

Implementation of a Clinical Pathway for Cesarean Section

Scott B. Ransom, DO; James W. Gell, MD; Mathew Harrison; and Franklin D. McDonald, MD

Abstract

We designed and implemented a clinical pathway on our perinatal service for the diagnostic-related group cesarean section with complications. The goal of the pathway was to reduce clinical practice variance and ultimately decrease length of stay and hospital costs. A work group comprised primarily of obstetricians developed a model that described appropriate care for a specific patient case type and produced pathways they believed were scientifically valid and credible. The variances between the ideal expressed by the pathway and what was actually consumed in the care of the average patient were computed in units and dollars. After the clinical pathway was implemented, length of stay decreased significantly (from 6.6 days to 6.0 days), resulting in an annual cost savings of \$240,000. Thus, implementing a clinical pathway for this perinatal diagnostic-related group reduced clinical practice variance, resulting in decreased length of stay and significant cost savings for the hospital.

(*Am J Man Care* 1996;2:1374-1380)

Hutzel Hospital is an urban teaching institution, which since 1988 has had four principal services: obstetrics and gynecology, pediatrics (neonatology), orthopedic surgery, and ophthalmology. Seventy percent of its revenue is derived from the care of pregnant women, newborns, and women requiring gynecologic care. A fall in the birthrate occurred in early 1992, which disrupted the hospital's revenue stream and led to the hospital administration's recommendation to the Board of Trustees that the accounting firm Ernst and Young be retained to

advise on streamlining hospital operations. Ernst and Young suggested a three-pronged approach. First, bench-marking—comparing the cost per unit of service to similar institutions and indicating where reductions could be made—was begun. Second, the use of clinical pathways as a means of understanding the number of units of service delivered during the course of an admission was recommended. The product of these first two recommendations was predicted to be the cost per admission (cost per unit of service times the number of units of service consumed per admission). Ernst and Young's third recommendation was to install a cost-accounting system, which was referred to as "decision support." When completely implemented, decision support would allow hospital administration to understand and quantify costs and divide them into their components (ie, fixed versus variable, direct versus indirect, marginal, and total).

The Board of Trustees accepted the proposals and charged Administration with implementing the recommendations of Ernst and Young. The trustees had two caveats: quality of care could not be compromised and medical staff members had to be involved in all aspects of the project and lead the clinical pathways project.

The goal of the clinical pathways project at Hutzel Hospital as it related to obstetrics and gynecology was to reduce clinical practice variance for the diagnostic-related group cesarean section with complications (DRG 370) and ultimately decrease length of stay and hospital costs associated with this DRG.

... METHODS ...

In developing the clinical pathway, we reviewed the case mix index of the hospital from the previous year. Diagnostic-related group 370 (cesarean section with complications) was selected because of its relative frequency based on the number of discharges. To develop a clinical pathway for DRG 370, the chairman of the obstetrics and gynecology department appointed a work group comprised of five obstetricians,

From Administration and the Department of Obstetrics and Gynecology, Hutzel Hospital, Wayne State University School of Medicine (S.B.R., J.W.G., and F.D.M.), and Ernst and Young (M.H.), Detroit, MI.

Address correspondence to: Scott B. Ransom, DO, FACOG, FACS, CHE, Division Head-Medical Director, Department of Obstetrics and Gynecology, Henry Ford Health System, Eastern Region, 131 Kercheval, Grosse Pointe Farms, MI 48236

one of whom served as chairman, three nurses, and one senior administration official, who also was a physician.

The work group was committed to providing a detailed description of quality care in the DRG and devising a clearly organized document for use by medical staff. The chart version of each clinical pathway in each area was a pair of small boxed letters (M and U) that were to be checked when an expectation was "met" or "unmet." The chart version is shown in Figure 1.

After the clinical pathway was completed, the charts of 50 randomly selected patients for DRG 370 treated in the previous 6 months were retrieved from the medical records department and analyzed to provide control data. Our intention was to select those ICD-9 codes that represented 50% to 80% of the cases in the DRG. The financial records of each of the selected 50 patients in the DRG also were analyzed. Reports from the finance department related to this DRG were presented in several formats. Each format was organized vertically by natural class of expense—laboratory, blood bank, electrocardiogram, physical and occupational therapy, respiratory therapy, supplies, pharmacy, radiology/ultrasound, and room and board.

