Original Research & Contributions

27. The Uncertainty Room: Strategies for Managing Uncertainty in a Surgical Waiting Room. Anne M Stone, PhD; John C Lawrence, PhD

The surgical waiting room represents the intersection of several sources of uncertainty that families experience. Staff are responsible for managing family members’ uncertainty related to insufficient information. Practically, this study provided some evidence that staff are expected to help manage the uncertainty that is typical in a surgical waiting room. Findings also illustrate how staff manage the uncertainty of families in the waiting room by communicating support.

28. How Do Emergency Physicians Interpret Prescription Narcotic History When Presenting Patients to the Emergency Department for Pain? Casey A Gove, MD; Gia M Carmel, MD, FAEP, FAFAEM

Pain is a common problem for which patients seek care in the Emergency Department (ED). An anonymous survey of emergency physicians (EPs) using fictitious cases of patients presenting to the ED with back pain, SF EP respondents most suspected drug seeking in patients with greater than 6 prescriptions per month or greater than 6 prescriptions in 2 months. Access to a prescription history would change EPs prescribing practices in all cases, yet interobserver reliability in the assessment of drug seeking was moderate.


29. Anesthesiology Leadership Rounding: Identifying Opportunities for Improvement. Dietrich G Greenstein, MD; Susan Ford, RN; I Fayerbroks, MA

Rounding that includes participation of individuals with authority to implement changes is important to the transformation of an institution into a high-quality and safe organization. The chief of anesthesiology, a quality coordinator, up to four residents, the ward charge nurse, and patient nurses participated in rounds. The introduction of leadership rounding by an anesthesiology service can identify opportunities for improving quality that are not captured by conventional efforts.

Diagnos Pathol Molecular Genetics of the Thyroid: A Comprehensive Guide for Practicing Thyroid Pathology, 2nd edition
Philadelphia, PA: Lippincott, Williams & Wilkins, 2012
Hardcover: 448 pages $225.00

30. Predicting Risk of Death in General Surgery Patients on the Basis of Preoperative Variables Using American College of Surgeons National Surgical Quality Improvement Project Data. Sachin Vaid, MD; Ted Bell, MD; Red Gove, MD; Vasant Shypko, MD

From the American College of Surgeons National Surgical Quality Improvement Project Participant Use Data File (2005 to 2008), a preoperative mortality predictor (PMP) was developed to determine which preoperative variables significantly were associated with death. Of the 296,801 patients analyzed, statistically significant variables predicting death were inpatient status, sepsis, poor functional status, do-not-resuscitate directive, disseminated cancer, age, comorbidities, steal, and weight loss. PMP score is an accurate, simple tool for predicting operative survival or death using only preoperative variables that are readily available at the bedside.

Arch Surg. 2012;147:221-228


It is a common presumption that higher productivity must entail a sacrifice in patient satisfaction or vice versa. For a large multispecialty medical and surgical practice, an observational study found discrepant sets of common characteristics for physicians and staff in four quadrants of high/low productivity and high/low satisfaction. There are many physicians who excel in both high productivity and high satisfaction.

Arch Surg. 2012;147:183-189

Original Research & Contributions

4. Changing Risk of Perioperative Myocardial Infarction. Kenneth D Levene, MD, PhD; Ilan S Rubinfeld, MD, MBA

Years ago, patients with recent myocardial infarction (MI) were reported to be at high risk of reinfarction (2%) and death after surgery using the National Surgical Quality Improvement Program Participant Use Data File for 2005 to 2009 (971,495 patients) authors found that, of patients who had recent MI, 2.1% had reinfarction perioperatively and 26% of those died. Frailty and American Society of Anesthesiology (ASA) class were stronger predictors of perioperative MI than was history of MI.

JAMA 2012;308:2401-2408

5. Reducing the Risk of Deaths in Surgery by Improving Communication About Preoperative Risk Factors. Scott S Leventhal, MD, MSc; Kerri Holbrook, MD; Joseph B Goldenberg, MD

A lack of communication and an inability to voice concerns during surgical rounds were associated with perioperative death. Communication is a key factor in error prevention.

**CASE STUDIES**

54 From Morbid Obesity to a Healthy Weight Using Cognitive-Behavioral Methods: A Woman’s Three-Year Process With One and One-Half Years of Weight Maintenance.

James J Annesi, PhD, FAAHB; Gisèle A Tennant, MSc

Although reduced-energy (kilocalorie) eating and increased exercise will reliably reduce weight, these behaviors have been highly resistant to sustained change. A woman, age 48 years, with morbid obesity initiated exercise through a 6-month exercise-support protocol based on social-cognitive and self-efficacy theory. During the 4.4 years reported, use of self-regulatory skills, self-efficacy, and overall mood significantly predicted both increased exercise and decreased energy intake. Morbid obesity was reduced to a healthy weight within 3.1 years, and maintained through the present (1.3 years later).

61 A Rhinitis Primer for Family Medicine.

Eric Macy, MD, MS, FAAAAI

There are four, often overlapping, syndromes or conditions that account for most of what patients perceive as “nose problems” or rhinitis: irritant rhinitis, the anterior nasal valve effect, migraine with vasomotor symptoms, and allergic rhinitis. Failure to consider all of the causes for the symptoms will result in poor clinical outcomes. The work-up and management of these common conditions is discussed in this article.

**NARRATIVE MEDICINE**

75 A Model for Humanization in Critical Care.

Adriano Machado Faciolli, PhD; Fábio Ferreira Amorim, MD, PhD; Karlo Jozeto Quadros de Almeida, MD

Implementing narrative medicine to assist a patient with amyotrophic lateral sclerosis, dependent on mechanical ventilation and prolonged hospitalization, led to the development of more effective communication that strengthened the therapeutic relationship, enhanced humane care practices, and resulted in greater physical and psychological comfort for the patient. The patient is viewed, not merely as a case to diagnose, but as a person with a story that evokes emotions in those who assist him or her.

**EDITORIAL**

67 From Medical Records to Clinical Science.

Mikel Aickin, PhD; Charles Elder, MD, MPH, FACP

Medical records contain an abundance of information. Increasing the information flow from medical records to clinical practice requires methods of analysis appropriate for large nonintervention studies. This article explains in nontechnical language what these methods are, how they differ from conventional statistical analyses, and why the latter are generally inappropriate: they use incorrect methods or misuse correct methods. A set of guidelines is suggested for use in nonintervention clinical research.
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http://leaflet.thepermanentepress.org

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Changing Risk of Perioperative Myocardial Infarction

Kenneth D Larsen, MD, PhD; Ilan S Rubinfeld, MD, MBA

Abstract

Introduction: Years ago, patients with recent myocardial infarction (MI) were reported to be at high risk of reinfarction (27%) and death after surgery. Therapy has changed in the 3 decades since those reports, so we reexamined that risk as well as other cardiac comorbidities and surgical work values in predicting adverse outcome.

Methods: We used the National Surgical Quality Improvement Program Participant Use Data File for 2005 to 2009. We included all patients of all included specialties, for outpatient and inpatient surgery. Cardiac comorbidities included history of congestive heart failure (30 days) or MI (6 months), percutaneous coronary intervention, previous cardiac surgery, and history of angina (30 days). Other predictors included a frailty index and American Society of Anesthesiologists (ASA) class. Adverse cardiac events included cardiac arrest requiring cardiopulmonary resuscitation, MI, and death. Cases were stratified according to surgical work units. Univariate χ² analysis and multivariate logistic regression established simple relationships and interactions, with p < 0.05 significant.

Results: Of patients who had recent MI, 2.1% had reinfarction perioperatively and 26% of those died. The odds ratio for infarction with vs without recent MI in inpatients age 40 years and older was 4.6. Frailty and ASA class were stronger predictors of perioperative MI and cardiac arrest than was history of MI, and risk increased as surgical work increased.

Discussion: The risk caused by preoperative MI has improved by an order of magnitude in the last 30 years. The ASA class and especially frailty are better predictors of adverse cardiac events. Because of perioperative MI at about 50%, as reviewed by Mangan,

Introduction

Half of perioperative mortality is said to be because of major adverse cardiac events. Numerous efforts have been made to identify who is at risk and to what degree. For example, Goldman et al prospectively studied 1001 patients older than age 40 years who were undergoing noncardiac surgery. Of those who had a myocardial infarction (MI) in the 6 months preceding surgery, 27.3% had a perioperative MI or cardiac death. Of those patients who had an MI more than 6 months before surgery or had no previous MI (there was no difference in outcome for the 2 groups), 2.8% had a perioperative MI or cardiac death.

Numerous studies from the 1960s through the 1980s found similar risk of preexisting cardiac disease, with mortality because of perioperative MI at about 50%, as reviewed by Mangan.7 On the basis of this risk, anesthesiologists recommended against all but urgent surgery until 6 months elapsed after an MI. Some studies in the 1980s, however, found less risk of previous MI. For example, Rao et al5 found that of 195 patients with previous infarct, 10 (5.1%) had perioperative MI. However, they monitored most of their patients (except minor surgery lasting less than 30 minutes) with an arterial line and pulmonary artery catheter and aggressively treated them in the intensive care unit for several days postoperatively, an expensive therapy that is not a standard of care and has not been duplicated in subsequent research.

During the last 30 years, medical therapy has changed, with statins, β-blockers, and aspirin becoming more standard; interventional therapy has advanced with coronary artery stents and coronary artery bypass using the internal mammary artery; anesthetic practice has changed; and surgeons have adopted less invasive approaches. Perioperative MI remains a contributor to perioperative morbidity and mortality, yet we found only one study in recent years examining the risk of previous MI on postoperative mortality.5

As the demographics of the surgical population change, age or single risk factors such as MI alone as acuity adjustors are inadequate. Clinicians are assessing risk in increasingly standardized ways.6-9 For example, a 50-year-old patient with congestive heart failure (CHF) and diabetes with renal failure is more worrisome than an octogenarian still working and living independently. A frailty index is a single score based on a standardized assessment of multiple measures, but the American Society of Anesthesiologists (ASA) class incorporates similar information except in a subjective way. The ASA class is useful because it is simple and widely known, but it suffers from interuser variability.10 Frailty is proving to be a powerful predictor of surgical morbidity and mortality.11

Data from the National Surgical Quality Improvement Program (NSQIP) have been used extensively to evaluate surgical risk and improve outcomes.12,13 NSQIP collects data in a uniform way from more than 250 hospitals around the US and Canada. Trained nurse reviewers submit all of the data, and sites are reviewed to ensure interrater reliability. A validated sampling method is used to collect data on a broad variety of cases, and outcomes are tracked for 30 days. It represents a highly reliable dataset that allows us to reexamine the risk of previous MI on postoperative outcome, to determine whether that risk has changed, and to measure the role of other cardiac comorbidities.
Methods
We developed a dataset using five years of NSQIP Participant Use Data File (2005 to 2009). Variables from the comorbidities that were most consistent with a cardiac history were identified and are listed in Table 1. Adverse events related to the heart were similarly identified (Table 1). Univariate analysis using a $\chi^2$ test was performed with all comorbidities predicting each adverse event. Multivariate logistic regression analysis was performed to account for preoperative conditions that may have affected outcomes, as well as to look for interactions between the cardiac risk variables. Variables known from the NSQIP semiannual reports to be highly predictive of cardiac risk were included in the model. These variables were preoperative albumin level, emergency status of the operation, ASA classification, and wound class.

