
The Nature and Management of Labor Pain: Executive Summary

The Nature and Management of Labor Pain Symposium Steering Committee:

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This report describes the background and process for a rigorous project to improve understanding of labor pain and its management, and summarizes the main results and their implications. Labor pain and methods to relieve it are major concerns of childbearing women, with considerable implications for the course, quality, outcome, and cost of intrapartum care. Although these issues affect many women and families and have major consequences for health care systems, both professional and public discourse reveal considerable uncertainty about many questions, including major areas of disagreement. An evidence-based framework, including commissioned papers prepared according to carefully specified scopes and guidelines for systematic review methods, was used to develop more definitive and authoritative answers to many questions in this field. The papers were presented at an invitational symposium jointly sponsored by the Maternity Center Association and the New York Academy of Medicine, were peer-reviewed, and are published in full in this issue of the journal. The results have implications for policy, practice, research, and the education of both health professionals and childbearing women. (*Am J Obstet Gynecol* 2002;186:S1-15.)

Key words: Labor pain, labor pain management, intrapartum care, informed consent, evidence-based maternity care

Background: Origins and rationale for *The Nature and Management of Labor Pain*

Labor pain and methods to relieve it are major concerns of childbearing women and their families, with considerable implications for the course, quality, outcome, and cost of intrapartum care. Although these issues affect approximately 4 million women and families annually in the United States alone and have major consequences for health care systems, both professional and public discourse revealed considerable uncertainty, with major areas of disagreement and controversy about the safety and effectiveness of some methods to relieve labor pain, and inattention to others. In addition, little attention ap-

peared to have been given to women's access to a choice of methods in US hospitals, to organizational factors and decision-making processes that determine methods used, and to actual patterns of use of pain relief methods.

Since 1918, the Maternity Center Association (MCA) has provided national leadership for woman- and family-centered maternity care. In 1999, MCA began a long-term national program to promote evidence-based maternity care. *The Nature and Management of Labor Pain* is a project of MCA's *Maternity Wise*TM program, which helps childbearing women, maternity caregivers, policymakers, and the media understand the best scientific evidence about the safety and effectiveness of specific elements of maternity care, undertake effective strategies for making care more consistent with the best evidence, and obtain sound answers to important questions about safe and effective care.

The evidence-based paradigm¹⁻³ offers an approach for moving from less definitive to more definitive conclusions about the effects of specific forms of care. This paradigm recognizes that conventional reviews of the literature have lacked the methodologic rigor required to minimize bias and develop firm conclusions. The "systematic review" has

Convened by the Maternity Center Association, New York City.

The views expressed by the Steering Committee do not necessarily reflect those of the agencies, institutions, and organizations with which its members are affiliated.

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been developed to address these limitations. Before carrying out such a review, the reviewer specifies parameters and procedures that will be followed. These include interventions, outcomes, populations, and study designs that will and will not be included, along with strategies for a thorough search for relevant reports, for evaluating the methodologic adequacy of identified relevant studies, and for summarizing results of studies that will be included in the analysis. The reviewer then conducts the review by adhering to these plans as closely as possible.⁴

A large body of research supports and refines this approach,^{5, 6} and there is growing international consensus that a well-conducted systematic review provides the best possible answers to specific questions about the effects of care, given the available research base of primary studies. A systematic review enables comparison of alternatives and determination, with respect to a specific outcome, of whether or not they are different, or whether uncertainty remains because of limited, flawed, or contradictory studies. In the context of these rigorous methods, a finding of uncertainty is as important for health professionals and individuals facing personal health care decisions as is a more definitive finding of either a difference or no difference.

The Maternity Center Association initiated a project to apply this evidence-based approach to questions about labor pain and its relief by commissioning a series of papers, holding a symposium where the papers would be presented and discussed by invited leaders representing all fields involved with labor pain issues, and making the peer-reviewed papers available to a broader audience.

Process and methods

The Maternity Center Association asked Judith Rooks to direct the project and entered into partnership with the New York Academy of Medicine for the purpose of planning and holding the symposium. The meeting was jointly sponsored by and held at the New York Academy of Medicine.

A multidisciplinary steering committee was formed comprising 12 members with expertise in anesthesiology, bioethics, childbirth education, consumer advocacy, epidemiology, journalism, labor support (doula care), midwifery, neonatology, nursing, obstetrics, pediatrics, physical therapy, and public health. Steering Committee members participated in all major decisions about content, authors, and quality of the papers. The group endeavored to ensure that papers presented at the symposium and published in this issue would offer a panoramic view of the field and avoid duplication where possible, would summarize the best research currently available and minimize bias, and that the project would address needs and interests of childbearing women and their families.

To help authors, symposium participants, and others understand the values and concerns underlying this project, the Committee developed a statement of values,

principles, and objectives.⁷ This statement gives priority to meeting needs and interests of women and their families, obtaining evidence-based information about labor pain and methods for relief of labor pain, ensuring that women and their caregivers have access to such information, ensuring that women have access to a choice among alternative pain relief methods, honoring and supporting choices women make, and identifying and addressing important gaps in the literature.

The committee next developed a view of the field of labor pain management as a whole and of individual papers that collectively might characterize this field. The view included both papers about the safety and effectiveness of specific methods of labor pain relief and several papers providing a context for the methods papers. Contextual issues include the nature of labor pain, the social history of labor pain management, the contribution of pain and pain relief to women's satisfaction with childbirth, and issues of access and choice. The committee considered methods that are widely used in the United States and methods that might warrant greater availability and use (eg, those now widely used in other western industrial nations), and decided to focus on epidural analgesia, opioids, nitrous oxide, paracervical block, and nonpharmacologic methods, including continuous labor support. To help avoid both duplication and gaps in important topics, the committee developed explicit and distinct scopes for these papers.

Some of the most contested information in the field involves possible undesired effects of epidural analgesia. Some investigators have concluded that changes in technique over time have eliminated many previous concerns, and others have concluded that many concerns persist. The range of stated conclusions among experienced investigators in this field posed a dilemma about whom to invite to conduct a review to answer these questions; the committee did not want the choice of author to either determine or appear to determine the results of a review of this very important pain relief method. After much deliberation, we decided to invite 2 capable and widely respected individuals who had in the past come to somewhat different conclusions about effects of this pain relief method to prepare parallel papers using the same specified scope and the same general and rigorous guidelines for systematic reviews.

Because epidural analgesia has rapidly become the most commonly used method of labor pain relief in the United States, a third paper on this topic was planned to address side effects and effects on intrapartum care, including co-interventions that are routinely used or more likely to be used to monitor, prevent, or address undesirable effects.

A subcommittee of the Steering Committee examined leading guidelines for preparing systematic reviews, identified 6 that are based on epidemiologic principles and incorporate findings from the science of research review-

ing⁸⁻¹³ and adapted the most current versions of these then available to develop guidelines appropriate for use by symposium authors. The resulting guidelines¹⁴ reflect international consensus about these methods and include the following key steps: (1) developing a written plan describing intended scope and procedures, (2) carrying out the planned review (including literature search, validity assessment, data abstraction, data synthesis, interpretation of results), and (3) developing a report that presents the decision rules adopted, steps taken, and results. Although some guidelines limit included studies to controlled trials, the Steering Committee's guidelines anticipated that it would be important to enable authors to include observational studies for many key questions relating to labor pain relief.