Financial data was first organized to show the individual elements of cost by day. The horizontal columns in this format were units expected to be consumed per patient on the day in question according to the clinical pathway, units actually consumed, the unit variance between the two, and the dollar variance between the two or the dollar value of the per-patient unit variance.

The second format for the financial data was an aggregate one that set down the elements of cost during each admission under the natural class of expense, without regard to the day in which the cost was incurred. The column labels across the top were units per patient or event called for by the clinical pathway during the entire admission, units actually consumed per patient, the difference between the two (unit variance per patient), dollar variance per patient, the annual number of cases for the procedure codes for which the pathway was written, the total annual dollar variance for the annualized cases for the procedure code in question (product of the latter two), the annual cases for the entire DRG that contained the procedure code for which the clinical pathway was written, and the total annual dollar variance for the entire DRG (annual cases for the DRG times the dollar variance per patient).

Finally, a summary of financial data was tabulated. The first section of the summary provided data for each day of the admission by natural class of expense.

The labels for the columns across the top were units per patient called for by the clinical pathway, units consumed per patient, unit variance per patient, and dollar variance per patient. The final form of the summary gave the aggregate data for the entire admission in a single panel. The categories on the left were those for the natural classes of expense. The titles across the top were units per patient called for by the clinical pathway, units per patient actually consumed, unit variance per patient, dollar variance per patient, total annualized dollar variance for the procedure code in question, and total and annualized dollar variance for the entire DRG containing the procedure code in question.

The clinical pathway was implemented in January 1993. After implementation, the expenses generated throughout the admission, without regard to day, were analyzed and computed for DRG 370. As each financial analysis was completed, the relevant work group reconvened. The group did a gap analysis to identify the difference between what the pathway called for and what treatments were given. Each group concentrated on items in natural classes of expense based on the size of the dollar variance of each. An action plan for each item outlined how the variance would be reduced and on what timetable.

The detailed gap analysis, action plan, and timetable were shared with the chairman of the obstetrics and gynecology department. After some modification of each action plan, the chairman presented them to department staff members as ideal goals and secured the commitment of the faculty, both full time and volunteer, to the clinical pathway.

... RESULTS ...

Data regarding length of stay for DRG 370 from the hospital information system were fed into a database. The reporting format for this database was continually modified as needed. At regular intervals, progress on length of stay for this DRG was reported in tabular and figure form to the chairman of the obstetrics and gynecology department. The chairman shared these data with department staff members, with the identity of each physician concealed as a code number.

For DRG 370, the slope of the fall in length of stay was +.0027 in the 12 months before and -.0030 in the 12 months after the clinical pathway was introduced (Figure 2). The average length of stay decreased from 6.6 days to 6.0 days, a statistically significant difference ($P < 0.05$).

Savings to the hospital were computed by comparing expenditures in the 12 months before and after

Figure 1. Chart Version of a Clinical Pathway for Cesarean Section with Complications (DRG 370)