We also used a simplified frailty index, which was recently developed and described elsewhere, and was modified from the Canadian Study of Health and Aging Frailty Index to use NSQIP data. This index included the following: 1) nonindependent functional status; 2) history of diabetes mellitus; 3) history of either chronic obstructive pulmonary disease or pneumonia; 4) history of CHF; 5) history of MI; 6) history of percutaneous coronary intervention, cardiac surgery, or angina; 7) hypertension requiring the use of medications; 8) peripheral vascular disease or “rest pain”; 9) impaired sensorium; 10) transient ischemic attack or cerebrovascular accident without residual deficit; and 11) cerebrovascular accident with deficit.

Finally, we stratified patients according to surgical work (in relative value units, [RVUs]), divided into groups of fewer than 10, 10 to 20, and more than 20 RVUs, and we examined the incidence of perioperative MI and death.

All statistical analysis was performed using SPSS version 20 (IBM SPSS, Armonk, NY). A p value of <0.05 was considered statistically significant. The study was done with the approval of.

<table>
<thead>
<tr>
<th>Table 1. Comorbidities and adverse events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comorbidities and adverse events</td>
</tr>
<tr>
<td>Comorbidity</td>
</tr>
<tr>
<td>CHF in 30 days before surgery</td>
</tr>
<tr>
<td>History of MI 6 months before surgery</td>
</tr>
<tr>
<td>Previous PCI</td>
</tr>
<tr>
<td>Previous cardiac surgery</td>
</tr>
<tr>
<td>History of angina in one month before surgery</td>
</tr>
<tr>
<td>Adverse event</td>
</tr>
<tr>
<td>MI</td>
</tr>
<tr>
<td>Cardiac arrest requiring CPR</td>
</tr>
<tr>
<td>Death</td>
</tr>
</tbody>
</table>

AICD = automatic implantable cardioverter defibrillator; CHF = congestive heart failure; CPR = cardiopulmonary resuscitation; ECG = electrocardiogram; MI = myocardial infarction; PCI = percutaneous coronary intervention.
Henry Ford Hospital’s institutional review board as well as under the Data Use Agreement of the American College of Surgeons.

Results

The NSQIP study population collected between 2005 and 2009 includes 971,455 patients. The frequencies of comorbidities were as follows: 1% CHF in the previous 30 days, 0.7% recent MI (in the 6 months before surgery), 5.4% previous percutaneous coronary intervention, 5.9% previous major cardiac surgery, and 1% angina in previous 30 days. Adverse events within 30 days after surgery were 0.3% MI, 0.4% cardiac arrest requiring cardiopulmonary resuscitation, and 1.7% death.

To analyze postoperative morbidity, we selected 2 subpopulations: 1) patients aged 40 years and older and 2) inpatients aged 40 years and older. The age distribution of the inpatients aged 40 years and older is illustrated in Figure 1, with inpatients aged 80 years and older in one of the categories. The ASA class of these inpatients was as follows: 3.0% ASA Class 1, 35.6% ASA 2, 49.7% ASA 3, 11.0% ASA 4, and 0.5% ASA 5.

Of 782,240 patients aged 40 years and older, 775,165 had no MI within 6 months before surgery, and 2540 (approximately 0.3%) of those had an MI perioperatively (Table 2). Of the 7075 patients who had recent MI, 148 (2.1%) had perioperative MI. The odds ratio (OR) for perioperative MI given a recent preoperative MI was 6.5 (confidence interval [CI], 5.5-7.7).

For 525,469 inpatients aged 40 years and older, 2462 of 518,819 (0.5%) with no recent MI had perioperative MI, whereas 142 of 6650 (2.1%) with recent MI had perioperative MI (Table 2). The OR of perioperative MI given recent preoperative MI was 4.6 (CI, 3.9-5.4).

In the group of inpatients aged 40 years and older, 2604 had an MI and 674 (25.9%) of them died within 30 days of surgery.

<table>
<thead>
<tr>
<th>Patient population</th>
<th>History of MIa</th>
<th>No history of MIb</th>
<th>Total</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total NSQIP population</td>
<td>149/7198 (2.0)</td>
<td>2665/964,257 (0.3)</td>
<td>2814/971,455 (0.3)</td>
<td>8.2 (6.9-9.7)</td>
</tr>
<tr>
<td>Age ≥40 years</td>
<td>148/7075 (2.1)</td>
<td>2540/775,165 (0.3)</td>
<td>2688/782,240 (0.3)</td>
<td>6.5 (5.5-7.7)</td>
</tr>
<tr>
<td>Inpatients aged ≥40 years</td>
<td>142/6650 (2.1)</td>
<td>2462/518,819 (0.5)</td>
<td>2604/525,469 (0.5)</td>
<td>4.6 (3.9-5.4)</td>
</tr>
</tbody>
</table>

a Patients with MI within six months preceding surgery. Values are the number of perioperative MIs/number in group (percentage).

b Patients with no MI within six months preceding surgery. Values are the number of perioperative MIs/number in group (percentage).

CI = confidence interval; MI = myocardial infarction; NSQIP = National Surgical Quality Improvement Program; OR = odds ratio.

Table 3. Logistic regression of risk factors for cardiac arrest

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>B</th>
<th>SE</th>
<th>Wald χ²a</th>
<th>df</th>
<th>p valueb</th>
<th>Exp(B)</th>
<th>Lower CI for Exp(B)</th>
<th>Upper CI for Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF</td>
<td>0.191</td>
<td>0.060</td>
<td>10.045</td>
<td>1</td>
<td>0.002</td>
<td>1.211</td>
<td>1.076</td>
<td>1.363</td>
</tr>
<tr>
<td>Recent MI</td>
<td>0.036</td>
<td>0.073</td>
<td>0.244</td>
<td>1</td>
<td>0.621</td>
<td>1.037</td>
<td>0.899</td>
<td>1.195</td>
</tr>
<tr>
<td>PCI</td>
<td>−0.067</td>
<td>0.047</td>
<td>2.079</td>
<td>1</td>
<td>0.149</td>
<td>0.935</td>
<td>0.853</td>
<td>1.024</td>
</tr>
<tr>
<td>PCS</td>
<td>−0.025</td>
<td>0.044</td>
<td>0.337</td>
<td>1</td>
<td>0.561</td>
<td>0.975</td>
<td>0.894</td>
<td>1.062</td>
</tr>
<tr>
<td>History of angina</td>
<td>0.189</td>
<td>0.076</td>
<td>6.145</td>
<td>1</td>
<td>0.013</td>
<td>1.208</td>
<td>1.040</td>
<td>1.402</td>
</tr>
<tr>
<td>ASA Class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>−3.127</td>
<td>0.501</td>
<td>38.893</td>
<td>1</td>
<td>0.001</td>
<td>0.044</td>
<td>0.016</td>
<td>0.117</td>
</tr>
<tr>
<td>2</td>
<td>−1.484</td>
<td>0.414</td>
<td>12.856</td>
<td>1</td>
<td>0.001</td>
<td>0.227</td>
<td>0.101</td>
<td>0.510</td>
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<tr>
<td>3</td>
<td>0.205</td>
<td>0.410</td>
<td>0.249</td>
<td>1</td>
<td>0.618</td>
<td>1.227</td>
<td>0.549</td>
<td>2.742</td>
</tr>
<tr>
<td>4</td>
<td>1.253</td>
<td>0.411</td>
<td>9.289</td>
<td>1</td>
<td>0.002</td>
<td>3.499</td>
<td>1.564</td>
<td>7.831</td>
</tr>
<tr>
<td>5</td>
<td>2.013</td>
<td>0.416</td>
<td>23.388</td>
<td>1</td>
<td>0.001</td>
<td>7.486</td>
<td>3.311</td>
<td>16.926</td>
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<tr>
<td>Emergency surgery</td>
<td>−0.703</td>
<td>0.038</td>
<td>346.691</td>
<td>1</td>
<td>0.001</td>
<td>0.495</td>
<td>0.460</td>
<td>0.533</td>
</tr>
<tr>
<td>Frailtyc</td>
<td>3.275</td>
<td>0.138</td>
<td>563.978</td>
<td>1</td>
<td>0.001</td>
<td>26.443</td>
<td>20.180</td>
<td>34.650</td>
</tr>
</tbody>
</table>

a Wald χ² test of the null hypothesis that the coefficient equals zero.

b Statistical significance is p < 0.05.

c See Methods for description of frailty index.

ASA = American Society of Anesthesiologists; B = coefficient for the logistic regression equation for predicting the dependent variable from the independent variable: log (p/1−p) = B₀ + B₁ x X₁ + B₂ x X₂ + B₃ x X₃ + ... + Bₙ x Xₙ where p is the probability of cardiac arrest; CHF = congestive heart failure; CI = confidence interval; df = degrees of freedom for the Wald χ² test; Exp(B) exponentiation of the B coefficient, an odds ratio; MI = myocardial infarction; PCI = percutaneous coronary intervention; PCS = previous cardiac surgery; SE = standard error around the coefficient.
Changing Risk of Perioperative Myocardial Infarction

vs 14,995 (2.9%) who died within 30 days but did not have an MI. The OR of a patient dying whether or not s/he had a perioperative MI was 11.8.

We also did logistic regression analysis of possible risk factors for perioperative cardiac arrest (Table 3) and perioperative MI (Table 4), including recent CHF, recent MI, history of percutaneous coronary intervention, history of previous major cardiac surgery, recent angina, ASA class, emergency surgery, and frailty index. Frailty and ASA class were the strongest predictors of cardiac arrest; the OR—Exp(B)—for frailty was 10.963 and 9.7, respectively. Also, as surgical RVUs increased, the ORs for ASA Classes 3, 4, and 5 were 1.2, 3.5, and 7.5, respectively. For perioperative MI, frailty and ASA class also were the most powerful predictors, with the OR for frailty being 4.7 to 6.5 times greater.

Finally, we examined outcomes (perioperative MI and death) in inpatients aged 40 years or older stratified by surgical complexity (RVUs). As surgical RVUs increased, the incidence of perioperative MI increased in patients with and without a history of recent MI, but the incidence was greater in those with a recent MI (Table 5). Also, as surgical RVUs increased, the incidence of death increased (Table 5). The incidence of death was greater in those with a history of recent MI; however, many deaths were noncardiac. For example, in the highest RVU group there were 73 perioperative MIs and 408 deaths (Table 5) in the patients with recent MI. In the mid- and high-RVU categories, 14% to 16% of patients with recent MI died even though only 1.9% to 2.5% of them had another MI after surgery.

