The concept of evidence-based practice (EBP) has gained considerable attention recently and has been identified as a process that can be used to link the best scientific evidence with clinical expertise to improve healthcare outcomes. Traditionally, medical and nursing programs have taught students to base their clinical decisions on experience, expertise, or single-sourced literature and not on a careful systematic review of all of the available evidence.

In the 1990s, a new paradigm was introduced into traditional medical and nursing training programs that stressed that clinical decision making should be based on the best evidence available in the literature in concert with clinical expertise and experience. Since this introduction into medicine and nursing, significant changes in curriculum have been done to stress EBP principles; however, it has been noted that nurse anesthesia programs have been slow to adapt these changes. Therefore, the purpose of this column is to review the basic principles of EBP and introduce an option that nurse anesthesia educators can use to implement EBP into a nurse anesthesia curriculum.

Key words: Education nursing/medical, evidenced-based practice, nurse anesthesia curriculum, research-based practice, residency education.

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USING EVIDENCE-BASED PRACTICE IN NURSE ANESTHESIA PROGRAMS

New clinical information is generated faster than clinicians and students can assimilate it. Nurse anesthetists, students, and faculty require up-to-date information on a daily basis regarding healthcare. This is even more daunting to student nurse anesthetists because they are not only trying to learn a new profession but also trying to use the most comprehensive evidence to support their clinical decision making. In the 1970s, it was recognized that practitioners often based their clinical decisions on practical or anecdotal knowledge, intuition, or information from an expert source or a textbook, and not on information from clinical research studies. In an effort to initiate change, a new concept called research utilization (RU) was developed and promoted in medicine and nursing that emphasized that clinical decision making should be based on findings from clinical research trials and not on intuition or anecdotal knowledge.

The concept of using RU was hailed as a significant change and adopted by many academic institutions as a method to train students in the basic concepts of using current evidence to guide clinical decision making. However, many practitioners complained that using RU as a base to form clinical decisions was flawed because it discounted some of the basic tenets of clinical practice, such as experience and intuition, and it was difficult to assimilate changes in many of the clinical practices using the studies reviewed because of significant methodological disparities between the populations described in the studies and those being cared for in the clinical settings. As a result of these difficulties many practitioners abandoned or did not adopt RU principles and continued to use a paradigm for practice that included the following:

1. Anecdotal observations from clinical experience are a valid way of building and maintaining one's knowledge concerning all aspects of patient care.
2. The study and understanding of basic mechanisms of disease and pathophysiologic principles is a sufficient guide for clinical practice.
3. A combination of thorough traditional training and common sense is sufficient to allow one to evaluate new tests, techniques, and treatments.
4. Content expertise and clinical experience is a sufficient base from which to generate valid guidelines for clinical practice.

In 1992, a new paradigm for practice called evidence-based practice (EBP) was introduced. It was recognized that clinicians needed to place less emphasis on scientific authority and more emphasis on the most current evidence that is present in the literature. However, unlike the concept of RU that substantially discounted clinical expertise, EBP recognized the value of expertise and experience and promoted EBP as a means to enhance expertise. The basic elements of the EBP paradigm included:

1. Clinical experience and development of clinical instincts remain crucial elements in decision making but no longer serve as the con-
fident endpoint for answering pertinent clinical questions.

2. The study and understanding of basic mechanisms of disease, physiology, and anatomy remain important and necessary but are insufficient guides to govern clinical practice.

3. Understanding the strength and evidence hierarchy rules of evidence is necessary to correctly interpret literature based on causation, prognosis, and treatment strategies.