	PRENATAL CARE	DAY OF START OF LABOR	DELIVERY DAY	CAESARIAN DELIVERY ROOM
ASSESSMENT	Initial HPE, pelvic, V/S, Ht, Wt Completion of records and documentation Schedule Follow-up q 4 weeks till 26 weeks then q 2 weeks till 36 weeks then q 1 weeks until delivery	Copy of all prenatal records HPE, VS, vaginal exam to determine position, cervical dilatation/effacement Demographic & Psychological profile Review existing records Monitor up to 60 min to evaluate fetal activity & contractions	Completion of nurse form 5003 Maternal & fetal q 15 min 2nd stage: Maternal & fetal q 5 min BP q 1 hr TRP q 4 hr or q 2 hr if ruptured membranes Continue ext fetal monitor or int ausc q 15 min 1st stage or q 5 min - 2nd stage Intrauterine pressure cath if: → unable to assess uterine contractility → or labor abnormally Spinal Scalp electrode if membrane ruptured & difficult interpretation fetal heart pattern	Maternal VS q 5 min by anesthesiologist Pulse oximeter q 5 min Continue fetal monitor
LABORATORY	INITIAL VISIT Type and screen Hgb UA Ind micro HBSAg HIV with consent RPR Pap Smear GC culture Gp B Strep Rubella Sickle Cell sm TB Tine Test	Hgb RPR If no previous lab values then: Urine drug screen Cultures for: Gc Chlamydia Group B Strep Rapid screen test for Group B strep HBSAg CBC Rubella if RHT suspected: Dipstick urine Platelet count SGOT Uric Acid	None	Cord Blood for: Coombs test Blood type pH Serum Creatinine if Gentamicin begun
ULTRASOUND	SUBSEQUENT VISITS 15-20 wk, maternal serum alpha fetoprotein 24-28 wk. Hgb 1 hr post glucose blood sugar RPR 34 wk Group B strep	None To confirm diagnose position To assess Amniotic Fluid Volume To estimate fetal weight Fetal biometry if: - suspected IUGR - macrosomia To localize placenta if: - vaginal bleeding - diagnose placental abruption To confirm fetal heart motion For suspected multiple pregnancies To assess fetal age if not clear All walk-ins	None To confirm Diagnose position To assess Amniotic Fluid Volume To estimate fetal weight Fetal biometry if: - suspected IUGR - macrosomia To localize placenta if: - vaginal bleeding - diagnose placental abruption To confirm fetal heart motion For suspected multiple pregnancies To assess fetal age if not clear All walk-ins	None May be used to identify heartbeat before delivery
CONSULTATION	As indicated by patient status especially social history Nutritionist Social worker WIC Social Services Childbirth education classes MSSP La Leche League (if interested in breast feeding) High Risk Clinics if preterm labor, increased BP genetic abnormality, drug use, diabetes mellitus or chronic medical illness	Social Service Education if problems suspected Notification of Health Care Provider	Anesthesia staff must be available	Anesthesia Pediatrics
DIET	Ad lib Modified based on nutritionist recommendation	NPO with ice chips	NPO with ice chips	NPO
ACTIVITY	Ad lib	Ad lib	During labor may shower During labor may ambulate	Bed rest

	PRENATAL CARE	DAY OF START OF LABOR	DELIVERY DAY	CAESARIAN DELIVERY ROOM
TREATMENT/ MEDICATIONS	Prenatal care Prenatal vitamins Prenatal iron	Labor support and comfort measures 18 gauge angiocath & IV of 1000cc F/L or w/w D-5 if dehydrated non-reassuring fetal heart rate tracing bleeding -liver If prenatal culture + for Group B strep: - Ampicillin 2 Gm IV plus 1 Gm q 4 hr - OR if PCN allergic: erythromycin 0.5 Gm q 6 hr IV Transfer to L & D or LDRP via stretcher or wheelchair	Labor support and comfort measures Pitocin Drip with IVPC for abnormal labor patterns Demerol or M S	Labor support and comfort measures 1-3 L RL or NS 10-20 U Pitocin Foley Cath DeLee suction if meconium Suction bulb Cefotax 2 grams after cord clamped
DISCHARGE PLANNING	Preterm labor precautions Over-the-counter medication use Substance use abuse avoidance Nutrition/diet	Nursing treatment plan	Nursing treatment plan	None
INFANT FEEDING	Parenting Newborn care needs/supplies Community resources Things to take to hospital Hospitalization process/length of stay Postpartum care needs Plans for discharge and transportation of infant car seat Family Planning Infant Feeding	Newborn care needs/supplies Hospitalization process/length of stay Postpartum care needs Plans for discharge and transportation of infant car seat Family Planning	Newborn care needs/supplies Transfer to Cesarean DeliveryRoom Postpartum care needs Plans for discharge and transportation of infant car seat Family Planning	
VARIANCE				

implementation of the clinical pathway. The shorter length of stay and reduction in clinical practice variance resulted in an annual cost savings of \$240,000. Costs were reduced an average of \$1012 per patient after the clinical pathway for DRG 370 was implemented.

... DISCUSSION ...

The methodologies used in clinical pathways were developed in the construction and engineering industries¹ and first introduced to healthcare in the early

... IMPLEMENTATION OF CLINICAL PATHWAY FOR CESAREAN SECTION ...