### Discussion

In the decades since the study by Goldman et al., our data show the absolute and relative risk of perioperative MI and death has decreased. The absolute risk of perioperative MI for patients with recent MI has decreased by an order of magnitude from 27.3% to 2.1%.

The risk of perioperative MI for patients with recent MI has improved, but so has the risk for patients without recent MI by an order of magnitude from 2.8% to 0.3%. Our data do not allow us to analyze what accounts for this improvement, but the reason is likely multifactorial.

Goldman et al. did not report an OR, but we calculated this ratio from their data. Of 22 patients with recent preoperative MI, 6 had a perioperative MI or cardiac death, and of 973 without recent preoperative MI, 26 had perioperative MI or cardiac death. The OR, therefore, was 9.7 for risk of perioperative MI or cardiac death given preoperative MI.

The OR of perioperative MI for patients with vs without recent MI has decreased from the 9.7 calculated from the data by Goldman et al. Which population one chooses to compare could be either all patients aged 40 years and older or inpatients aged 40 years and older. Surgical practice has changed so that some patients who would have been inpatients in the 1970s would now be outpatients. Nonetheless, an OR between 4.7 (inpatients only) and 6.5 (inpatients and outpatients) in our data seems an appropriate comparison and is substantially less than 9.7. Not only is the absolute risk improved but also the relative risk for patients with preexisting cardiac disease is reduced by at least one third, if not one half. The risk of perioperative MI for a patient who had a recent preoperative MI has fallen from 9.7 times greater that of a patient who had no recent MI to 4.7 to 6.5 times greater.

### Table 4. Logistic regression of risk factors for perioperative myocardial infarction

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>B</th>
<th>SE</th>
<th>Wald χ²a</th>
<th>df</th>
<th>p valueb</th>
<th>Exp(B)</th>
<th>Lower CI for Exp(B)</th>
<th>Upper CI for Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF</td>
<td>-0.588</td>
<td>0.103</td>
<td>32.531</td>
<td>1</td>
<td>0.002</td>
<td>0.555</td>
<td>0.454</td>
<td>0.680</td>
</tr>
<tr>
<td>Recent MI</td>
<td>0.002</td>
<td>0.098</td>
<td>.000</td>
<td>1</td>
<td>0.984</td>
<td>1.002</td>
<td>0.828</td>
<td>1.213</td>
</tr>
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<td>PCI</td>
<td>0.345</td>
<td>0.052</td>
<td>44.058</td>
<td>1</td>
<td>0.001</td>
<td>1.412</td>
<td>1.275</td>
<td>1.564</td>
</tr>
<tr>
<td>PCS</td>
<td>0.217</td>
<td>0.052</td>
<td>17.139</td>
<td>1</td>
<td>0.001</td>
<td>1.242</td>
<td>1.121</td>
<td>1.376</td>
</tr>
<tr>
<td>History of angina</td>
<td>0.345</td>
<td>0.093</td>
<td>13.834</td>
<td>1</td>
<td>0.001</td>
<td>1.411</td>
<td>1.177</td>
<td>1.693</td>
</tr>
<tr>
<td>ASA Class</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>1</td>
<td>-1.476</td>
<td>1.070</td>
<td>1.904</td>
<td>1</td>
<td>0.01</td>
<td>0.228</td>
<td>0.028</td>
<td>1.860</td>
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<td>2</td>
<td>0.429</td>
<td>1.003</td>
<td>0.183</td>
<td>1</td>
<td>0.168</td>
<td>1.536</td>
<td>0.215</td>
<td>10.963</td>
</tr>
<tr>
<td>3</td>
<td>1.942</td>
<td>1.001</td>
<td>3.765</td>
<td>1</td>
<td>0.052</td>
<td>6.974</td>
<td>0.981</td>
<td>49.594</td>
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<td>4</td>
<td>2.514</td>
<td>1.002</td>
<td>6.299</td>
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<td>0.012</td>
<td>12.353</td>
<td>1.735</td>
<td>87.980</td>
</tr>
<tr>
<td>5</td>
<td>2.702</td>
<td>1.009</td>
<td>7.166</td>
<td>1</td>
<td>0.007</td>
<td>14.906</td>
<td>2.062</td>
<td>107.747</td>
</tr>
<tr>
<td>Emergency surgery</td>
<td>-0.653</td>
<td>0.050</td>
<td>169.492</td>
<td>1</td>
<td>0.001</td>
<td>0.520</td>
<td>0.472</td>
<td>0.574</td>
</tr>
<tr>
<td>Frailtyc</td>
<td>3.732</td>
<td>0.177</td>
<td>444.617</td>
<td>1</td>
<td>0.001</td>
<td>41.757</td>
<td>29.518</td>
<td>59.072</td>
</tr>
</tbody>
</table>

a Wald χ² test of the null hypothesis that the coefficient equals zero.

b Statistical significance is p < 0.05.

c See Methods for description of frailty index.

ASA = American Society of Anesthesiologists; B = coefficient for the logistic regression equation for predicting the dependent variable from the independent variable: \( \log(p/1-p) = B_0 + B_1 \times X_1 + B_2 \times X_2 + ... + B_n \times X_n \) where \( p \) is the probability of cardiac arrest; CHF = congestive heart failure; CI = confidence interval; df = degrees of freedom for the Wald χ² test; Exp(B) = exponentiation of the B coefficient; an odds ratio; MI = myocardial infarction; PCI = percutaneous coronary intervention; PCS = previous cardiac surgery; SE = standard error around the coefficient.
The inhospital mortality for perioperative MI was approximately 50% in the earlier studies. In our data, 30-day mortality after perioperative MI was 25.9%. Although this number is an improvement, it is still high and remains a serious concern. Also, delayed morbidity for this population remains high. Patients surviving an inhospital MI had a 28-fold increase in cardiac complications within 6 months of surgery.7

Recent studies of patients undergoing vascular surgery have also reported mortality from perioperative MI as below 50%, finding 16% to 21% mortality.16-18 Previous coronary artery bypass grafting, even more than a year before vascular surgery, has been reported to reduce the risk of cardiac mortality,16 but McFall et al18 found that bypass grafting did not decrease reinfarction or mortality in major vascular surgery.

We focused on recent MI as a predictor of outcome for historical comparison and found that 2% of patients with recent MI will experience a reinfarction, but others have used known coronary artery disease (CAD) or CAD risk factors as predictors of outcome. Mangano et al19 showed that those with risk factors who were treated with atenolol had a 6-month mortality of 0% whereas those not treated had 8% mortality. At-risk patients of Wallace et al20 had 2% 30-day mortality when treated with atenolol. Badner et al21 found at-risk patients had 5.6% perioperative MI (17% fatal). Lee et al22 reported 2% of at-risk patients had major cardiac events perioperatively. Most impressively, Wallace et al23 illustrated a reduction in 30-day all-cause mortality after surgery from 1% in 1996 to 0.4% in 2008 (vs 1.7% in our total population), whereas 1-year mortality fell from 16% to 4% in their study population, which included at-risk and low-risk patients.

All measures of perioperative morbidity and mortality for patients with a history of MI (preexisting CAD) have improved in the above cited studies compared with those from the 1970s. In addition, cardiac events seem no longer to account for half of perioperative morbidity since our inpatients 40 years of age and older had 2604 perioperative MIs and 15,669 deaths. Nonethe-

less, recent preoperative MI still must be viewed as a serious risk factor.21 An OR greater than 1 signifies elevated risk, and the much-improved risk we report is still considerable and requires continuing diligent care.

The improvement in outcomes we measured is not matched by that observed by Livhits et al,2 who collected data in Califor-

nia between 1999 and 2004. When MI occurred in the 1 month before surgery, they found 33% reinfarction, with nearly half of those patients dying (14% mortality), similar to 1970s outcomes. Our data recorded MI in the 6 months before surgery, but not in 30 day increments so we cannot compare with that finding. At 3 to 6 months after MI, Livhits et al found 6% reinfarction, showing a decrease in risk with time from preoperative MI, although still higher than what we observed.2 Even when we analyzed outcomes by surgical RVU, patients in the highest RVU category with a history of recent MI had a reinfarction rate of only 2.5%. The selected study population of Livhits et al, composed of patients having 5 major operations, seems not the same as ours because 2.9% of their patients had an MI in the year before surgery whereas 1.2% of our inpatients age 40 years and older had an MI in the preceding 6 months, and their patients’ mean age was 69 years whereas that of our group of inpatients aged 40 and older was 63 years. For the purpose of evaluating a change in outcomes compared with older studies, we believe our population of inpatients aged 40 years and older is more suitable. Livhits et al appropriately recommend delaying elective surgery after MI by at least 8 weeks, using temporizing measures if necessary.

Frailty, other indexes, and screening procedures have been proposed as ways to stratify perioperative risk.6,10,12 We found that risk increased as surgical RVUs increased, but patient factors account for operative mortality in all but the most complex cases.23 In our data the multifactorial measures of frailty and ASA class were better predictors of adverse outcome than single factors such as history of MI.

In summary, we examined the risk of previous MI and other risk factors on perioperative cardiac morbidity using the NSQIP

<table>
<thead>
<tr>
<th>Surgical RVU</th>
<th>Recent history</th>
<th>No Periop MI no. (%)</th>
<th>Periop MI no. (%)</th>
<th>OR (95% CI)</th>
<th>No Death no. (%)</th>
<th>Death no. (%)</th>
<th>χ²</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10 (n = 64,119)</td>
<td>MI</td>
<td>63265 (99.8)</td>
<td>149 (0.2)</td>
<td>59.9</td>
<td>7.4</td>
<td>62384 (98.4)</td>
<td>103 (1.6)</td>
<td>248.4</td>
</tr>
<tr>
<td>10-20 (n = 239,234)</td>
<td>MI</td>
<td>323321 (99.6)</td>
<td>871 (0.4)</td>
<td>1760</td>
<td>5.2</td>
<td>230187 (97.5)</td>
<td>6005 (2.5)</td>
<td>1957.0</td>
</tr>
<tr>
<td>&gt;20 (n = 222,116)</td>
<td>MI</td>
<td>217771 (99.3)</td>
<td>1442 (0.7)</td>
<td>1458</td>
<td>3.9</td>
<td>211529 (96.5)</td>
<td>7684 (3.5)</td>
<td>9083.0</td>
</tr>
<tr>
<td>Total (N = 525,469)</td>
<td>MI</td>
<td>516357 (99.5)</td>
<td>2462 (0.5)</td>
<td>3673</td>
<td>4.6</td>
<td>504100 (97.2)</td>
<td>14719 (2.8)</td>
<td>2974.8</td>
</tr>
</tbody>
</table>

- Patient factors account for operative mortality in all but the most complex cases.