The committee asked authors of all papers about specific methods of pain relief and the author of the paper about women's satisfaction with childbirth to use the project's systematic review guidelines to develop their papers. Although this method was not fully applicable to the remaining papers, other authors were encouraged to apply elements of a systematic review as fully as possible. Principles with broad application include establishing clear criteria for inclusion and exclusion and designing and carrying out a systematic search for relevant material. David Hopkins, MD, a member of the Steering Committee and an epidemiologist with experience in systematic review methods, critiqued drafts of all papers from this perspective and was available to provide technical support to the authors.

The Steering Committee then identified strong candidates for preparing the commissioned reviews. They were asked to adhere as closely as possible to the detailed written scope for their respective papers. Lead authors were given the option of working alone or inviting co-authors of their own choosing. As with the Steering Committee, the authors brought perspectives of many fields to this project, including anesthesiology, epidemiology, labor support, midwifery, nursing, obstetrics, pediatrics, physical therapy, and political science.

Several months before the symposium, the Steering Committee met to review drafts of the papers. With the intent of helping the authors make their papers as strong as possible, the committee provided detailed feedback and asked authors to revise their papers before the meeting.

To ensure a balance of participants across all professions and organizations involved with labor pain, symposium attendance was by invitation only. Participants included anesthesiologists, anthropologists, childbirth educators, consumer advocates, doulas, epidemiologists, family physicians, hospital administrators, midwives, neonatologists, nurses, nurse-anesthetists, obstetricians, pediatricians, political scientists, public health practitioners, social workers, and persons from federal health agencies. The committee wanted to involve people who were in a strong position to make substantive contributions to the dialogue at the

meeting and to use the information provided at the meeting to improve labor pain management within their professional activities and organizations.

The symposium was held at the New York Academy of Medicine on May 4-5, 2001. The lead authors presented 10 commissioned papers. Substantial time was devoted to questions and comments. The dialogue was rich, engaging, and frequently impassioned, representing a very broad spectrum of perspectives. Many participants later said that they had been exposed to new and important perspectives that they rarely encountered in their usual professional activities. Despite strong personal preferences, most notably in favor of epidural analgesia or of unmedicated labors, there was general agreement that women's preferences and choices should be honored.

In addition to the papers and discussions, the symposium included 2 multidisciplinary panels. Leaders of 4 relevant disciplines were asked to compare, contrast, and critique the 2 parallel papers on unintended effects of epidural analgesia. Stephen B. Thacker, Director of the Epidemiology Program Office at the Centers for Disease Control and Prevention, responded as an epidemiologist. Lawrence J. Saldman, former editor of the journal, *Anesthesiology*, and professor at Stanford University School of Medicine, provided an anesthesiology perspective. Michael F. Greene, director of maternal-fetal medicine at Massachusetts General Hospital and member of the editorial board of the *New England Journal of Medicine*, offered an obstetric perspective. Roberta A. Ballard, professor of pediatrics at the University of Pennsylvania School of Medicine, responded from the perspective of neonatology.

A multidisciplinary concluding panel included Valerie A. Arkoosh (anesthesiology, MCP Hahnemann University), Eugene Declercq (childbirth education, political science, public health, Boston University), Margaret Comerford Freda (nursing, Albert Einstein College of Medicine), Fredric D. Frigoletto (obstetrics, Harvard University), Lisa L. Paine (midwifery and public health, Boston University), and Stephen D. Ratcliffe (family medicine, University of Utah). Because of space constraints, summaries of the 2 panels are available elsewhere,¹⁵ along with remarks of Charles S. Mahan (public health, obstetrics, University of South Florida), who was scheduled to serve as a discussant to the final symposium paper but was unable to attend.

The Maternity Center Association's Carola Warburg Rothschild Award that recognizes outstanding contributions to the health and well-being of women and their families was presented during the meeting. The award was given to Iain Chalmers, Murray Enkin, and Marc J. N. C. Keirse, whose pioneering work in evidence-based maternity care¹⁶⁻¹⁸ helped to establish the evidence-based paradigm for health and medicine in general.¹⁹ On behalf of the group, Dr Enkin accepted the award, which was given "for refining the scientific synthesis of research

evidence and leading a dedicated team in the application of these 'systematic review' methods to the entire field of maternal and newborn care, for disseminating their findings in a series of landmark publications, for helping to ensure that women, clinicians, and policy makers can make decisions about maternity care that are informed by the best available research, and for their continuing efforts to determine the safety and effectiveness of maternity care for mothers and babies."

After the symposium, authors had an opportunity to revise their papers in consideration of the fruitful discussions that had taken place at the meeting, before sending manuscripts to the journal. With the exception of this executive summary and a commentary on the two parallel papers about epidural analgesia, all papers published in this issue were peer-reviewed.

As a consequence of the process just described, the papers are rigorous, comprehensive, and complementary. Some are also long because of their ambitious scopes and standards for reporting systematic reviews. Some authors are making less central, but important, information, such as details about excluded studies, available elsewhere.¹⁵

Results

The following summaries of *The Nature and Management of Labor Pain* project papers will provide an introduction and orientation to the papers themselves. These overviews cannot substitute for the individual papers, which are exceptionally comprehensive. Both the papers developed with the systematic review methods and their summaries below are generally longer than papers that, out of necessity, used a more conventional approach to review of literature. The summaries appear in the order of presentation at the symposium and in this issue.

"The Nature of Labor Pain." In the opening paper, Nancy K. Lowe synthesizes the best work from an extensive literature on the essence, characteristics, and factors that contribute to the phenomenon of labor pain. Dr Lowe's research in this area has focused on measurement of labor pain and factors contributing to the experience of labor pain. Her far-reaching and up-to-date overview of both theory and empiric research is of interest to a wide audience.²⁰ Systematic review methods were not appropriate for the paper's diverse questions and data sources.

Dr Lowe applies Chapman's conceptual model of pain to the phenomenon of labor pain. The experience of labor pain is a highly individual reflection of variable stimuli uniquely received and interpreted through an individual woman's emotional, motivational, cognitive, social, and cultural circumstances. The complexity and individuality of this experience suggest that a woman and her caregivers may have a limited ability to anticipate her labor pain experience before labor, and that standardized and limited approaches to labor pain management may not meet the needs of many women. Choice among

a variety of methods and individualization of pain-related care is desirable.

In the context of a project that seeks to improve women's access to safe and effective labor pain relief, Dr Lowe's synthesis makes an important contribution by identifying modifiable factors that may alleviate labor pain independent of administering or undertaking any specific method of labor pain relief. Modifiable factors that have empirically been shown to influence labor pain include the following: environmental conditions, coping strategies, fear, anxiety, expectations about the experience, and, above all, a woman's sense of self-efficacy or confidence in her ability to cope.

In a related discussion, Dr Lowe underscores the striking qualitative difference between pain in the context of helplessness, suffering, and loss, and pain in the context of coping resources, comfort, and a sense of accomplishment. Care and resources available to women as they look toward their birthing experiences and during the time of labor and birth may influence whether the sensory intensity of labor pain is experienced in a fundamentally negative or positive manner.