	RECOVERY ROOM	DELIVERY DAY - POST PARTUM FLOOR	DAY 1 POST DELIVERY POST PARTUM FLOOR	DAY 2 POST DELIVERY POST PARTUM FLOOR
ASSESSMENT	Completion of records and documentation BP & P q 15 min x 4 BP & P q 30 min x 2 Assessment: -fundus -for bleeding Complete labor form	Complete labor form	Vital signs q 8 hr for 24 hr if afebrile	
LABORATORY	None Serum creatinine if not already done and Gentamycin begun	Hgb within 24 hr of delivery Serum creatinine if not already done and Gentamycin begun	If febrile: Blood culture UA with C & S CBC Chest x-ray Serum creatinine if not already done and Gentamycin begun	If febrile: Blood culture UA with C & S CBC Chest x-ray Serum creatinine on 3rd and 6th day if patient on Gentamycin
ULTRASOUND	None	None	None	None
CONSULTATION	None	Social Services Lactation consult if needed Perinatal loss counseling if necessary	None	None
DIET	NPO	Regular	Regular	Regular
ACTIVITY	Bed rest	Ad lib	Ad lib	Ad lib

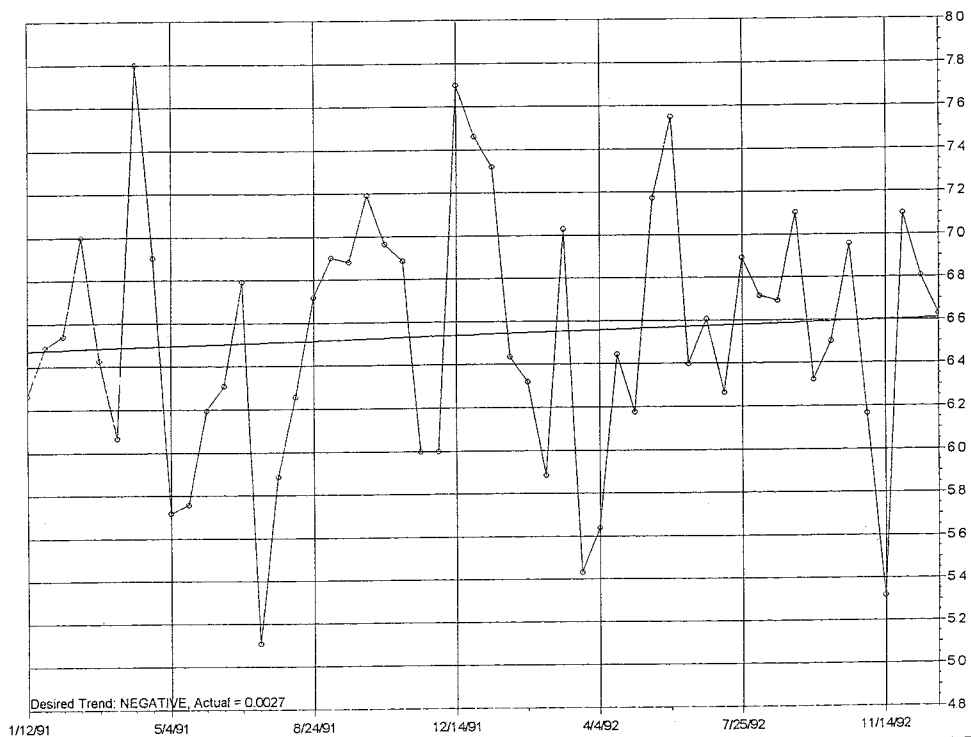
	RECOVERY ROOM	DELIVERY DAY - POST PARTUM FLOOR	DAY 1 POST DELIVERY POST PARTUM FLOOR	DAY 2 POST DELIVERY POST PARTUM FLOOR
TREATMENT/MEDICATIONS	Support and comfort - RL or N/S at 200 cc/hr Foley Cath ET Tube out -when breath spontaneous -and CO2 saturation > 94% Then O2 Mask - 8 to 10 L/Min x 20 and O2 cannula start PCA Assist with bonding with baby Assist with breast feeding Gentamycin 100 mg IV q 8 hr NG tube if ilius	Support and comfort if eating then KVO Remove dressing within 24 hr ---PCA Gentamycin 100 mg IV q 8 hr NG tube if ilius	Support and comfort if eating then KVO Oral pain med ---PCA Gentamycin 100 mg IV q 8 hr NG tube if ilius	Support and comfort if eating then KVO DC IV when IV antibiotics discontinued 125 cc/hr Oral Pain Med If wound suspicious open wound and culture DC PCA on 3rd day as long as indicated continue Gentamycin 100 mg IV q 8 hr NG tube if ilius
DISCHARGE PLANNING	None	None	Circumcision consent done Complete labor form	Complete labor form
INFANT FEEDING				
VARIANCE				

M = met; U = unmet.