- Table 5. Perioperative myocardial infarction and death by relative value units category and history of recent myocardial infarction.

- OR > 1 signifies elevated risk, and the much-improved risk we report is still considerable and requires continuing diligent care.

- Frailty, other indexes, and screening procedures have been proposed as ways to stratify perioperative risk.

- In summary, we examined the risk of previous MI and other risk factors on perioperative cardiac morbidity using the NSQIP.

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- CI = confidence interval; MI = myocardial infarction; OR = odds ratio; Periop = perioperative; RVU = relative value units.
Changing Risk of Perioperative Myocardial Infarction

The author(s) have no conflicts of interest to disclose.

Acknowledgment

Kathleen Louden, ELS, of Louden Health Communications provided editorial assistance.

References

1. Devereaux PJ, Goldman L, Cook DJ, Gilbert K, Guyatt GH. More powerful predictors of adverse outcome. Circulation 1990 Jan;72(1):153-84. DOI: http://dx.doi.org/10.1161/01.CIR.100.10.1043


A Permanent Place in Surgery

Any operation which reduced the mortality of a given injury from 90 to about 63 percent is entitled to a permanent place in surgery, and... every wound of the heart should be operated upon immediately.

— Luther Leonidas Hill, Jr, 1862-1946, pioneering American vascular surgeon who performed the first successful surgical repair on a wounded heart

The Permanente Journal/ Fall 2012/ Volume 16 No. 4 9
ORIGINAL RESEARCH & CONTRIBUTIONS

Predicting Risk of Death in General Surgery Patients on the Basis of Preoperative Variables Using American College of Surgeons National Surgical Quality Improvement Program Data

Sachin Vaid, MD; Ted Bell, MS; Rod Grim, MA; Vanita Ahuja, MD

Abstract

**Objectives:** To use the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) database to develop an accurate and clinically meaningful preoperative mortality predictor (PMP) for general surgery on the basis of objective information easily obtainable at the patient’s bedside and to compare it with the preexisting NSQIP mortality predictor (NMP).

**Methods:** Data were obtained from the ACS NSQIP Participant Use Data File (2005 to 2008) for current procedural terminology codes that included open pancreas surgery and open/laparoscopic colorectal, hernia (ventral, umbilical, or inguinal), and gallbladder surgery. Chi-square analysis was conducted to determine which preoperative variables were significantly associated with death. Logistic regression followed by frequency analysis was conducted to assign weight to these variables. PMP score was calculated by adding the scores for contributing variables and was applied to 2009 data for validation. The accuracy of PMP score was tested with correlation, logistic regression, and receiver operating characteristic analysis.

**Results:** PMP score was based on 16 variables that were statistically reliable in distinguishing between surviving and dead patients (p < 0.05). Statistically significant variables predicting death were inpatient status, sepsis, poor functional status, do-not-resuscitate directive, disseminated cancer, age, comorbidities (cardiac, renal, pulmonary, liver, and coagulopathy), steroid use, and weight loss. The model correctly classified 98.6% of patients as surviving or dead (p < 0.05). Spearman correlation of the NMP and PMP was 86.9%.

**Conclusion:** PMP score is an accurate and simple tool for predicting operative survival or death using only preoperative variables that are readily available at the bedside. This can serve as a performance assessment tool between hospitals and individual surgeons.

Introduction

Accurate estimation of the risk of death can help patients and their physicians to make decisions and to manage expectations; however, surgeons lack an easily accessible preoperative bedside evaluation system to calculate mortality. Various scoring systems to assess perioperative mortality have been reported in the literature, including the Physiologic and Operative Severity Score for the enUmeration [sic] of Mortality and Morbidity,1 Surgical Risk Score,2 Biochemistry and Haematology Outcome Models,3 Acute Physiology and Chronic Health Evaluation,4,5 Cleveland Clinic Foundation Colorectal Cancer Model,6 and the French Association of Surgery’s colorectal scale.7,8 However, these are not easily calculated at the bedside. None of these scoring systems has the ability to predict accurately death or survival solely on the basis of preoperative variables, nor do they account for interhospital variability in outcomes.

The American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) database has been described by the Institute of Medicine as the best in the nation for measuring and for reporting surgical quality and outcomes. It is based on three important quality measurement principles: 1) data are collected and independently entered by specially trained nurse reviewers, thus eliminating the possible bias inherent in traditional surgical databases; 2) all cases are followed up for 30 days, even if the patient is discharged from the hospital, thus increasing the accuracy and thoroughness of reporting; and 3) cases are categorized by current procedural terminology codes, which standardizes analysis and reporting across institutions. NSQIP has developed models that use these data to predict mortality and morbidity across broad categories, such as general and vascular surgery.6

ACS NSQIP assesses surgical quality at more than 200 hospitals in the US by collecting thorough data on preoperative risk factors and postoperative morbidity and mortality.6 Comprehensive computerized procedures and on-site auditing ensure data integrity. NSQIP also has a reliable postdischarge mortality predictor. The NSQIP mortality predictor (NMP)6,9 is calculated from 35 variables related to the patient’s physiologic status, demographic data, medical history, laboratory values, and American Society of Anesthesiologist (ASA) scores. It was designed with stepwise logistic regression. The probabilities from the regression analyses yield a probability (0 to 1) that a patient will experience a mortal event on the basis of the preexisting, or preoperative, conditions. These numbers can be converted to percentages. Therefore, a 0.50 probability can be expressed as a 50% chance of death.

Objectives

The purpose of this study was to use the ACS NSQIP database to develop an accurate, reliable, and clinically meaningful preoperative general surgery model to predict death or survival on the basis...
of information obtainable at the patient’s bedside. NMP, the ACS NSQIP risk predictor, is available in the semiannual report provided to the hospital; however, the up-to-date NMP is not available to the surgeon at the time of patient admission. The preoperative mortality predictor (PMP) we developed in this study is based entirely on objective preoperative variables and is designed to be useful during preoperative counseling and the informed consent process.

Methods

Overview

A model to predict death or survival was developed and tested using data from the ACS NSQIP database for patients who underwent common surgical procedures from January 1, 2005, through December 31, 2009. The project was reviewed and approved by the WellSpan Health Medical/Surgical institutional review board. The study comprised three steps. Step 1 was to create the PMP using data from 2005 through 2008. Step 2 was to apply the PMP to the 2009 data for verification. Step 3 was to compare the PMP with the NMP to determine the accuracy of the new tool.

Patient Selection and Data Collection

For the present study, two datasets (2005 to 2008, 2009) were created from the ACS NSQIP database. The goal was to create the PMP model using the 2005 to 2008 dataset and then to apply it to the 2009 dataset to test its accuracy. We applied the same inclusion criteria to all data. All eligible patients were included.

Inclusion criteria were age 18 years or older, and 1 of 7 common surgeries: open pancreas surgery or open/laparoscopic colorectal, hernia (ventral, umbilical, or inguinal), or gallbladder surgery (Table 1). These 7 categories of surgery were chosen to represent 2 aspects of general surgery: the variety of cases, and their operative complexity. Regarding variety, the procedures we selected comprise a mixture of elective and emergent surgeries, such as perforation and obstruction. They also address the concern raised by Aust et al, that operative complexity must be evaluated to accurately estimate operative mortality.

We included all variables available in the ACS NSQIP database. Some variables were redefined to facilitate analysis. For example, patients were categorized as surviving or dead on the basis of year of death. To assess the effects of comorbidities on mortality, we created summary variables: pulmonary (including ventilator, history of chronic obstructive pulmonary disease, and current pneumonia), liver (including ascites and esophageal varices), renal (including dialysis and renal failure), neurologic (including history of transient ischemic attack and cardiovascular event with or without neurologic deficit), and cardiac (including dyspnea and history of congestive heart failure, myocardial infarction, angina, peripheral artery disease, and hypertension requiring medication) morbidity. Poor functional health status was defined as total assistance required for all daily activities (see Sidebar: National Surgical Quality Improvement Program definition: poor functional health status).

In an exploratory analysis of the entire dataset, only 4 (blood urea nitrogen, white blood cell count, serum glutamic-oxaloacetic transaminase, and partial thromboplastin time) of 13 (30.8%) laboratory variables were statistically significant predictors of death, with an odds ratio (OR) barely greater than 1. The statistically significant OR for albumin was less than 1 (0.350), indicating that death is less likely to occur on the basis of albumin levels. However, for 8 of the 13 (61.5%) laboratory variables, 19% (hematocrit) to 75% (albumin) of data were missing. Instead, we used a variable that has been shown to be an independent predictor of death.

<table>
<thead>
<tr>
<th>Table 1. Current procedural terminology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation</strong></td>
</tr>
<tr>
<td>Open colon/rectal</td>
</tr>
<tr>
<td>Lap colon/rectal</td>
</tr>
<tr>
<td>Open gallbladder</td>
</tr>
<tr>
<td>Lap gallbladder</td>
</tr>
<tr>
<td>Open hernia</td>
</tr>
<tr>
<td>Lap hernia</td>
</tr>
<tr>
<td>Open pancreas</td>
</tr>
</tbody>
</table>

CPT = current procedural terminology; lap = laparoscopic.

National Surgical Quality Improvement Program definition: poor functional health status

Functional Health Status (before surgery): This variable focuses on the patient’s abilities to perform activities of daily living (ADLs) in the 30 days before surgery. ADLs are defined as “the activities usually performed in the course of a normal day in a person’s life.” ADLs include: bathing, feeding, dressing, toileting, and mobility. The corresponding level of self-care for ADLs demonstrated by the patient at the time the patient is being considered as a candidate for surgery are a) levels before the current illness, and b) levels at the time of surgery (no longer than 30 days before surgery). The level of functional health status is defined by the following criteria.

1. Independent: The patient does not require assistance from another person for any ADLs. This includes a person who is able to function independently with prosthetics, equipment, or devices.
2. Partially dependent: The patient requires some assistance from another person for ADLs. This includes a person who uses prosthetics, equipment, or devices but still requires some assistance from another person for ADLs.
3. Totally dependent: The patient requires total assistance for all ADLs.
4. Unknown: If unable to ascertain the functional status before surgery, report as unknown.

All patients with psychiatric illnesses should be evaluated for their ability to perform ADLs with or without assistance on the same basis as the nonschizophrenic patient. For instance, if a patient with schizophrenia is able to care for himself/herself without the assistance of nursing care, s/he is considered independent.