The choice of a tool for measuring labor pain is an important consideration in research to compare effects of different methods for pain relief or assess the effect of other factors that may affect how it is experienced. Dr Lowe provides a thoughtful discussion of the leading tools, expressing greatest appreciation for the McGill Pain Questionnaire and the Short-form McGill Pain Questionnaire. Although visual analogue scales (VASs) are widely used, they have many shortcomings for measuring labor pain.

The paper also provides an overview of the causes and transmission of labor pain stimuli, identifies the need for better research to understand the purported harmfulness of labor pain, and reviews the evidence on physiologic and psychosocial factors that affect how it is experienced.

"Anesthesia for Childbirth: Controversy and Change." Donald Caton, the author of *What a Blessing She Had Chloroform*,²¹ is widely recognized as a chronicler of the social history of labor pain relief in the United States and Europe during the last 200 years. With Michael A. Froelich and Tammy Y. Euliano, he reviews changes in technology, knowledge, and the values and interests of both professionals and women since the mid-19th century.²² This paper was not amenable to systematic review methods.

The methods that have been available and used for labor pain relief reflect a complex interplay of technology, knowledge, and values and interests of both professionals and childbearing women. At different times, widely different views have prevailed. Professional views have ranged from understanding childbirth as "a physiologic process, best managed with the least possible interference" to the importance of using "aggressive practices," requiring intensive anesthetic intervention. Women's views have simi-

larly ranged from the idea that pain and the avoidance of medication “might have physiologic, psychologic, or social value” to freedom from labor pain as “a necessity, if not a ‘right’.” The authors argue that the present complex environment includes the full spectrum of professional and consumer viewpoints.

Dr Caton and colleagues then address the topic of epidural analgesia, which has rapidly become the most common method of labor pain relief in the United States. They argue that this method offers flexibility in balancing the trade-offs of the degree of pain relief against the degree of interference with other functions and review physicians’ attempts to find an optimal balance by modifying choice of drug, dosage (volume and concentration), and method of administration (eg, use of plastic catheters and infusion pumps).

They conclude by reviewing many intriguing observations that have been made about the effect of epidural analgesia on maternal and fetal/newborn physiology. Despite these observations, current knowledge in this area is inadequate. Research about epidural analgesia has largely bypassed these important matters in favor of questions about technique and outcomes.

“Unintended Effects of Epidural Analgesia During Labor: A Systematic Review” and “The Effects of Epidural Analgesia on Labor, Maternal, and Neonatal Outcomes: A Systematic Review.” Ellice Lieberman and Barbara L. Leighton were both invited to prepare independent systematic reviews of unintended effects of epidural analgesia on specified labor, maternal, and fetal/newborn outcomes. Dr Lieberman is a physician and perinatal epidemiologist with a special research interest in effects of epidural analgesia and other labor management practices on maternal and neonatal outcomes. Dr Leighton, an anesthesiologist and former president of the Society for Obstetric Anesthesia and Perinatology, has conducted studies investigating epidural analgesia outcomes and technique. Dr Lieberman collaborated with Carol O’Donoghue,²³ and Dr Leighton and Stephen H. Halpern updated and expanded a previously published meta-analysis.^{24, 25}

Both teams made and carried out a priori decisions consistent with conventions for systematic review methods, yet their methodologic decisions varied in fundamental ways. Because of high rates of protocol noncompliance and study group crossover in the randomized controlled trials (RCTs) of epidural analgesia as well as difficulty examining less common outcomes with this study design, Lieberman and O’Donoghue included both RCTs and better quality observational studies. Leighton and Halpern limited their review to RCTs, except when examining 2 outcomes for which only observational studies were available: breast-feeding success and urinary incontinence. The search strategy of Lieberman and O’Donoghue was somewhat broader and outcomes of interest were considerably broader, but in ex-

cluding abstracts, their criteria for inclusion eliminated some studies that the other team included. The Lieberman team provides detailed narrative assessments of individual studies, and the Leighton team used the Jadad scale²⁶ to rate individual RCTs. In developing conclusions about specific outcomes, Lieberman and O’Donoghue also summarize included studies narratively, and Leighton and Halpern use formal meta-analytic techniques. Leighton and Halpern limited comparison groups to women receiving opioids, whereas Lieberman and O’Donoghue included other available comparisons that met other criteria for inclusion. The commentary by Stephen B. Thacker and Donna F. Stroup that follows the parallel papers provides a fuller discussion of these methodologies.²⁷

The Lieberman and O’Donoghue²³ paper is longer than the Leighton and Halpern²⁵ paper for several reasons. First, it specifically addresses an array of methodologic challenges, with the aim of careful interpretation and a transparent process. The authors provide explicit rationale for the rules used to carry out the review and, by examining strengths and weaknesses of individual studies, explicit rationale for their interpretation of the data. This discussion is an important resource for investigators working in this field and practitioners attempting to make sense of the evidence. It clarifies, for example, that “practice-based” outcomes that vary greatly across providers, facilities, and communities help to explain some variation across studies and some confusion in the field about unintended effects of epidural analgesia.

Second, it examines a broader range of outcomes of interest with respect to unintended effects of epidural analgesia (see Table I).

Third, it includes a series of analyses to examine whether specific alterations in epidural analgesia technique affect the incidence of unintended outcomes (see Table II). Lieberman and O’Donoghue²³ ask what difference it makes if (1) epidural analgesia is discontinued late in labor versus continued during the time of pushing and birth, (2) epidural analgesia is delayed until greater cervical dilation is achieved versus initiated earlier in labor, (3) “light” or “walking” epidural analgesia versus “standard” epidural is used, (4) anesthetic agents are administered continuously versus intermittently, and (5) combined spinal–epidural technique versus epidural analgesia alone is used?

Drs Leighton and Halpern²⁵ include 2 important comparisons in their review that are not addressed in the other review. Their meta-analysis finds that mothers who receive epidural analgesia had lower pain scores and were more satisfied with their analgesia than mothers in the opioid groups. (Ellen D. Hodnett’s paper in this issue,²⁸ summarized later, examines a different outcome, overall satisfaction with the childbirth experience.)

