innovations from clinicians and NPs are ideally suited for this role and to promote the implementation of EBP.[38] Finally, celebrating success when an evidence-based innovation has been effectively implemented, particularly when it resulted in positive change in patient outcomes, is a strong approach to nurture a culture of inquiry.

Hypothetical evidence table

Research Question: What is the best approach to withdrawing patients from antidepressants to avoid adverse reactions?

Study type	Study purpose	Population	Intervention	Outcome	Limitations
Depression Treatment Cohort, 2013, Level 1					
Meta-analysis, 7 studies (N = 620)	Effectiveness of 2 different withdrawal techniques	Adults, 18-65	3 different approaches to SSRI withdrawal: • abrupt withdrawal • tapering SSRI dose • tapering SSRI dose; initiating use of a weak SSRI	Nature and severity of symptoms significantly less with planned reduction at 50% rate	Absence of comorbidities
Jones et al, 2009, Level 2					
RCT, 2 different approaches to withdrawing from SSRIs (N = 132)	Compare use of vitamin B6 daily and gradual dose reduction	Adults, 21-40	50 mg vitamin B6 daily, scheduled reduction of SSRI (fluoxetine, sertraline)	50% reduction in adverse reactions when taking 50 mg daily of vitamin B6 ($p = 0.5$)	Variable length of time on medication; variable dosing
Munkle et al., 2006, Level 3					
Prospective clinical trial to differentiate 3 approaches to fluoxetine withdrawal (N = 83)	Compare 3 approaches to fluoxetine withdrawal	Men, 22-35	3 groups: 1) half dosing for two weeks until off, 2) half dosing for 3 days until off, 3) self-determination of rate of withdrawal	Severity of symptoms, relapse rates both fewer when patient determined rate of withdrawal	Self-report of comorbidities and dose reduction
Myberg and Sullivan, 2011, Level 5					
Meta-synthesis of 6 qualitative studies (N = 73)	Patient experience of SSRI withdrawal	Adults, 18-70	Not applicable	Withdrawal debilitating with little provider support. Need for supportive interventions.	Limited to adults
Nolte and Watson, 2010, Level 6					
Qualitative focus group (N = 11)	Describe process of withdrawing from SSRIs	Women, reproductive age	Not interventional; descriptive	Providers rarely mentioned withdrawal issues and provided little support when confronted.	Variable medication, dosing, and women only

LOE: level of evidence: Level 1 evidence–Systematic review and meta-analysis of randomized controlled trials (RCTs) or evidence-based guidelines based on systematic reviews or meta-analysis, Level 2–One or more RCT, Level 3-Controlled trial with no randomization, Level 4-Case-control or cohort study, Level 5–Systematic review of descriptive and qualitative studies, Level 6-Single descriptive study, Level 7–Expert opinion.

Source for LOE: Melnyk BM, Fineout-Overholt E. *Evidence-Based Practice in Nursing & Healthcare*. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2011.

LEGEND: SSRIs= Selective Serotonin Reuptake Inhibitors,

Note: Table of hypothetical data reflects strong evidence to support withdrawal of SSRIs utilizing controlled dose de-escalation. Patients need to be aware of potential withdrawal difficulties when starting SSRIs and need support during the withdrawal process. Self-determination of the rate of withdrawal meets with better patient outcome and long-term success for withdrawal with fewer complaints about adverse reactions.

A number of different approaches to reliable implementation of evidence for practice have been proposed and the theoretical foundation for implementation is strong with 47 models identified in the literature.[39,40] Among the dozens of implementation science frameworks available, the Translating Research into Practice (TRIP) framework is one of the most commonly used. TRIP can be used to design implementation studies that test the degree of provider adoption of an innovation by providers and organizations. Adoption of the innovation as proposed in TRIP is influenced by: characteristics of the innovation, communication, users, and the social system. Factors that influence adoption of the innovation include users' beliefs that the innovation is superior to usual care; compatibility with existing values; limited complexity; trialability (the degree to which an innovation can be tested on a small scale); and observability.[41] Institutionalizing a new innovation is challenging, but several factors may enhance successful implementation and sustainability of the innovation. In addition to those previously mentioned, a multifaceted and interdisciplinary communication process that includes: educational outreach, including opinion leaders, and change champions from the earliest stages of project design can prove essential for successfully sustaining an evidence-based innovation in a clinical setting.[42]

Disseminating evidence into practice

Dissemination and implementation research (also referred to as knowledge translation and/or knowledge utilization) identifies factors and strategies that lead to adoption, maintenance, and sustainability of science-based innovations and is most urgently needed.[41] This process promotes high-quality care, adaptable innovations, and the inclusion of sustainability and evaluation measures. To achieve these goals, essential elements must be integrated and include multidisciplinary team care, health information technology, and stakeholder engagement.[43,44]

Equally important is the dissemination of information about effective innovations to a larger audience. NPs who have successfully implemented evidence into practice must share their experiences and results with others to facilitate the widespread use of the evidence in an organization or clinical practice setting. This can be accomplished by identifying other clinicians in the organization who could benefit from learning about the results of the evidence-based innovation and who might wish to apply it to their own practices. Another dissemination strategy is to partner with other professionals who are opinion leaders or influential clinicians to share information about a successful implementation of an evidence-based innovation.[45]

Heavy clinical workloads and an explosion of knowledge preclude reading all relevant information from scholarly publications; it is too inefficient. Clinicians would need to read approximately 17 articles each day to keep up with the available literature in a given area of practice, and with nearly 40% of nurses reporting insufficient time to read research, this is unlikely.[46,47] In addition, research suggests that moving evidence into practice is most likely to occur when the information is interactive and applied; reading alone is probably insufficient to create change in clinician behavior.[48] By partnering with opinion leaders to share findings about successful implementation of an evidence-based innovation, the NP can facilitate the adoption of this practice in the organizational setting.

Creation of sustained change based on best evidence requires consideration of new models of care. Project ECHO is a model of education and care delivery that has received positive review. This model takes advantage of basic communication technology with activities such as weekly virtual grand rounds. Teams meet and together review and manage patients, sharing cumulative knowledge of the literature and best practices.[49] This type of learning network pools expertise with teams joining together to solve problems and creating best practices. NPs must participate in such networks and could serve as leaders in forming a learning network.

Finally, a crucial and central consideration in the implementation of evidence in clinical practice is involvement of patients as key stakeholders. Evidence about the comparative effectiveness of varied treatment options is needed for patients to make informed healthcare decisions. Successful translation of the evidence into practice requires patient engagement that is sustained and continuous.[50,51] NPs need to solicit input from patients that will make the translation of evidence more useful.

Moving forward

Care that is not evidence-based is likely both unethical and incompetent. For NPs who are on the front lines in the provision of primary care services, innovations with demonstrated effectiveness, that are cost-effective, and that consider patient perspectives hold hope for improved patient outcomes. Better use of existing knowledge by NPs can contribute to the improvement and transformation of healthcare. The overriding goal of EBP is quality improvement that ensures best practices are implemented.[44] NP

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The authors have disclosed that they have no financial relationships related to this article.

DOI-10.1097/01.NPR.0000463783.42721.ef