Reference

Predicting Risk of Death in General Surgery Patients on the Basis of Preoperative Variables Using American College of Surgeons National Surgical Quality Improvement Program Data

Table 2. Patient characteristics by year

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>2005–2008, n (%)</th>
<th>2009, n (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>99,632 (49.10)</td>
<td>45,340 (48.20)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Men</td>
<td>103,100 (50.90)</td>
<td>48,715 (51.80)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>151,044 (74.50)</td>
<td>74,012 (78.70)</td>
<td>0.056</td>
</tr>
<tr>
<td>Black</td>
<td>18,497 (9.10)</td>
<td>9037 (9.60)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>33,200 (16.40)</td>
<td>11,011 (11.70)</td>
<td></td>
</tr>
<tr>
<td>Age, years</td>
<td></td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>18-64</td>
<td>138,645 (68.40)</td>
<td>63,467 (67.50)</td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>18,490 (9.10)</td>
<td>9364 (10.00)</td>
<td></td>
</tr>
<tr>
<td>70-79</td>
<td>29,828 (14.70)</td>
<td>13,797 (14.70)</td>
<td></td>
</tr>
<tr>
<td>≥80</td>
<td>15,778 (7.80)</td>
<td>7432 (7.90)</td>
<td></td>
</tr>
<tr>
<td>Inpatient/outpatient</td>
<td></td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Inpatient</td>
<td>111,547 (55.00)</td>
<td>50,088 (53.30)</td>
<td></td>
</tr>
<tr>
<td>Outpatient</td>
<td>91,194 (45.00)</td>
<td>43,972 (46.70)</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>6935 (3.40)</td>
<td>2712 (2.90)</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>53,363 (26.50)</td>
<td>23,006 (24.70)</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>66,891 (33.20)</td>
<td>30,645 (32.90)</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>74,015 (36.80)</td>
<td>36,907 (39.60)</td>
<td></td>
</tr>
<tr>
<td>Current smoker within 1 year</td>
<td></td>
<td>0.853</td>
<td></td>
</tr>
<tr>
<td>Disseminated cancer</td>
<td>40,888 (20.20)</td>
<td>18,942 (20.10)</td>
<td>0.006</td>
</tr>
<tr>
<td>DM with oral agents or insulin</td>
<td>23,704 (11.70)</td>
<td>12,260 (13.00)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DNR</td>
<td>1095 (0.50)</td>
<td>418 (0.40)</td>
<td>0.011</td>
</tr>
<tr>
<td>Functional statusa</td>
<td>9539 (4.70)</td>
<td>4246 (4.50)</td>
<td>0.022</td>
</tr>
<tr>
<td>Pulmonary morbidityb</td>
<td>9588 (4.70)</td>
<td>4675 (5.00)</td>
<td>0.004</td>
</tr>
<tr>
<td>Cardiac morbidityb</td>
<td>91,746 (45.30)</td>
<td>44,309 (47.10)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sepsis</td>
<td>14,501 (7.20)</td>
<td>6127 (6.50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Liver morbidityc</td>
<td>2859 (1.40)</td>
<td>814 (0.90)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Renal morbidityc</td>
<td>2584 (1.30)</td>
<td>1196 (1.30)</td>
<td>0.946</td>
</tr>
<tr>
<td>Weight lossd</td>
<td>5741 (2.80)</td>
<td>2336 (2.50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Neurological morbiditye</td>
<td>9446 (4.70)</td>
<td>4478 (4.80)</td>
<td>0.223</td>
</tr>
<tr>
<td>Steroid use for chronic condition</td>
<td>7075 (3.50)</td>
<td>3006 (3.20)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Bleeding disorders</td>
<td>7909 (3.90)</td>
<td>3502 (3.70)</td>
<td>0.019</td>
</tr>
<tr>
<td>Surgery type</td>
<td></td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Open colon/rectal</td>
<td>31,730 (15.90)</td>
<td>14,180 (15.30)</td>
<td></td>
</tr>
<tr>
<td>Lap colon/rectal</td>
<td>15,773 (7.90)</td>
<td>8390 (9.10)</td>
<td></td>
</tr>
<tr>
<td>Open gallbladder</td>
<td>6751 (3.40)</td>
<td>2670 (2.90)</td>
<td></td>
</tr>
<tr>
<td>Lap gallbladder</td>
<td>58,188 (29.20)</td>
<td>21,833 (23.60)</td>
<td></td>
</tr>
<tr>
<td>Open hernia</td>
<td>71,775 (36.00)</td>
<td>33,400 (36.10)</td>
<td></td>
</tr>
<tr>
<td>Lap hernia</td>
<td>7859 (3.90)</td>
<td>9134 (9.90)</td>
<td></td>
</tr>
<tr>
<td>Open pancreas</td>
<td>7184 (3.60)</td>
<td>3034 (3.30)</td>
<td></td>
</tr>
</tbody>
</table>

2 ventilator dependent, chronic obstructive pulmonary disorder, pneumonia.
3 dyspnea, congestive heart failure, myocardial infarction, revascularization, percutaneous coronary intervention, angina, hypertensive.
4 ascites, esophageal varices.
5 diabetes, renal failure.
6 >10% loss body weight in last 6 months.
7 transient ischemic attack, stroke.
BMI = body mass index; DM = diabetes mellitus; DNR = do not resuscitate; lap = laparoscopic.

and that is easy to determine from medical history: loss of >10% body weight in the last 6 months.14 Weight loss is a predictor of death after intra-abdominal surgery and lung surgery.15,16

The predictive ability of ASA score has been debated since its inception because of its subjective descriptions.17,18 In the exploratory phase of the present study, ASA strongly predicted operative death, and its contribution to the mortality score far outweighed other variables. We excluded ASA from our analysis because we wanted to investigate objective factors on the basis of the history taken by and the physical examination performed by the surgeon. Recently, concerns have been raised that ASA class can be manipulated so it appears that the hospital is caring for sicker patients. ASA may lack precision and poor inter-rater consistency, which can lead to inaccuracy. There is significant interdependence between ASA and other preoperative NSQIP variables that can be used to calculate risk.20

Statistical Analysis and Development of the Score

All analyses were performed using SPSS 19 (IBM, Armonk, New York). To create the PMP model with the 2005 to 2008 data, we selected a set of preoperative variables on the basis of published studies.22,23 We conducted a χ2 analysis to determine which preoperative variables were significantly associated with death.

We analyzed those significant variables with logistic regression, which identified a number of variables with high ORs (β > 1.3, p < 0.001). To construct the scoring system, we performed a frequency analysis of the variables (for deceased patients only) that were significant on logistic regression (p > 0.05). The purpose of the frequency analysis was to determine the frequency of these characteristics among patients who died in hospitals nationwide. The ORs calculated with logistic regression were then weighted according to the frequencies of the corresponding characteristics to arrive at a score for each variable. A 1-point increase in score would indicate a predictable increase in overall mortality. Therefore, each variable’s score was based on 2 factors: 1) its OR and 2) the frequency of the cor-
responding characteristic in patients who died in hospitals nationwide.

We compared the PMP to the NMP using Spearman correlation, a non-parametric test to determine the strength of association between two variables, with scores ranging from -1 (no correlation) through 1 (perfect correlation). Typically, results are presented as percentages; eg, a 0.85 Spearman correlation coefficient means that 85% of the variation in one variable is related to variation in the other. To test the accuracy of the PMP and NMP, three logistic regressions (2005 to 2008 data, 2009 data, and combined data) were run to determine how well the PMP and NMP predicted death. Logistic regression uses both categorical and quantitative