The EBP model was first used in the training of medical students and has since been described as a valuable method to train resident physicians and nurse practitioners, but to date no method has been described in the literature regarding the training of nurse anesthetists using EBP principles.\(^4,12\) It has been recognized that implementation of EBP into practices at the subspecialty level (which includes nurse anesthetists) is difficult because of several obstacles.\(^10\) Many practitioners consider that integration of EBP principles at the subspecialty level (ie, anesthesia) is too limited for EBP to be useful, and specialty trainees are too busy to effectively incorporate the principles of EBP into daily practice.\(^10\) However, there are some examples of successful EBP programs in subspecialties. For example, Haines and Nicholas\(^10\) report on the successful implementation of EBP into a busy neurosurgical residency and noted that while the resident did have a slight decrease in direct patient contact, the residents were able to assimilate basic principles faster and retained new information for longer periods of time than that observed prior to implementation of their EBP training program.\(^10\) The successful implementation of an EBP program does require the acquisition of new knowledge and techniques for both the staff and faculty; therefore, prior to implementation of an EBP program, all trainees and faculty must be educated regarding the basic principles of EBP. The purpose of this column is to review some of these basic principles as well as highlighting an option that nurse anesthesia educators can use to implement EBP into nurse anesthesia curriculums.

**Evidence-based practice**

Evidence-based practice is the conscientious, explicit, and judicious use of the best current evidence to use concerning the care of individual patients.\(^12\) This principle has been successfully applied to many training programs in medicine and nursing. When presented with a clinical question, students should be asked to analyze available evidence using the following guidelines:

1. Define the problem or question in terms of the patient or problem, the intervention or comparison interventions used to answer the question, and the outcomes of the studies reviewed.

2. Outline the current methods used in your clinical practice to address the clinical problem.

3. Use a hierarchy to determine the quality of evidence presented in the literature. This hierarchy, in descending order,\(^11,12\) consists of results of systematic reviews of well-designed clinical trials (meta-analysis), results of one or more well-designed studies (randomized trials, cohort studies), results of large case series and case reports, editorials and opinions, animal research, and in vitro research (Figure 1).

4. Identify the resources available to adequately implement any proposed changes to clinical practice to help differentiate which evidence will be applicable to the current clinical setting.

5. Appraise the validity of the

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**Figure 1. The pyramid of evidence**

- Meta-analysis
- Randomized controlled trials
- Cohort studies
- Case control studies
- Case series
- Case reports
- Editorials, opinions
- Animal research
- In vitro “test tube” research

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Increasing clinical relevance
research presented using a standardized technique to review clinical trials. This includes asking these questions: (1) Did the clinical trials under investigation include basic elements (such as randomization of subjects, adequate power, and statistical analysis)? (2) Were the results clinically relevant? (3) Were the therapeutic maneuvers reported feasible in clinical practice? (4) Were all patients who entered into the study accounted for at the end of the study? In our training program, we use a standardized evaluation tool to grade the evidence reviewed (Figure 2).

Following a review of all of the available evidence, strategies are discussed as to how to implement these findings in relation to clinical practice. Following implementation it is important to ensure that a plan be established to determine the impact that these changes have had on practice as well as resolution of the clinical question that was proposed.

**Implementation of EBP into your curriculum**

It is recognized that clinical faculty may be resistant to change and implementation of an EBP program. As educators, your emphasis will be to dispel misinterpretations that EBP ignores the clinical experience intuition of the practitioners; therefore, you must stress that EBP is designed to include experiences and intuition and is meant to build on that knowledge. The following is an EBP education model that we use at our clinical anesthesia sites. It was recognized that a plan of implementation of this model was needed to include faculty and student training regarding EBP principles and using a format of EBP that could be easily implemented into a busy clinical setting.

To introduce an EBP education model, it was recognized that the best way to implement these changes was by reformatting existing educational tools that were currently used in our curriculum. The existing tools that were found to be the easiest to reformat were the journal club and case presentation.

- **EBP education model.** We used the guidelines below to implement these changes into the curriculum as well as a typical case presentation that was presented and analyzed using basic EBP principles to derive a solution to a clinical question.