Table I summarizes conclusions of the 2 teams about unintended effects of epidural analgesia when compared with other methods of labor pain relief. As shown in this

Table I. Best available evidence about unintended effects of epidural analgesia: Summary of conclusions from 2 parallel systematic reviews

<i>Possible unintended effects that have been studied</i>	<i>Conclusions of Lieberman and O'Donoghue²³: Effects of epidural analgesia vs control group*</i>	<i>Conclusions of Leighton and Halpern²⁵: Effects of epidural analgesia vs control group†</i>
Length of 1st stage labor	Possible association. Existing data insufficient for conclusion.	No difference in length (↑ use of oxytocin augmentation after analgesia)
Length of 2nd stage labor	↑ Length	↑ Length
Instrumental vaginal delivery rate: forceps or vacuum extraction	↑ Instrumental delivery Insufficient data to evaluate association with specific indications such as dystocia.	↑ Instrumental delivery No difference in instrumental delivery for dystocia
Fetal malpresentation	Possible association. Existing data insufficient for conclusion.	Outcome not reported
Cesarean delivery rate	Possible association. Existing data insufficient for conclusion.	No difference in cesarean delivery rate
Spontaneous vaginal birth rate: neither cesarean nor instrumental delivery	↓ Spontaneous vaginal birth	Outcome not reported
Maternal fever $\geq 38^{\circ}\text{C}$ (and increased temperature of fetus)	↑ Maternal fever	↑ Maternal fever
Effects on fetus and newborn (except for behavioral and neurologic effects)	No evidence for difference in meconium-stained fluid, low umbilical cord pH, low Apgar scores ↑ Fetal tachycardia. Existing data insufficient for conclusion about other fetal heart rate abnormalities No data available to evaluate differences associated with use of usual doses of opioid. ↓ Need for naloxone found in randomized trials was associated with atypical use of high opioid doses close to birth in some studies Consistent association with hyperbilirubinemia Existing data suggest no difference in newborn retinal hemorrhage	No difference in fetal heart rate abnormalities or intrapartum meconium, low 5-minute Apgar scores, low umbilical cord pH, severe asphyxia (↑ maternal hypotension) ↓ Low 1-minute Apgar scores ↓ Need for naloxone
Effects of epidural-related fever	↑ Neonatal sepsis evaluation and antibiotic treatment (2 studies) In one study of low-risk women, 98% of febrile mothers used epidural analgesia compared with 55% of afebrile mothers, and maternal fever was associated with: low 1-minute Apgar scores, hypotonia after birth, bag and mask resuscitation, oxygen therapy in nursery, and possibly neonatal seizure One study found that unexplained neonatal seizure is associated with exposure to intrapartum fever	Outcomes not reported
Neonatal behavioral and neurologic outcomes	Epidural-exposed versus unmedicated infants* Studies using more comprehensive Brazelton Neonatal Behavioral Assessment Scale (NBAS) found differences favoring nonmedicated infants; no difference when less comprehensive tools used Epidural- vs opioid-exposed infants† Existing data find small differences that do not overall favor one or the other exposure. Epidural-exposed infants tended to perform better on auditory orientation and habituation, and opioid-exposed infants had better muscle tone	Outcome not reported
Perineal laceration	↑ 3rd- and 4th-degree perineal laceration	Outcomes not reported
Postpartum hemorrhage and retained placenta	Existing data insufficient for conclusion	Outcomes not reported
Breast-feeding success	Existing data insufficient for conclusion	No difference in breast-feeding success at 6 wk
Longer-term problems in the mother: new-onset long-term back pain, urinary problems	No evidence to support difference in new-onset long-term back pain Existing data insufficient for conclusion about urinary retention or stress incontinence	No difference in new-onset mid- or low-back pain at 3 mo and 12 mo ↑ Urinary incontinence in immediate postpartum period No difference in urinary incontinence at 3 or 12 mo

↑, authors conclude evidence exists for increased association with epidural analgesia; ↓, authors conclude evidence exists for decreased association with epidural analgesia.

*This review includes best available data from both randomized controlled trials (RCTs) and observational studies. Most women enrolled in comparison groups of RCTs received opioids. Control groups in observational studies often combined all other types of pain relief or did not provide detailed information about the types of pain relief used by women not receiving epidural.

†All women enrolled in comparison groups in this review received opioids. In included RCTs, all epidural protocols called for the use of bupivacaine (plus other drugs); nearly all opioid protocols were for intramuscular or intravenous meperidine (plus other drugs). Observational studies were used only to examine breast-feeding success and postpartum urinary incontinence because RCTs were not found.

Table II. Best available evidence about the impact of modification of technique on unintended effects of epidural analgesia: Conclusions of systematic review of Lieberman and O'Donoghue²³

<i>Modification of technique used to minimize unintended effects of epidural analgesia</i>	<i>Objectives of Modification of Technique</i>	<i>Effects of Modified Technique</i>
Discontinuing administration late in 1st stage vs continuing during 2nd stage	Increase ability to push Increase rate of spontaneous vaginal birth	Existing data insufficient for conclusion about mode of delivery and length of second stage labor No evidence for difference in fetal outcomes
Delaying start of analgesia until greater cervical dilation vs initiating with less dilation	Improve labor progress Increase rate of spontaneous vaginal birth	Existing data insufficient for conclusion about fetal malposition and instrumental vaginal delivery Delay may reduce cesarean delivery but existing data insufficient for definitive conclusion
Using "light" (↓ concentration of local anesthetic and addition of opioid) vs "standard" doses	Decrease motor block Reduce length of 2nd stage Reduce instrumental delivery	No evidence for difference in: length of labor, instrumental and cesarean delivery rates, or fetal outcomes
Administering continuous infusion vs intermittent infusion	Reduce pain experienced before new bolus Reduce hypotension with bolus administration	No evidence for difference in cesarean or instrumental vaginal deliveries Existing data insufficient for conclusion about fetal heart rate abnormalities and length of labor No evidence for difference in fetal outcomes
Using combined spinal-epidural (CSE) analgesia vs epidural alone	Rapid onset of pain relief	Existing evidence suggests no difference for cesarean or instrumental delivery rates, fetal malposition, length of labor Possible association of CSE with fetal heart rate abnormalities but data not conclusive No evidence for difference in meconium-stained fluid, umbilical cord pH

table, the 2 teams agreed that epidural analgesia increases the likelihood of (1) longer second stage labor, (2) instrumental delivery, and (3) maternal fever.

Two unintended outcomes were only addressed by Leighton and Halpern,²⁵ and thus also do not involve disagreement. They conclude that epidural analgesia increases the likelihood of the use of oxytocin augmentation after analgesia and maternal hypotension.

Many outcomes were only addressed by Lieberman and O'Donoghue,²³ and thus also do not involve disagreement. They conclude that epidural analgesia (1) decreased spontaneous birth, (2) increased neonatal sepsis evaluation and antibiotic treatment, (3) increased 3rd- and 4th-degree perineal laceration, and (4) had consistent association with hyperbilirubinemia.

They also find that epidural analgesia may be associated with the following outcomes (about which further research is needed): (1) fetal malpresentation, (2) infant hypotonia after birth, bag and mask resuscitation, oxygen therapy in nursery, and unexplained neonatal seizure, in infants of women with epidural-related fever, (3) decreased performance of infant on comprehensive Neonatal Behavioral Assessment Scale (NBAS) compared with nonmedicated infants (but no difference when testing was done with less comprehensive assessment tools), and (4) better infant auditory orientation and habituation but poorer muscle tone on NBAS compared with infants exposed to opioids.

These researchers found no evidence for difference in newborn retinal hemorrhage or new maternal backache.

Available data were insufficient to reach conclusions about association of epidural analgesia with postpartum hemorrhage and retained placenta.

The 2 teams came to different conclusions about effects of epidural analgesia on the many outcomes that remain in Table I. These include the following:

1. Length of first stage labor: possible association, data insufficient for conclusion (Lieberman team); no difference (Leighton team)
2. Cesarean delivery rate: possible association, data insufficient for conclusion (Lieberman team); no difference (Leighton team)
3. Breast-feeding success: data insufficient for conclusion (Lieberman team); no difference at 6 weeks (Leighton team)
4. Urinary problems: data insufficient for conclusion about urinary retention or stress incontinence (Lieberman team); increased urinary incontinence after birth, no difference at 3 or 12 months (Leighton team).