### Table 3. Comparison of patient characteristics by outcome

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>98,334 (49.20)</td>
<td>1298 (48.10)</td>
<td>0.296</td>
<td>44,693 (48.20)</td>
<td>647 (50.80)</td>
<td>0.06</td>
</tr>
<tr>
<td>Men</td>
<td>101,702 (50.80)</td>
<td>1398 (51.90)</td>
<td></td>
<td>48,089 (51.80)</td>
<td>626 (49.20)</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>148,900 (74.40)</td>
<td>2144 (79.50)</td>
<td>&lt;0.001</td>
<td>73,008 (78.70)</td>
<td>1004 (78.90)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Black</td>
<td>18,233 (9.10)</td>
<td>264 (9.80)</td>
<td></td>
<td>8885 (9.60)</td>
<td>152 (11.90)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>32,912 (16.50)</td>
<td>288 (10.70)</td>
<td></td>
<td>10,894 (11.70)</td>
<td>117 (9.20)</td>
<td></td>
</tr>
<tr>
<td>Age, years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-64</td>
<td>137,944 (69.00)</td>
<td>701 (26.00)</td>
<td>&lt;0.001</td>
<td>63,122 (68.00)</td>
<td>345 (27.10)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>65-69</td>
<td>18,181 (9.10)</td>
<td>309 (11.50)</td>
<td></td>
<td>9219 (9.90)</td>
<td>145 (11.40)</td>
<td></td>
</tr>
<tr>
<td>70-79</td>
<td>29,024 (14.50)</td>
<td>804 (29.80)</td>
<td></td>
<td>13,429 (14.50)</td>
<td>368 (28.90)</td>
<td></td>
</tr>
<tr>
<td>≥80</td>
<td>14,896 (7.40)</td>
<td>882 (32.70)</td>
<td></td>
<td>7017 (7.60)</td>
<td>415 (32.60)</td>
<td></td>
</tr>
<tr>
<td>Inpatient/outpatient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inpatient</td>
<td>108,912 (54.40)</td>
<td>2635 (97.70)</td>
<td>&lt;0.001</td>
<td>48,845 (52.60)</td>
<td>1243 (97.60)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Outpatient</td>
<td>91,133 (45.60)</td>
<td>61 (2.30)</td>
<td></td>
<td>43,942 (47.40)</td>
<td>30 (2.40)</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>6664 (3.40)</td>
<td>271 (10.30)</td>
<td>&lt;0.001</td>
<td>2586 (2.80)</td>
<td>126 (10.10)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Normal</td>
<td>52,521 (26.40)</td>
<td>842 (32.00)</td>
<td></td>
<td>22,593 (24.60)</td>
<td>413 (33.20)</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>66,145 (33.30)</td>
<td>746 (28.30)</td>
<td></td>
<td>30,310 (32.90)</td>
<td>335 (27.00)</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>73,240 (36.90)</td>
<td>775 (29.40)</td>
<td></td>
<td>36,538 (39.70)</td>
<td>369 (29.70)</td>
<td></td>
</tr>
<tr>
<td>Current smoker within 1 year</td>
<td>40,374 (20.20)</td>
<td>514 (19.10)</td>
<td>0.151</td>
<td>18,684 (20.10)</td>
<td>258 (20.30)</td>
<td>0.91</td>
</tr>
<tr>
<td>Disseminated cancer</td>
<td>3161 (1.60)</td>
<td>292 (10.80)</td>
<td>&lt;0.001</td>
<td>1335 (1.40)</td>
<td>137 (10.80)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>23,043 (11.50)</td>
<td>661 (24.50)</td>
<td>&lt;0.001</td>
<td>11,923 (12.80)</td>
<td>337 (26.50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DNR</td>
<td>855 (0.40)</td>
<td>210 (7.80)</td>
<td>&lt;0.001</td>
<td>331 (0.40)</td>
<td>87 (6.80)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Functional status</td>
<td>8105 (4.10)</td>
<td>1434 (53.20)</td>
<td>&lt;0.001</td>
<td>3583 (3.90)</td>
<td>663 (52.10)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pulmonary morbidity</td>
<td>8544 (4.30)</td>
<td>1044 (38.70)</td>
<td>&lt;0.001</td>
<td>4186 (4.50)</td>
<td>489 (38.40)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cardiac morbidity</td>
<td>89,518 (44.70)</td>
<td>2228 (82.60)</td>
<td>&lt;0.001</td>
<td>43,260 (46.60)</td>
<td>1049 (82.40)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sepsis</td>
<td>13,060 (6.50)</td>
<td>1441 (53.40)</td>
<td>&lt;0.001</td>
<td>5442 (5.90)</td>
<td>685 (53.80)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Liver morbidity</td>
<td>2416 (1.20)</td>
<td>443 (16.40)</td>
<td>&lt;0.001</td>
<td>673 (0.70)</td>
<td>141 (11.10)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Renal morbidity</td>
<td>2137 (1.10)</td>
<td>447 (16.60)</td>
<td>&lt;0.001</td>
<td>983 (1.10)</td>
<td>213 (16.70)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Weight loss</td>
<td>5404 (2.70)</td>
<td>337 (12.50)</td>
<td>&lt;0.001</td>
<td>2215 (2.40)</td>
<td>121 (9.50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Neurologic morbidity</td>
<td>8974 (4.50)</td>
<td>472 (17.50)</td>
<td>&lt;0.001</td>
<td>4265 (4.60)</td>
<td>213 (16.70)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Steroid</td>
<td>6703 (3.40)</td>
<td>372 (13.80)</td>
<td>&lt;0.001</td>
<td>2803 (3.00)</td>
<td>203 (15.90)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Bleeding disorders</td>
<td>7324 (3.70)</td>
<td>585 (21.70)</td>
<td>&lt;0.001</td>
<td>3221 (3.50)</td>
<td>281 (22.10)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Surgery type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open colon/rectal</td>
<td>30,224 (15.40)</td>
<td>1506 (63.40)</td>
<td>&lt;0.001</td>
<td>13,448 (14.70)</td>
<td>732 (65.90)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lap colon/rectal</td>
<td>15,611 (7.90)</td>
<td>162 (6.80)</td>
<td></td>
<td>8323 (9.10)</td>
<td>67 (6.00)</td>
<td></td>
</tr>
<tr>
<td>Open gallbladder</td>
<td>6573 (3.30)</td>
<td>178 (7.50)</td>
<td></td>
<td>2612 (2.90)</td>
<td>58 (5.20)</td>
<td></td>
</tr>
<tr>
<td>Lap gallbladder</td>
<td>58,040 (29.50)</td>
<td>148 (6.20)</td>
<td></td>
<td>21,777 (23.80)</td>
<td>56 (5.00)</td>
<td></td>
</tr>
<tr>
<td>Open hernia</td>
<td>71,572 (36.40)</td>
<td>203 (8.50)</td>
<td></td>
<td>33,289 (36.40)</td>
<td>111 (10.00)</td>
<td></td>
</tr>
<tr>
<td>Lap hernia</td>
<td>7856 (4.00)</td>
<td>3 (0.10)</td>
<td></td>
<td>9121 (10.00)</td>
<td>13 (1.20)</td>
<td></td>
</tr>
<tr>
<td>Open pancreas</td>
<td>7007 (3.60)</td>
<td>177 (7.40)</td>
<td></td>
<td>2961 (3.20)</td>
<td>73 (6.60)</td>
<td></td>
</tr>
</tbody>
</table>

* > 10% loss body weight in last 6 months.
BMI = body mass index; DNR = do not resuscitate; lap = laparoscopic.
variables to predict a dichotomous variable. The classification number generated indicates how well a group of variables predict another variable. In this study, death was the dichotomous variable being predicted by the quantitative variables of the PMP and NMP.

The PMP was further tested with a receiver operating characteristic curve. Receiver operating characteristic curves are used to test discrimination, or, in the case of this study, the ability of a model to distinguish between dead and surviving patients. This is tested using the area under the curve, which is expressed as a percentage and indicates how well the model discriminates between dead and surviving patients.

Results

The analysis includes 202,741 (68%) patients from the 2005 to 2008 period and 94,060 (32%) patients from 2009. Demographic and clinical patient characteristics were compared by year (Table 2). A χ² analysis of 2005 to 2008 patient characteristics by outcome (death/survival) showed that 18 variables are significantly associated with death (Table 3).

Logistic regression showed that 15 of the 18 variables (including 3 age groups) were strong predictors of death or survival (Table 4). Some of these variables had a stronger association with death than others. For example, 98% of those who died were inpatients, whereas only 11% of those who died had disseminated cancer. The value of the logistic regression coefficient β was then weighted by the frequency of the characteristic to provide a score. Scores were assigned to each variable on the basis of their OR and frequency (Table 5). PMP scores could range from -1 through 30.

Spearman correlation of NMP and PMP scores for the 2005 to 2008 data was 87.5%. Spearman correlation of NMP and PMP for the 2009 data was 85.5%. Spearman correlation of NMP and PMP for all (combined) data was 86.9% (linear relationship) (Figure 1). As NMP scores increase, so do PMP scores. Regression results for 2005 to 2008 data, 2009 data, and all (combined) data indicated that PMP score was statistically reliable (p < 0.05) in distinguishing between dead and surviving patients and correctly classified 98.7%, 98.6%, and 98.6% of cases, respectively.

Receiver operating characteristic curve analysis found that the PMP was 93% accurate at predicting death (Figure 2). As PMP scores increase, so do the mortality rates (Figure 3). For example, <1% of people in the 0-5 score range died, whereas 73% of those in the 20 to 30 range died.

Discussion

Operative mortality can be used to compare quality of care in different health care settings. This information is sought by both the payer and the patient and is also valued by surgeons assessing their outcomes. PMP score accurately predicted death or survival after a common general surgery operation. This information could be used as a standardized indicator to compare observed and expected mortality rates at different hospitals and to assess their performance. Additionally, the PMP could be a useful audit tool for surgeons. Optimal patient care requires a successful interface between the surgeon, operating room staff, nursing staff, and ancillary staff. The success of this interaction reflects the performance of the hospital. The PMP could be used as a reliable measure of quality at the system level, replacing older tools that focused only on patient variables.

Table 4. Characteristics associated with 30-day mortality in 202,741 patients, 2005–2008

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>p</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient</td>
<td>&lt;.001</td>
<td>4.943</td>
<td>3.909-6.249</td>
</tr>
<tr>
<td>Age ≥80 years</td>
<td>&lt;.001</td>
<td>3.884</td>
<td>3.490-4.322</td>
</tr>
<tr>
<td>Liver morbidity</td>
<td>&lt;.001</td>
<td>3.181</td>
<td>2.792-3.626</td>
</tr>
<tr>
<td>Functional status</td>
<td>&lt;.001</td>
<td>3.138</td>
<td>2.869-3.433</td>
</tr>
<tr>
<td>Disseminated cancer</td>
<td>&lt;.001</td>
<td>3.080</td>
<td>2.706-3.507</td>
</tr>
<tr>
<td>Renal morbidity</td>
<td>&lt;.001</td>
<td>2.879</td>
<td>2.523-3.287</td>
</tr>
<tr>
<td>Sepsis</td>
<td>&lt;.001</td>
<td>2.824</td>
<td>2.584-3.086</td>
</tr>
<tr>
<td>Pulmonary morbidity</td>
<td>&lt;.001</td>
<td>2.517</td>
<td>2.301-2.752</td>
</tr>
<tr>
<td>DNR</td>
<td>&lt;.001</td>
<td>2.335</td>
<td>1.966-2.772</td>
</tr>
<tr>
<td>Age 70-79 years</td>
<td>&lt;.001</td>
<td>2.189</td>
<td>1.973-2.429</td>
</tr>
<tr>
<td>Steroid</td>
<td>&lt;.001</td>
<td>1.729</td>
<td>1.534-1.949</td>
</tr>
<tr>
<td>Age 65-69 years</td>
<td>&lt;.001</td>
<td>1.649</td>
<td>1.446-1.880</td>
</tr>
<tr>
<td>Cardiac morbidity</td>
<td>&lt;.001</td>
<td>1.622</td>
<td>1.465-1.796</td>
</tr>
<tr>
<td>Weight loss*</td>
<td>&lt;.001</td>
<td>1.572</td>
<td>1.387-1.782</td>
</tr>
<tr>
<td>Bleeding disorder</td>
<td>&lt;.001</td>
<td>1.465</td>
<td>1.321-1.625</td>
</tr>
<tr>
<td>Open pancreas surgery</td>
<td>&lt;.001</td>
<td>1.396</td>
<td>1.206-1.617</td>
</tr>
<tr>
<td>Obese</td>
<td>0.159</td>
<td>0.931</td>
<td>0.842-1.029</td>
</tr>
</tbody>
</table>

* >10% body weight in the last 6 months. CI = confidence interval; DNR = do not resuscitate; OR = odds ratio.
In our analysis, inpatient status had the greatest contribution to PMP score. The practice of ambulatory surgery is increasing in the US, but inpatient surgery is still required for sicker patients and for more complex operations. Inpatient status exposes patients to hospital-acquired infections, which contributes indirectly to mortality. Five percent to 10% of patients admitted to acute care hospitals in the US will acquire a nosocomial infection. Healthcare-associated bloodstream infections are associated with attributable mortality that makes them the eighth-leading cause of death in the US.24

Our analysis reveals that advanced age independently predicted death or survival. The assigned score for age increased from 1 to 1.5 to 2.5 as patients moved between age groups, from 65-69 to 70-79 to ≥80 years. Several studies have confirmed old age as a risk factor for operative mortality.25-31 Advanced age leads to progressive decline in physiologic reserve and ability to compensate for stress. Elderly patients have both more and more serious medical comorbidities, which may be related to delayed presentation, poor communication, or increased incidence of certain diseases, such as colorectal cancer and diverticulitis. Abdominal pathology in older patients often presents emergently.32,33 Elderly patients are a vulnerable group and need special attention and care. Healthcare professionals may have to alter practices to accommodate their needs, e.g., by minimizing sleep interruptions, altering dosage and type of medicines, or having a geriatrician follow-up with the patient while in the hospital. Improving perioperative practices could be one avenue to lower mortality among geriatric patients. Approximately 403,000 cholecystectomies were performed in the US in 2007.24 The mortality rates associated with these common general surgery procedures are minimal but may escalate if cholecystectomy is performed in elderly patients in emergent settings, as shown by Dolan et al.33 More than 33% of cholecystectomies and 50% of partial colectomies were being performed in patients older than age 65 years. In 2007, those aged at least 65 years accounted for just 13% of the US population but 37% of hospital discharges and 43% of days of care.24

Poor functional status (PFS) and do-not-resuscitate (DNR) directives were independent predictors of mortality.37-40 Patients with PFS and DNR directives are generally sicker, have more comorbidities, are more vulnerable to neglect, and may present later in their disease process, which may result in higher mortality. The decision to operate on patients with PFS and DNR directives should be thoroughly reviewed with a detailed preoperative workup and optimization. A study in the United Kingdom also indicated that patients with DNR directives may require specialized care, and limited access to such care may contribute to higher mortality.41 PFS has been shown to be a strong predictor of postoperative cardiac42 and neurologic43 adverse events.
Patients with renal failure who are on hemodialysis and patients with cirrhosis are known to have higher postoperative mortality rates than their age peers. The present study identified liver and renal failure as independent risk factors that predicted death. Medical comorbidities such as cardiac problems, pulmonary dysfunction, and bleeding disorders also independently predicted death. Preoperative optimization of these conditions may be an avenue for risk reduction.