  1. Train the faculty and students regarding the basic components of EBP to include use of existing databases.

  2. Introduce the concepts of critical analysis and critical synthesis into the formal and informal teaching in the individual anesthesia departments. The students are encouraged to present a case to their attending staff so that a discussion regarding the best course of treatment can be initiated. If the topic is determined to be clinically relevant, the faculty then assigns several students to perform a thorough review of the literature regarding the topic and to grade the evidence using an EBP grading tool (see Figure 1). Those findings that are deemed the most relevant are then added to a list of articles for future review. This review analysis can then be presented either in a case presentation format or a specialized journal club called the EBP journal club. A combination of case presentation and journal club is often used to facilitate this training and is done on a monthly basis in

**Figure 2. Evidence-based practice grading tool**

<table>
<thead>
<tr>
<th>Title:</th>
<th>Research questions/hypothesis:</th>
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<tbody>
<tr>
<td>Author(s):</td>
<td>Methods:</td>
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<td>Journal and date, volume, no. pages:</td>
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<td>Decision/reservations</td>
<td>Level of evidence:</td>
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<td>(Overall grade)</td>
<td>A – Strongly recommended; good evidence</td>
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<td>B – Recommended; fair evidence</td>
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<td></td>
<td>C – Not recommended; balance of benefits and harm to close to justify recommendation</td>
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<tr>
<td></td>
<td>D – Recommend against; fair evidence of ineffectiveness or harm outweighs risk</td>
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<tr>
<td></td>
<td>F – Insufficient evidence; evidence is lacking or poor quality research</td>
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A student nurse anesthetist working on his obstetrical rotation reports back to his faculty that during his rotation he was reprimanded by the clinical staff because he did not prophylactically treat an elective cesarean section patient with 10 mg intravenous (IV) ephedrine prior to induction of a spinal anesthetic. He reported that this was common practice in that department and was told that this was done because it has been “proven” to prevent hypotension without causing any detrimental effects to the mom or baby. He questioned this practice, and the question was analyzed at an EBP journal club. The well-built clinical questions that were proposed included the following: “Is the prophylactic administration of 10 mg IV ephedrine an effective means to prevent hypotension in a parturient undergoing a cesarean section under spinal anesthesia?” and “What effect does the prophylactic administration of 10 mg IV ephedrine to a parturient undergoing a cesarean section under spinal anesthesia have on the parturient and the fetus or neonate?”

In review of the preceding scenario, EBP principles were applied to analyze the research question. The format used was definition of the problem, analysis of the intervention, comparison of the available literature to determine those studies or articles that provided the best source of evidence and, finally, analysis of the outcome following implementation of the evidence into clinical practice. The following is a review of the findings from the aforementioned question.

- **The problem.** Some practitioners advocate prophylactic administration of ephedrine to all parturients undergoing a cesarean section under spinal anesthesia to prevent hypotension while others do not.

- **The intervention.** The routine administration of prophylactic ephedrine to parturients receiving a spinal anesthetic for cesarean section to prevent hypotension.

- **Comparison.** A disagreement regarding the worth of routinely administering prophylactic ephedrine was noted among anesthesia staff. Rationale for administering or not administering prophylactic ephedrine was noted and recorded. In review of the literature, multiple comparative studies of prophylactic ephedrine in this patient population were found that met all the critical appraisal criteria from all sectors of the literature hierarchy that included meta-analysis, well-designed clinical trials, case studies (series), and expert opinion.

- **Outcome.** Overwhelming evidence indicated that the prophylactic administration of ephedrine to a cesarean section patient undergoing a subarachnoid block was not effective in preventing hypotension and was, in fact, detrimental to both the mother and fetus or neonate leading to implementation of a change to practice and policy in the anesthesia department.

### Conclusions

As nurse anesthesia curriculums and clinical practices evolve, changes will be needed to be made in regard to the way nurse anesthesia students are taught. The former paradigm of using clinical judgment and expertise as the sole basis for clinical decision making needs to be replaced with a new paradigm that uses the best evidence available to formulate clinical decision making coupled with experience and expertise. Using the basic methods outlined in this column may help to accomplish this goal, and implementation of EBP principles into basic nurse anesthesia education will not only result in a better informed student but also ensure that the nurse anesthesia...
students and faculty remain at the forefront of the latest evidence and technology that is presented in the literature.

REFERENCES

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