Attention to the authors' respective methodologic decisions and study quality assessments helps to explain these discrepancies. Readers are encouraged to consult the 2 papers.

Table II summarizes results of the analysis of Lieberman and O'Donoghue about the effect of modifications of epidural technique on unintended effects of this method of labor pain relief. Depending on the outcome and technique, this analysis finds that no evidence for a difference

exists, existing evidence suggests no difference, or existing data are insufficient for a conclusion. These results call into question the widespread assumption that these changes in technique make a difference in outcome.

Given the rigorous process that has been used to develop the conclusions in these papers, the Steering Committee believes that clinicians, women, and policymakers should have access to clear and full information about both outcomes and conclusions about which there is no disagreement, and outcomes and conclusions about which disagreement and uncertainty persist. Women need this information well in advance of labor and again during labor.

“Epidural Analgesia Side Effects, Co-Interventions and Care of Women During Childbirth: A Systematic Review.”

Linda J. Mayberry was invited to conduct reviews to identify and describe the incidence of the most common intrapartum side effects of epidural analgesia, to describe the effects of epidural analgesia on the use of other medical interventions during labor, and to examine associated modifications in nursing care. Dr Mayberry is a nurse-researcher whose interests include appropriate intrapartum care for women with epidural analgesia and promotion of evidence-based practice among intrapartum nurses. With co-authors Donna Clemmens and Anindya De, she conducted a systematic review of RCTs that had a stated goal of seeking methods for minimizing the incidence of side effects.²⁹ They limited their review of the incidence of side effects to studies published since 1990 to focus on agents and techniques in current practice.

This review of side effects provides information about the effect of modified epidural analgesia techniques. Notably, 18 of the 19 included studies examined “light” or “walking” epidural analgesia, which includes opioids to enable lower concentrations of local anesthetic with the objective of limiting hypotension and lower extremity motor blockade.

Several side effects were common and varied widely among study groups, suggesting that these effects might be associated with particular agents, dosages, drug combinations, or other factors. These side effects include:

1. Itching (17 studies): very common in groups receiving agents including opioids (had on average by 62%), whereas only 0% to 4% in groups receiving analgesia without opioids had itching.
2. Voiding difficulties (4 studies): inability to void ranged from 0% to 35% in 2 studies and 62% to 68% in another; 28% to 61% of women were catheterized in the only study that reported this outcome.
3. Sedation (6 studies): 21% of the women on average had sedation, but the range varied considerably across groups (1%-56%).
4. Hypotension (16 studies): incidence in all study groups ranged from 0% to 50%; groups in 6 studies had hypotension rates of 24% or higher.

5. No ambulation (8 studies): 0% to 25% of women in all groups did not walk at any time in labor in 2 studies, 30% to 45% did not walk in 2 studies, and 52% to 85% did not walk in 4 studies.

Incidence of nausea and vomiting was relatively low and may be unrelated to this method of pain relief. Although incidence of shivering was also low, this outcome was examined in just 2 small studies.

One of the most important findings in the review by Mayberry et al²⁹ is that a large proportion of women who receive what has been called a “light” or “walking” epidural do not ambulate at all during labor. Even within the 3 groups that were expressly encouraged to walk, rates of no-ambulation were high (34%-85%). Possible reasons for this general finding include: opioids contribute to drowsiness and fatigue, motor block interferes with ability or stability, women are confined to bed by tubes and cords connecting them to various devices, nurses have other responsibilities and are not available to assist with ambulation, and policies or advice of caregivers discourage ambulation.

The authors also examined the effect of epidural analgesia on the use of other interventions during labor. Electronic fetal monitoring, intravenous infusions, and frequent blood pressure monitoring are used routinely with epidural analgesia. The best available research finds that routine use of these interventions could be avoided with low-risk women without a specific indication such as epidural analgesia.³⁰ The authors discuss co-interventions that women may have more frequently with epidural analgesia, including oxytocin augmentation, bladder catheterization, and drugs for hypotension. The questionable practice³⁰ of directed, sustained pushing with breath-holding may also be more frequent with epidural analgesia.

The review concludes by discussing implications of both the side effects and care used to monitor, prevent, or address them for informed consent, the nursing care required by women who have epidurals, the availability of supportive care for women, hospital costs, and ambulation during labor.

Use of epidural analgesia may involve a complex cascade of intervention. For example, the authors note that this method of pain relief may impair a sense of bladder distention, a full bladder may impede uterine contractility, women may be at increased risk for bladder trauma or lack of postpartum bladder tone, and catheterization may introduce infection. Research is needed to clarify the interplay of these and other effects and interventions.

The authors stress the importance of giving women who are considering the use of epidural analgesia clear information during pregnancy about co-interventions that would or may be required and side effects that may occur. Those considering this pain relief method should understand that for most laboring women, having an

epidural would make labor more technology-intensive than it would otherwise need be. It would be inappropriate to imply that a woman who chooses a “light” or “walking” epidural will definitely be interested in and able to walk. The term “walking” epidural is misleading and should be discontinued. The appropriateness of the term “light” is also called into question, given possibilities for motor block and/or sedation.

“Parenteral Opioids for Labor Pain Relief: A Systematic Review.” Although epidural analgesia is apparently becoming the most frequently used method of labor pain relief in the United States, opioids are widely used as first-line labor pain medication that may preclude or precede epidural and in settings where epidural analgesia is not available. A recent survey found that parenteral opioids are given to 39% of women in US hospitals with >1500 births per year, 56% in hospitals with 500 to 1500 births per year, and 50% in hospitals with <500 births per year.³¹ Leanne Bricker was invited to prepare a systematic review examining the safety and effectiveness of opioids for labor pain relief. Dr Bricker is a clinical lecturer in obstetrics whose research interests include intrapartum management and clinical trials; she is working in the United Kingdom. As a member of the Cochrane Collaboration’s Pregnancy and Childbirth Review Group, she is well versed in systematic review methods. In this issue, Dr Bricker and co-author Tina Lavender review 48 RCTs that met a priori criteria for relevance and quality.³²

Most trials reviewed by Bricker and Lavender³² compared opioid with opioid, including different opioid agents, dosages, routes or techniques of administration, and opioid with codeine added. Eleven trials compared intravenous opioid with epidural analgesia, one compared intravenous opioid with paracervical block, and only one was placebo-controlled.

The authors³² calculate that some included trials were powered to address the primary outcome of clinical effectiveness, defined as maternal satisfaction with pain relief in 1 to 2 hours; none were powered to address the primary outcome of safety, defined as need for infant resuscitation after normal birth. Only 39% of the trials reported data for the primary clinical effectiveness outcome, and 15% reported data for the safety outcome.