Sepsis emerged as an independent predictor of death. Patients presenting in sepsis are generally operated on emergently. The mortality rate associated with emergency laparotomies is greater than mortality for elective operations, which has also been reported by McIlroy et al and Pederson et al. The hospitalization rate of those with a principal diagnosis of septicemia or sepsis more than doubled from 2000 to 2008, increasing from 11.6 to 24.0 per 10,000. In-hospital deaths increased from 2% to 17% among patients hospitalized with a diagnosis of sepsis, compared to other diagnoses. For patients younger than age 65 years, 15% who were hospitalized for septicemia or sepsis died in the hospital, compared with 1% of those hospitalized for other conditions. For patients age 65 years and older, 20% of septicemia or sepsis hospitalizations ended in death, compared with 3% for other hospitalizations. Adhering to the Surviving Sepsis Campaign and similar guidelines could potentially decrease mortality.

Steroid use in the preoperative phase was an independent predictor of death. Ismael et al, in their study using 2005 to 2008 NSQIP data, demonstrated that steroid use increased the rate of surgical site infections but also may have increased mortality almost fourfold and hospitals seem unlikely given the diverse array of representation in the current ACS NSQIP. It would be interesting to see if this tool can be successfully used in health care settings outside of the US.

Conclusion
The PMP is an accurate, simple, effective, and clinically meaningful tool to calculate the risk of perioperative death using only preoperative variables. Risk can be easily calculated at the bedside without any laboratory values. The PMP would give physicians the ability to reliably report the risk of death for a wide range of patients undergoing common general surgery procedures, both elective and emergent. It would be helpful in providing accurate information about the risk of death and in obtaining informed consent. In addition to being a useful counseling tool, the PMP could also provide data on the performance of surgeons and hospitals.

Disclosure Statement
The author(s) have no conflicts of interest to disclose.

Acknowledgment
Leslie E Parker, ELS, provided editorial assistance.

References
11. Khuri SF, Daley J, Henderson W, et al. The Department of Veteran's Affairs NSQIP; the first national, validated, outcome-based, risk-adjusted program for the measurement and enhancement of the quality of surgical care.
This photograph was taken during a safari in the Bandhaugarh National Park in Madyha Pradesh, India, using a Sony SLT-A55 camera with G series 70-300 mm lens at 1/200, iso 1600, f5.6 at 300 mm.

Dr Sommers is an Emergency Physician at the West Los Angeles Medical Center in CA.
ORIGIANL RESEARCH & CONTRIBUTIONS

Patient Experience and Physician Productivity: Debunking the Mythical Divide at HealthPartners Clinics

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Abstract

Introduction: Physicians are continually encouraged to be more productive while providing higher levels of patient satisfaction. It is a common presumption that the two goals are somewhat exclusive—that higher productivity must entail a sacrifice in patient satisfaction or vice versa. Moreover, physicians seeking tested, evidence-based approaches to improving satisfaction have had relatively little to go on, and they commonly have justifiable concerns about how ineffective changes may hurt their productivity for no benefit.

Methods: For our large specialty practice, we plotted physicians into quadrants on a scattergram: strong performers on productivity and patient satisfaction, those who are weak in both areas, and those who are strong in one and weak in the other. We performed an observational study to investigate behaviors and work processes associated with a range of performance levels in productivity and patient satisfaction.

Results: The observation yielded clear, discrete sets of common characteristics for physicians and staff in each quadrant. In our organization, these findings have provided practical assistance for physicians performing at any level to assess their own situation and chart a path, on their own or with coaching, that leads to improvement.

Conclusions: The findings help dispel commonly held myths about the exclusivity of productivity and patient satisfaction, suggesting that there are physicians who excel in both areas simultaneously, and there are different characteristics associated with varying levels of performance. The study encourages the further development of evidence-based methods for improving the patient experience while enhancing—not sacrificing—productivity.

Introduction

Clinicians, whether operating their own practice or employed within another, have always been motivated to keep productivity strong. In recent years, however, especially as concepts such as pursuit of the “Triple Aim” of best care, best experience, and lowest cost have been embraced by leading health care organizations, many physicians are facing simultaneous expectations for delivering stronger patient satisfaction and a better patient experience.

Many published studies have examined the links between different aspects of physician behavior and patient satisfaction. Although most physicians would like to improve their productivity and patient satisfaction ratings simultaneously, several interrelated obstacles have often frustrated their attempts to achieve this.

Many physicians, for example, tend to view the balance between productivity and patient satisfaction as something of a zero-sum game: that improvement in one area can occur only at the expense of the other. Physicians with weak satisfaction ratings may believe that strong satisfaction ratings result from having a natural knack for dealing with patients that they do not happen to have. They may believe that patient satisfaction survey instruments are flawed, or that only dissatisfied patients complete them.

In our multispecialty practice, we know that strong productivity and strong patient satisfaction ratings are not necessarily exclusive. We have physicians across many specialties who achieve both, as well as those who achieve neither, despite working with similar patient populations, working conditions and facilities, and staff support.

Recognizing this, in 2008 we began work leading to an observational pilot study conducted in our organization with three purposes. We first wished to identify behaviors and characteristics of high-performance care teams and understand the differences, if they existed, in behaviors and characteristics of physicians with strong productivity and satisfaction ratings and those of physicians with weaker ratings. Second, we wished to develop and validate a set of physician and care team observation tools. Third, we wished to develop an encounter structure detailing best practices for optimal workflow and a care model process to help guide division of tasks among the care team. In doing so, we wished to give clinicians a useful tool for assessing their performance that would also suggest potential best practices for weak-performing clinicians to emulate. Although our organization has made advancements in all of these areas since beginning this work, in this article we will focus on the foundational work behind the first and second goals.

In our organization, as with many health care organizations, physicians face increasingly high expectations for achieving strong patient satisfaction ratings. In our experience, addressing weak patient satisfaction ratings has long been problematic for a number of reasons. These reasons include the physician’s
skepticism or reluctance to change as well as misapprehensions about patient satisfaction and productivity.

**Overcoming Skepticism or Personal Reluctance to Change**

Not surprisingly, most physicians do not welcome the news that their satisfaction ratings are weak when they first hear it. In our experience, they often progress through four similar stages (Table 1): 1) resistance/denial, 2) initial acceptance, 3) initial frustration, and 4) seeking meaningful help. Reflecting on these stages, we identified two obstacles contributing to difficulty in helping move physicians through these stages. First, we found that from the physician’s perspective, consideration of patient satisfaction experience as a stand-alone goal could seem unfair because it did not take productivity and clinical effectiveness—also important measures—into account at the same time. Second, we recognized that physicians, once persuaded that their satisfaction scores could and should be strengthened, had few practical tools available to help them accomplish it, especially those grounded in evidence relevant to their own practice.

### Misapprehensions about Patient Satisfaction and Productivity

Besides skepticism or reluctance to change, another obstacle to improvement in patient satisfaction is the presence of misconceptions. Among physicians, there is a common presumption that strong productivity and strong patient satisfaction are an “either-or” choice. Physicians who accomplish one well may presume that improvements in the other area must come at the cost of the part of their practice that is going well.

If asked to improve patient satisfaction scores, physicians may presume that changes to their workflow would be needed to achieve the improvement. They may presume that they need to see fewer patients, have more time with each patient, have more staff support, or other changes. They may also question the validity of the instruments used to assess patient satisfaction. Table 2 summarizes seven common beliefs drawn from our experience.

Whatever the perceived obstacle may be, these beliefs may reinforce physicians’ resistance to change or their denial that a need or opportunity for improvement exists. Furthermore, without being shown evidence to counter these beliefs, physicians may be unwilling to make changes if they sense a potential risk to productivity.

It should be noted that some of these beliefs are, at times, true. For example, it is true that some physicians are more naturally adept than others at behaviors that promote strong patient satisfaction. We surmised, however, that these beliefs alone are insufficient support for the broad premise that physician productivity and patient satisfaction are exclusive. We simply lacked a way to demonstrate that persuasively to physicians in our practice, and we believed that an approach involving some degree of rigor would be useful. Therefore, we undertook the two-phase study described herein.

### Methods

**Subjects**

Our organization, HealthPartners Inc, operates a comprehensive specialty center in St Paul, MN, in which this research project took place. The project involved clinicians in four specialty departments located in the same complex: Orthopedics, Podiatry/Foot and Ankle Surgery, Gas-

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**Table 1. Typical reaction stages for physicians learning of weak patient-satisfaction ratings**

| Stage 1: Resistance/denial | Some physicians resent receiving instruction about how to communicate with patients or how to enhance patient satisfaction. They can be defensive, offended, or upset, or they may cite opinions about why the ratings shown to them are invalid or inaccurate. They may view patient satisfaction as largely secondary to their primary role of providing excellent care, and they may claim that their strong clinical results or productivity results offset any weakness in their patient-satisfaction ratings. Common comments include “I’m not a salesperson,” “I didn’t go to medical school to please people,” or “I’m providing great care, so why does it matter?” |
| Stage 2: Initial acceptance | The physician begins to concede that s/he could improve satisfaction ratings and becomes open to looking at ways to do so. Common comments include “I want to make my scores better because I’m tired of seeing the bad numbers.” They may resolve, without much specificity, to “try harder,” or “do better.” |
| Stage 3: Initial frustration | It is typical for self-guided attempts at patient satisfaction improvement to fail at first. Given that data reporting can take months or a year to reveal what kind of progress has been made, delays in feedback can further frustrate the physician. Common comments include “I just spent a year trying to improve, but it’s not getting better, and it may be worse. And I don’t even know how to measure it.” |
| Stage 4: Seeking meaningful help | The physician recognizes that s/he can’t realize the desired changes alone and becomes willing to look for best practices, coaching, or guidance from others. Common comments include “I’m looking for answers. Tell me what I need to do to change.” |

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**Table 2. Seven commonly held physician beliefs about patient satisfaction and productivity**

1. “I can achieve strong productivity or strong patient satisfaction—I can’t do both.”
2. “If I had more time to spend with patients, I would have great patient satisfaction.”
3. “Physicians with strong satisfaction are that way naturally—some have ‘it’ and I don’t.”
4. “Patients have unrealistic expectations.”
5. “My practice is different; my patients are different (they are sicker, less compliant with medications, have multiple conditions, etc.).”
6. “The patient satisfaction survey is flawed.”
7. “Only disgruntled patients fill out the survey—most of my patients are happy.”
troenterology, and General and Vascular Surgery. The physicians work in largely similar conditions. They have the same kinds of patients, similar workloads, the same facility and support staff, and so forth.