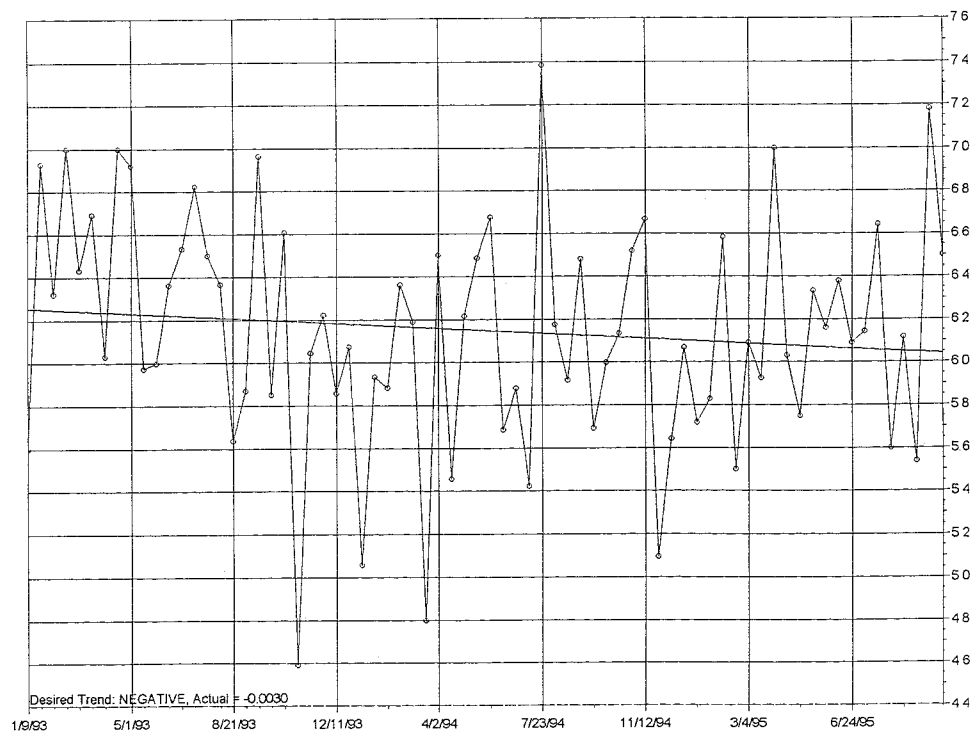
1970s. However, since healthcare institutions at that time were reimbursed on a cost-plus basis, administrators had little incentive for implementing clinical pathways, which would have reduced costs and thereby reduced profits or retained earnings.

In the late 1980s, a nurse was the first to apply clinical pathways to healthcare.² Clinical pathways describe the sequence of events that should occur in delivering care to patients with a specific disease state. Pathways must be multidisciplinary in initiative, de-

Figure 2. Length of Stay Before (a) and After (b) Implementation of a Clinical Pathway for Cesarean Section with Complications (DRG 370)



(a)



(b)

velopment, and implementation. They tend to be organized according to the time the event should take place and who is responsible for accomplishing the event.

Many papers in the healthcare literature regarding clinical pathways appear in nursing, utilization review, quality assurance, and administrative publications. Indeed, most pathways described in the literature were developed by members of one or more of these departments. A review of the literature indicates that those who organized some of these initiatives did so in near isolation from the medical staff.³⁻⁶ Still others involved physicians in minor roles or late in the development or implementation of the pathway.⁷⁻¹⁴ However, several groups did involve medical staff in their clinical pathway project substantively and from the beginning.¹⁵⁻²³ Few, if any, papers describe how to create clinical pathways. Nor are there descriptions of how to keep the medical staff, either collectively or individually, informed about the development and implementation of the pathway, even though follow-up is necessary to modify and improve the pathway.²⁴

We wanted to correct these deficits, as they related to the medical staff, when developing our clinical pathway. We assumed that the more involved obstetricians were in the process, the more likely the project would succeed. We believed success was even more likely if physicians designed, modified, and implemented a follow-up system. We also kept physicians informed by presenting data regarding clinical practice variance, length of stay, and hospital cost savings to the medical staff at regular intervals.