How effective are opioids for labor pain relief? Bricker and Lavender³² conclude that there are “considerable doubts about its effectiveness for maternal pain relief.” Epidural analgesia is consistently more effective. In the single (double-blind) trial comparing opioid with another agent, paracervical block was more effective for 1 hour after administration, after which there was no difference. In the single (double-blind) trial comparing opioid with placebo, more women were dissatisfied with pain relief in the placebo group (71% vs 83%), but the opioid results are not impressive.

Although the included trials were underpowered to address the primary safety outcome, the authors³² note that opioids readily cross the placenta and identify observational studies consistently showing adverse effects of opioids on newborns. They identify concerns about the use of the opioid antagonist naloxone. They also point to a series of studies that have associated self-destructive and addictive behaviors later in life with fetal exposure to opiates during labor. Opioids are also associated with troubling maternal side effects, such as nausea, vomiting, and sedation, and may also pose more serious risks to mothers. Little or no data were available about many secondary, and arguably important, outcomes of interest, most notably breast-feeding and mother-infant bonding.

Bricker and Lavender³² provide a series of analyses comparing effects of opioids and epidural analgesia during labor. They conclude that opioids are associated with greater pain and less satisfaction with pain relief method, but shorter first- and second-stage labor, less oxytocin augmentation, fewer fetal malpositions, and fewer instrumental vaginal deliveries. They found no difference in cesarean delivery rates, low 5-minute Apgar scores, and use of naloxone in trials comparing these 2 methods.

Existing evidence provides very limited support for widespread use of opiates for labor pain relief. Bricker and Lavender³² conclude that if women and their caregivers do choose opioids, pethidine is the agent of choice because it is familiar to caregivers throughout the world and relatively inexpensive, whereas no convincing research evidence supports preference for a different opioid. They end their contribution by identifying a large research agenda relating to the use of opioids in labor.

“Nitrous Oxide for Relief of Labor Pain: A Systematic Review.” Recent surveys in Canada and the United Kingdom indicate that many women in those countries use nitrous oxide for labor pain relief. Sixty-eight percent of Canadian hospitals responding to a national survey of routine maternity care in 1993 reported that this method was available for laboring women at their facility; pooled facility-level estimates suggest that about 37% of Canadian women used this method during labor at the time of the survey.³³ Fully 99% of UK maternity units responding to a national survey about labor pain and its relief in 1990 reported that nitrous oxide was available for laboring women. In a simultaneous national survey of women just after birth, 60% reported using nitrous oxide for labor pain relief, and 85% of these rated pain relief with this method as “very good” or “good.”³⁴

A recent national survey of the use of pharmacologic methods of labor pain relief in the United States did not even mention nitrous oxide.³¹ Although formerly more widely available in the United States, relatively few laboring women appear to have access to this method at this time. Mark A. Rosen prepared a systematic review³⁵ of the safety and effectiveness of nitrous oxide to help consider

whether women in the United States might welcome and benefit from increased access to this method of pain relief. Dr Rosen's experience as director of a residency program in a hospital that offers nitrous oxide to laboring women helped inform his review in this issue. This experience was appreciated at the symposium, where many participants had little previous knowledge of this method and expressed considerable interest.

In the introduction to his paper,³⁵ Dr Rosen discusses the possible mode of action of nitrous oxide, as well as the agents and relatively simple and inexpensive equipment used to administer it. Women self-administer this inhalation anesthetic through a face mask or mouthpiece, and a demand valve closes when they are not exerting negative pressure. It is a flexible method that may be used at any time and for any duration during labor, if and as needed. It can be used alone, as a complement to other pharmacologic methods (eg, before administration of epidural), or in combination with nonpharmacologic measures. It takes effect in about 50 seconds and can be used intermittently with contractions or continuously. When used intermittently, women who anticipate their contraction and begin to breathe into the mask or mouthpiece slightly ahead of it obtain better relief than women who wait for the contraction to begin. Continuous use may cause a high level of maternal sedation, dizziness, or lightheadedness. Physicians of various specialties, midwives, and nurses can all supervise the use of nitrous oxide.

To examine the effectiveness of pain relief with nitrous oxide, Dr Rosen identified 11 RCTs meeting his criteria for relevance and quality. Nine of these studies involved either study groups or crossover designs with other inhalation agents. Because of the predominant comparison with other inhalation agents and other limitations, the best available studies are difficult to compare and summarize. In most studies, the great majority of women who used nitrous oxide gave high ratings to their pain relief. Many chose to continue to use nitrous oxide after the study ended and indicated that they would use that method again. A study comparing different concentrations found a dose-response effect. Although a placebo-controlled study found no difference in ratings of pain, it was conducted in early labor and used an intermittent technique beginning with the onset of a contraction that limited the effectiveness of the drug at a time when pain levels are generally low. Dr Rosen estimates that "although the efficacy of nitrous oxide seems limited compared with epidural analgesia ..., it appears to provide analgesia at a level comparable with paracervical block, and probably better than that provided by opioids."

Seven trials used to assess effectiveness also included data on adverse outcomes and were included in an analysis of safety. An additional 11 observational studies offered larger sample sizes and were included to examine safety. Dr Rosen concludes, "After maternal use of nitrous

oxide for labor analgesia, infants are clinically unaffected." Maternal dreams or drowsiness have been reported (0-24%), and women may also experience hazy memory during labor. The greatest maternal risk is loss of consciousness, a rare occurrence that can be prevented by self-administration (hand falls away with drowsiness), avoiding high drug concentrations, and limiting co-use with opioids. The available literature is not amenable to concise summary and definitive conclusions about other outcomes, and we refer readers to Dr Rosen's paper.³⁵

This review also addresses concern about occupational exposure of health care workers to nitrous oxide and other anesthetic gases, as raised in a number of earlier studies. Dr Rosen cites a meta-analysis concluding that the earlier studies do not establish an association between these agents and outcomes of concern. He notes that hospital facilities in the United States are well-ventilated, and that Nitronox machines that deliver a blend of nitrous oxide and oxygen have an active scavenging device.

On the basis of his review and personal experience, Dr Rosen offers recommended guidelines for the use of nitrous oxide during labor and birth. He concludes by identifying priorities for research, including more rigorous studies and studies examining questions of timing of administration, equipment modification, co-administration with other medications, supervision by different types of health care providers, safety, effects on breastfeeding, and effects during different stages of labor.

Serious consideration of ensuring greater access to nitrous oxide in the United States is warranted. Women and hospital administrators and staff may appreciate the availability of nitrous oxide for many reasons:

1. A large proportion of women appear to obtain adequate pain relief and to be satisfied with this method.
2. As women self-administer it, they can maintain a sense of control and reduce burdens on staff.
3. Effects appear to reverse rapidly when women stop inhaling the drug.
4. It does not appear to interfere with labor physiology.
5. Use of co-interventions that require monitoring and management and increase risks to the mother and fetus/infant appears to be limited.
6. Once incorporated into practice, the technique is simple and inexpensive.

"Paracervical Block for Labor Analgesia: A Brief Historical Review." Paracervical block, a local bilateral injection near the cervix, is given to block pain during the first stage of labor. The analgesic effect lasts for about 2 hours or longer if codeine is included to prolong the effect. This method of labor pain relief is rarely available and used in the United States at this time and appears to be primarily used in rural areas and small towns. The Steering Committee wished to determine whether it had been

discontinued for good reason, or whether it might warrant greater availability. Mark A. Rosen prepared a review³⁶ that examined the safety and effectiveness of paracervical block. His review, which appears in this issue, relies primarily and necessarily on earlier studies and uses conventional review methods.