Data on length of stay currently are fed from the hospital information system into a quality assurance database. We continually modify the reporting format in collaboration with our physician administrator and our vendor. The cost accounting (decision support) system, which allows us to understand and control our costs, is still evolving. Although our current system does not allow us to separate procedure codes from DRGs, the decision support system will. This is crucial in obstetrics and gynecology to generate further cost savings and improve the hospital's competitiveness. Equally important is the ability of this new system to identify, separate, and recognize trends in other natural classes of costs incurred in delivering care to patients in a specific DRG and procedure code. These data will be available on a real-time basis plus 45 days.

... CONCLUSION ...

Development and implementation of a clinical pathway can decrease variance in clinical practice and ultimately reduce costs for the hospital. Although clinical pathways often are designed by nursing, administrative, or utilization review staff, their success depends on involvement of medical staff members. Participation by physicians early in the development and implementation process must be encouraged for maximum benefit.

... REFERENCES ...

1. Coffey RJ, Richards JS, Remmert CS, et al. An introduction to clinical paths. *Qual Manag Health Care* 1992;1: 45-54.
2. Zander K. Focusing on patient outcome. Case management in the 90s. *Dimens Crit Care Nurs* 1992;3:127-129.
3. Crummer MB, Coster V. Critical pathways—the pivotal tool. *J Cardiovasc Nurs* 1993;7:30-37.
4. Hampton DC. Implementing a managed care framework through care maps. *J Nurs Adm* 1993;23:21-27.
5. Mosher C, Cronk P, Kidd A, et al. Upgrading practice with critical pathways. *Am J Nurs* 1992;92:41-44.
6. Woodyard LW, Sheetz JE. Critical pathway patient outcomes. *J Nurs Care Qual* 1993;8:51-57.
7. Dowling WJ, Frommer AG, O'Keefe T. Critical pathways in total joint procedures. *Strateg Healthc Excell* 1995;8:9-12.
8. Graybeal KB, Gheen M. Clinical pathway development: The Overlake model. *Nurs Manag* 1993;24:42-45.
9. Hofmann PA. Critical path method. *Jt Comm J Qual Improv* 1993;19:235-246.
10. Lord JT. How we built support for clinical pathways. *Hosp Health Netw* 1994;68:20-21.
11. Lumsdon K, Hagland M. Mapping care. *Hosp Health Netw* 1993;67:34-40.
12. Meidig JR, Megel ME, Koehler KM. The critical path. *Neonatal Netw* 1992;11:45-51.
13. Metcalf EM. The orthopaedic critical path. *Orthop Nurs* 1991;10:25-31.
14. Schriefer J. The synergy of pathways and algorithms. *Joint Comm J Qual Improv* 1994;20:485-499.
15. Brandt M. Clinical practice guidelines and critical paths—roadmaps to quality, cost-effective care: Part 1. *J AHIMA* 1994;65:51-54.
16. Brandt M. Clinical practice guidelines and critical paths—roadmaps to quality, cost-effective care: Part II. *J AHIMA* 1994;65:54-57.
17. Cook JC. Clinical pathways improve organizational performance. *QRC Advis* 1994;10:4-6.
18. Goode CJ, Biegen MA. Developing a caremap for patients with a cesarean birth: A multidisciplinary process. *J Perinat Neonatal Nurs* 1992;7:40-49.
19. Grimshaw J, Freemantle N, Wallace S, et al. Developing and implementing clinical practice guidelines. *Qual Health Care* 1995;4:55-64.
20. Hart R, Musfeldt C. MD-directed critical pathways: It's

time. *Hospitals* 1992;66:56.

21. Healey KM, Loukota SS, Sears TD, et al. Innovation and dedication. *Hosp Health Netw* 1994;68:68-74.

22. Musfeldt C, Hart RI. Physician-directed diagnostic and therapeutic plans: A quality cure for America's health-care crisis. *J Soc Health Syst* 1993;4:80-87.

23. Weber DO. Clinical pathways stretch patient care but shrink costly lengths of stay at Anne Arundel Medical Center in Annapolis, Maryland. *Strateg Healthc Excell* 1992;5:1-9.

24. Lomas J, Anderson GM, Domnick-Pierre K, et al. Do practice guidelines guide practice? *N Engl J Med* 1989; 321:1306-1311.