Concerns about the risks of fetal bradycardia have led to attempts to better understand the effect of paracervical block on maternal–fetal physiology and to decreased use of this method. Currently, investigators lack consensus about the physiologic basis for postparacervical block fetal bradycardia. Tragic technique errors involving injection of paracervical block into the fetal head have been another leading concern.

To examine the effectiveness of paracervical block, Dr Rosen identified 4 RCTs meeting a priori criteria for relevance and quality. In these trials, about 75% of women rate their pain relief as “good” or “excellent.” There is considerable heterogeneity of technique in both of these studies and actual practice.

Dr Rosen sought RCTs to determine the incidence of fetal bradycardia. The evidence suggests that bradycardia occurs in about 15% of fetuses exposed to paracervical block. In most instances, the decrease in fetal heart rate is mild and transient. Trial size does not provide a basis for identifying the incidence of severe and harmful bradycardia.

Dr Rosen examined many types of studies to identify other unintended outcomes of paracervical block. Possible maternal complications include abscess, hematoma, and neuropathy. He found no evidence of adverse effects on labor progress, spontaneous vaginal birth, and breast-feeding.

He concludes that “PCB is an effective and relatively simple technique, although the skill and experience of the operator are among the most important variables related to both efficacy and safety.” The data reviewed do not clarify whether specific training and technique can limit or eliminate the occurrence of severe bradycardia and other safety concerns with paracervical block. Further research is needed to address important safety questions.

“Nonpharmacologic Relief of Pain During Labor: Systematic Reviews of Five Methods.” Although the subject of nonpharmacologic measures for relief of labor pain is relatively neglected in the health and medical literature, it is relevant to virtually all childbearing women: those who choose the most effective medications possible but need help before these medications can be administered and take effect or after they are discontinued, those who may welcome drug-free measures for pain relief as a complement to less effective medications, and those who prefer to labor entirely without pain medications. National data are unavailable to describe both childbearing women’s access to and use of drug-free pain relief measures in the United States, which appear to be quite limited and far from commensurate with this universal relevance.

Penny Simkin, who has done extensive work in the field of nonpharmacologic measures for labor pain relief,³⁷⁻⁴¹ was invited to prepare systematic reviews of selected measures. To narrow this vast topic, she limited her scope to methods that require institutional support (ie, specific skills, policies, and/or equipment) and have been evaluated by methodologically adequate, controlled prospective studies. By using these criteria, Penny Simkin and co-author MaryAnn O’Hara present in this issue systematic reviews of the effects of the following nonpharmacologic measures on pain and related outcomes: continuous labor support, baths, touch and massage, maternal movement and positioning, and intradermal water blocks for relief of back pain.⁴²

Simkin and O’Hara⁴² identify the following components of labor support: physical comforting, emotional support, guidance and support for the woman’s partner, information, and facilitation of communication between the woman and the hospital staff. Although a systematic review of 14 RCTs conducted throughout the world finds that this type of care is associated with a broad range of favorable outcomes and no identified drawbacks,⁴³ relatively few women in the United States have access to this kind of care during labor. In this context, Simkin and O’Hara make an important contribution by conducting a new systematic review of the effects of labor support on pain indicators and related outcomes under the distinctive conditions existing in North America. Their review of 9 North American RCTs finds that “continuous labor support by a trained layperson provides relief of pain and improves other outcomes, to a greater degree in low-income women who are not accompanied by a loved one than among middle-class accompanied women.”

A growing number of hospitals in the United States appear to be making immersion in water available to laboring women. Simkin and O’Hara⁴² review 2 prospective cohort studies and 7 RCTs assessing the effect of bathing on labor pain and related outcomes. They conclude that it is a “safe, popular, and promising method of temporary pain relief in labor.” Their analysis provides important insights about such matters as water temperature, timing of entry, water depth, duration of immersion, and physiologic effects. This discussion and the authors’ proposed guidelines for baths during labor will be of particular interest to staff in facilities offering such baths, childbirth educators, doulas, women themselves, and investigators planning research in this area.

Because movement and positioning may be safe and simple ways to enhance comfort during labor, Simkin and O’Hara⁴² review 14 trials that investigate this question. Unfortunately, problems with the studies make interpretation difficult. For example, study protocols directing women to move in specific ways beginning at specific points for a specific length of time had high

rates of noncompliance. The authors conclude that predominant use of upright positions during the first stage of labor and squatting during the second stage may speed labor and increase mothers' comfort levels. They underscore the need for trials that compare a policy of women's freedom of movement with one of restriction to a labor bed.

Despite an extensive search, Simkin and O'Hara⁴² identified just one controlled study of the effects of touch and one of massage on outcomes related to labor pain. Although these studies do not enable a clear conclusion, they suggest that reassuring touch and massage during labor "may relieve pain, reduce anxiety, and enhance labor progress, with no identified risks."

A large proportion of women have low-back pain during labor, both with and without fetal occiput posterior position.²⁰ Simkin and O'Hara⁴² review 4 RCTs that assess the effects of intradermal water blocks for relief of back pain in labor. These well-designed studies are consistent in demonstrating "a significant reduction in back pain during labor from [four sterile water] injections into the skin overlying the sacrum, but maternal satisfaction with this method varies."

The authors⁴² end this wide-ranging review with a summary of priorities for research and recommendations to help hospitals and caregivers make these methods more widely available. On the basis of their review, they propose a simple but far-reaching pain management protocol that combines nonpharmacologic methods with pharmacologic relief, as desired and appropriate, and offers a woman "safe and effective choices that allow for flexibility, individual attention, adequate pain relief, and consideration of her psychosocial needs."

"Pain and Women's Satisfaction with the Experience of Childbirth: A Systematic Review." To develop a better understanding of the perspectives of women themselves, Ellen D. Hodnett prepared a systematic review that examined factors contributing to women's overall satisfaction with the childbirth experience, and the role of pain and pain relief in this satisfaction. Dr Hodnett, an editor of the Cochrane Collaboration's Pregnancy and Childbirth Group, is the author of a series of systematic reviews and primary studies examining effects of different maternity care arrangements on women and infants. Dr Hodnett's resulting review in this issue is an important contribution in both the present pain-related context and with respect to the more general question of satisfaction in childbirth.²⁸

Dr Hodnett reviews an extensive body of research. By using established criteria for inclusion, her review is based on 6 systematic reviews, 27 RCTs, and 29 observational studies of childbirth. Collectively, these studies describe the experience of more than 45,000 women.

Dr Hodnett concludes that 4 factors are remarkably consistent in their association with childbirth satisfaction:

1. The amount of support a woman receives from caregivers
2. The quality of her relationship with her caregivers (eg, good communication, rapport, and information; comfort expressing feelings)
3. Her involvement with decision-making
4. Her personal expectations (higher satisfaction is associated with both a childbirth experience that exceeds expectations and having high expectations; lower satisfaction is associated with having and realizing low expectations).

The following factors appear to be considerably less important: age, socioeconomic status, ethnicity, childbirth preparation, the physical birth environment, mobility, medical interventions, continuity of care, and pain.

With respect to the role of pain and pain relief, Dr Hodnett writes:

Caregivers frequently assume that optimum pain relief during labor and birth is very important to most laboring women, and that those who say they wish to avoid pharmacologic pain relief measures are either martyrs or misinformed. However, the results concerning the impact of pain and pain relief on childbirth satisfaction were consistent across a wide variety of circumstances — when epidural analgesia was common or rare, across a wide variety of study designs and methods, in a variety of countries, over almost 30 years. Pain and pain relief do not generally play major roles in satisfaction with the childbirth experience, unless expectations regarding either are unmet.

Although pain and pain relief appear to have a rather small effect on women's overall satisfaction with childbirth, much care during labor and birth is related to pain. Offering pain-related care consistent with the 4 preeminent factors noted previously (eg, providing good information and involving women in decision-making about pain relief) may be highly related to satisfaction.

Dr Hodnett's review has major implications for health care managers and policymakers. "Females with delivery" is the most common discharge on the US National Hospital Discharge Survey, involving nearly 4 million hospitalizations in the United States every year.⁴⁴ To attract women, some hospitals have offered incentives (eg, champagne dinners) and have focused on cosmetic physical modifications (eg, wallpaper). Facilities and caregivers can use Dr Hodnett's research to ensure and publicize the availability of services that are most appreciated by women.

This review also offers important information to women who are selecting maternity caregivers and birth settings. It is important that women understand that the best available evidence suggests that their satisfaction with this important life event will be enhanced by arranging for care that involves the 4 preeminent factors identified in the review. This consideration is especially

important in light of evidence suggesting that vivid and largely accurate memories of the childbirth experience endure through women's lives.^{45, 46}

Dr Hodnett's review also addresses key methodologic issues relating to childbirth satisfaction, including tools for measuring it and methods used to develop and carry out this research. It also provides guidance to help investigators evaluating methods of pain relief include a measure of satisfaction with the overall childbirth experience into their research.

“Labor Pain Management in the United States: Understanding Patterns and the Issue of Choice.” Theodore R. Marmor, a senior scholar of health policy, management, and politics, was invited to examine questions concerning related health system and policy issues. To what extent are specific methods of labor pain relief available and used in the United States? Why are some methods widely available and used, whereas others are much less available and used? How do caregivers, women, health care delivery systems, and costs affect these patterns? Dr Marmor collaborated with co-author David M. Krol to prepare the final paper in this issue.⁴⁷ Systematic review methods were not appropriate for these questions and the data available to answer them.

The authors did not find any national data about the degree to which specific methods of labor pain relief are available in the United States that are comparable with detailed surveys conducted in Canada and the United Kingdom.^{33, 34} A national survey to ascertain rates of the use of selected pharmacologic methods in US hospitals was first conducted in 1981 and repeated in 1992 and 1997. The survey examined parenteral, paracervical, spinal, epidural, and combined spinal/epidural methods, but did not address nonpharmacologic measures and other pharmacologic measures. Marmor and Krol⁴⁷ combine results from the 3 surveys and comment on trends. During this period, the use of epidural analgesia sharply increased. Hospitals with more births per year have higher epidural rates than hospitals with fewer births per year. Opioid use was also high, with trends differing according to size of the service. Rates of women who did not use pain medications declined during this period.

The authors⁴⁷ conclude that the range of choice available to women in the United States is restricted relative to many other western industrial nations. They found no data sources describing the preferences of women in the United States for one or another method of labor pain relief and factors contributing to their preferences.

Marmor and Krol⁴⁷ argue that the following factors shape the availability and use of methods of labor pain relief in the United States: philosophy and professional training of caregivers, practice settings, staffing constraints, economic rewards, and inclinations to avoid pain. This discussion is largely based upon general knowledge of the US health care system and of factors that have

repeatedly been shown to influence the provision of care more generally and in other clinical areas, because few empiric studies of care relating to labor pain are available to address these matters.

A health policy and politics perspective suggests that these inferences are highly likely to apply to the field at hand. Nonetheless, rigorous, specific studies are needed to answer these important questions with greater clarity and confidence, and to address specific questions of access and choice relating to labor pain, childbearing women, and maternity care in the United States.

Implications for practice

The Nature and Management of Labor Pain project has used an open and systematic process to identify and assess the best available research to answer leading questions facing professionals and childbearing women. Until they are superseded by new and updated reviews of equivalent or greater rigor, these are arguably the best available answers to the specific questions addressed.

The Steering Committee believes that the major conclusions from these papers should inform pain-related decision making by clinicians, educators, administrators, and policymakers in the fields with responsibility for childbearing women and their newborns. Colleagues in various fields are actively involved in presenting results and examining implications for their specialty or discipline. We encourage action/implementation projects on the basis of this material. The Maternity Center Association has an ongoing program commitment to this area and welcomes the opportunity to support or collaborate with such efforts.

These papers should also be used to develop clear and full information for women about labor pain and about the advantages and disadvantages of a variety of methods for labor pain relief. This material should be available during pregnancy to enable women to become familiar with issues and options, to have their questions answered, and to seek care arrangements according to their needs and preferences. They should have access to this information again during labor as a part of an open and respectful informed consent process oriented toward women rather than toward professional liability concerns. The Maternity Center Association has a section on its *Maternity Wise* website⁴⁸ that relies upon results of *The Nature and Management of Labor Pain* project to help women make informed decisions about labor pain relief.

Implications for research

As is clear from the accompanying papers, this identification and summary of the best available research clarifies that many critical gaps in knowledge remain. Space limitations preclude an in-depth discussion here, and readers are referred to the papers themselves. The committee would, however, like to identify one important research gap that is evident across all of the methods

papers. By and large, the comparison groups in available studies of the effects of pain relief methods reflect needs and interests of physicians and other caregivers rather than those of laboring women. Many studies compare one or another dosage, mode of administration, or agent within the same class or drugs. With the exception of a series of trials that compare epidural analgesia with opioids, few comparisons are available to help inform women about the choices and options that they face. It would be very helpful for women to understand the advantages and disadvantages of epidural or opioid analgesia relative to such options as nitrous oxide, labor support, and other nonpharmacologic methods.

We also note that some national survey data relating to labor pain and its relief that have not previously been available will become available later in 2002. In collaboration with the Johnson & Johnson Pediatric Institute, the Maternity Center Association is conducting *Listening to Mothers*, the first national US survey of the experiences of childbearing women and their assessments of these experiences. The survey will include a number of pain-related issues, such as population-based information about the use of various pharmacologic and nonpharmacologic methods, women's knowledge and attitudes about various methods, and care and outcomes associated with various methods. Information about survey reports will be available online.⁴⁹

Finally, the Steering Committee recommends the process we have undertaken as a model for rigorously examining other topics within maternity care and other areas of health and medicine. We believe that the field and recipients of care benefit from multidisciplinary perspectives, the evidence-based approach, a concerted and comprehensive examination of an entire field, and a process that engages all stakeholders over time and includes repeated opportunities for feedback, dialogue, and refinement.

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