Observation was conducted of physicians and, to lesser extent, staff. In this report, we focus on physician-related observations and findings, because we recognize them as the strongest drivers of patient satisfaction.

**Phase 1 Methods**

Our first goal was to assess our physicians’ lack of knowledge about the true range of their productivity and satisfaction performance. To explore the baseline productivity-satisfaction equation, we plotted individual measures for physicians from our 4 departments on a scattergram, distributed into performance quadrants for both productivity and patient satisfaction (weak and strong scores for each). The productivity score was based on productivity targets established by the Medical Group Management Association (now MGMA-ACMPE, Englewood, CO), with the 63rd percentile as a nationally recognized goal for financial stability in multispecialty groups. Patient satisfaction scores were based on a sampling derived from the ongoing collection of our organization’s survey data obtained from NRC Picker (Lincoln, NE) and an organizational goal of a “problem score” of no higher than 18%. This score refers to the percentage of patients having a negative response to a handshake and a smile, whether treating physicians their individual place in the scattergram and the places of others in the overall practice, we hoped that physicians would be able to understand clearly where their performance is rated alongside their peers.

**Phase 2 Methods**

Having plotted the baseline performance data, we constructed an observational study to examine characteristics and behaviors of physicians in each of the quadrants. We also designed a standardized observational tool for use during the assessment. A summary of the methods in this phase appears in Table 3.

Step 2 of Table 3 is detailed here. A trained, independent observer observed approximately 24 physicians as a “fly on the wall” during a half-day of patient encounters involving approximately 200 patients. We selected a nonclinically trained observer to allow for focus on behavioral aspects of the visit and to avoid potential distraction of observing care-related events. Using a set of more than 100 internally developed observational criteria, the observer took note of the presence or absence of characteristics and behaviors demonstrated by the physician during the encounter. These behaviors included whether the physician offered a handshake and a smile, whether treatment alternatives were offered, whether medication side effects were explained, and so forth. Behaviors were rated by the observer on a 5-point scale ranging from “Always” to “Never.” The same observer was present at each observation and had no knowledge of which performance quadrant each physician’s baseline productivity-satisfaction rating fell.

The observer noted aspects of workflow details surrounding the visit, such as the preparation of the examination room, the rooming process (nurse calling patients from the waiting area, taking vital signs, clarifying reason for visit, and prepping patients for the exam or procedure), and discharge. Using a separate questionnaire, the observer also interviewed physicians and staff and performed exit interviews with patients about their experience during the visit.

The goal of using an observer was to allow assessment of characteristics and behaviors that are difficult for a physician to assess on his or her own. The observation of workflow behaviors allowed an itemization of which members of the care team were performing specific tasks.

The results of all observations were synthesized and referenced against individual physician productivity-satisfaction scores to identify associations between the noted characteristics or behaviors and the ratings plotted on the productivity-satisfaction scattergram. All physicians and staff in the study were debriefed in one-on-one meetings, during which they were shown their physician productivity scores as well as the sets of behaviors and characteristics common to those achieving stronger scores. This, we hoped, would give the physicians a set of relevant, evidence-based tactical suggestions for what they could do to affect their scores in the desired direction.

**Results**

**Phase 1**

The plotted baseline data (Figure 1) countered the idea that strong productivity and strong patient satisfaction could not be achieved simultaneously. The aggregate distribution (which looked generally similar when plotted by individual departments within the aggregate) suggested that we had roughly equal numbers of physicians in each of the performance quadrants. The quadrants were as follows: physicians achieving strong scores in both categories (upper left quadrant of Figure 1), physicians with strong productivity and

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**Table 3. Observational study: summary of methods**

<table>
<thead>
<tr>
<th>Method</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewed WRVU productivity and patient satisfaction data for 24 physicians from 4 departments (General Surgery, Gastroenterology, Orthopedics, Foot and Ankle Surgery)</td>
<td>24 physicians and 18 clinic staff during patient care (using observation tool)</td>
</tr>
<tr>
<td>Conducted blinded observation of 24 physicians and 18 clinic staff during patient care (using observation tool)</td>
<td>Interviewed physicians and clinic staff about current workflow and attitudes about patient experience (using standard questionnaire)</td>
</tr>
<tr>
<td>Reviewed physician satisfaction comments about the 24 physicians during the same time period</td>
<td>Conducted patient exit interviews</td>
</tr>
<tr>
<td>Provided individual feedback to care teams</td>
<td>Measured impact on patient satisfaction scores and physician productivity (ongoing)</td>
</tr>
</tbody>
</table>

WRVU = work relative value unit
weak patient satisfaction (upper right quadrant), physicians with weak productivity and strong satisfaction (lower left quadrant), and physicians with weak scores in both categories (lower right quadrant). Physicians tended to remain in their given quadrants consistently, over the period of the study and over time, both before the study and in the quarters to follow.

There were essentially no variables that could explain the distribution of the data other than that the physicians and their care teams in the quadrants were doing something differently—that they had different characteristics and behaviors in their workflows and with their patients. This provided a counter for the commonly held beliefs in Table 2. The data, when shared with physicians in our practice, were arresting. The data showed, at a glance, that strong productivity and strong patient satisfaction could be achieved in tandem.

These findings suggested to us that identification of associated behaviors and characteristics for each quadrant could be a valuable step in helping to provide evidence-based context for physicians, their supervisors, and their care teams in the assessment of their own productivity and patient satisfaction ratings. It also suggested that the potential existed for development of meaningful recommendations designed to improve those ratings.

Sample Scenario: Physicians “A” and “B”: In the data set shown in Figure 1 are two physicians whom we will call “Dr A” and “Dr B.” At the time of the ratings, the physicians practiced in the same clinic, and the essentials of their practices were identical; they shared the same building and staff, and handled the same kinds of cases. A patient calling for an appointment would have an equal chance of being seen by either physician.

Drs A and B, however, achieved dramatically different ratings for both productivity and patient satisfaction—the highest and lowest ratings in a single practice subset. In the scattergram (Figure 1), Dr A was plotted in the “strong-strong” quadrant (strong in both productivity and patient satisfaction), whereas Dr B was in the “weak-weak” quadrant (weak in both categories). Shown in Figures 2 and 3 are their baseline individual productivity and patient satisfaction scores, illustrating, for example, that Dr B had 40% less productivity during the 2-year period of 2008 to 2009 than did Dr A.

Phase 2

In the observational study, the cross-referencing of observational data with productivity-satisfaction scores, although based on qualitative assessments, yielded fairly clear and discrete sets of common characteristics for physicians and staff in each of the performance quadrants. Although space prohibits a complete listing of physician characteristics found, common characteristics for strongest and weakest scoring physicians are shown in Tables 4 and 5, respectively. These characteristics incorporate both interpersonal behaviors and administrative or workflow-related aspects of the patient encounter.
Sample sizes used in deriving these characteristics were not large enough to allow statistically significant results, but we did note some interesting qualitative aspects. For example, the “strong-strong” physicians scored “always” in showing characteristics associated with warmth, such as smiling, shaking hands or initiating touch, and using a friendly, familiar greeting, whereas the “weak-weak” physicians scored “mostly” or only “sometimes” in these areas.

Interestingly, “weak-weak” physicians were actually more likely than were “strong-strong” physicians to perform a certain desired behavior: concluding a visit by asking the patient if s/he had any further questions. This may suggest that the ability of the physician to connect with the patient and listen during the visit has a stronger bearing on patient satisfaction than how the physician concludes the visit.

“Dr B”—One Year Later: Although analysis of changes in performance in productivity and patient satisfaction is still ongoing, a sample postintervention result for the weak-scoring “Dr B” referenced earlier is shown in Figure 4. Over the course of two years, we saw Dr B progress through the four stages listed in Table 1. When shown data depicting individual weak performance within the context of the overall practice, Dr B at first felt frustrated and unable to understand what could be done about the weakness of the scores. Ultimately, however, Dr B reached a point of readiness to be counseled on what was needed for improvement. Figure 4 depicts Dr B’s patient satisfaction improvement after being debriefed and presented with suggestions based on the observational study.

**Discussion**

The behaviors and characteristics in each of the performance quadrants were generally what one might have predicted, were one to surmise what drives strong and weak ratings. By associating the behaviors and characteristics with actual performance data, however, we were able to demonstrate a real, relevant, and localized connection between what our physicians were doing and how they were performing.

When shown their individual place in the scattergram, and the places of others

| Table 4. Characteristics of physicians with strong productivity and strong patient satisfaction |
|----------------------------------|----------------------------------|
| Focused on teaching and explanations | Conveys warmth from the start |
| Well-planned flow of visit with focus on patient’s agenda | Controlled script with clear parts |
| Extremely personable—connects with every patient | Always looking for buy-in from the patient that s/he fully understands |
| Recap the history: “I read your chart …” | Confident but not arrogant |
| Finishes dictation and coding each day | Clinic staff enters orders and prepares after-visit summary |

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Figure 3. Patient satisfactiona scores: comparison for Drs “A” and “B,” 2006 to 2009.  
+ Patient satisfaction was measured by the percentage of patients who responded “Yes, definitely” to the survey question “Would you recommend this office to family and friends?” Quarterly scores represent a 12-month rolling average.  
Q = Quarter.

Figure 4. Patient satisfactiona ratings for “Dr B” before and after observation.  
+ Patient satisfaction was measured by the percentage of patients who responded “Yes, definitely” to the survey question “Would you recommend this office to family and friends?” Quarterly scores represent a 12-month rolling average.  
Q = Quarter.
Within the overall practice, physicians were able to see and understand clearly where their performance rated alongside their peers. It also suggested that movement toward the “strong-strong” category was at least theoretically possible. For weaker performers, a common reaction at this point was, “I can’t help it if patients don’t like me. I don’t know what I’m doing wrong. I’m working hard and nothing is getting better. Tell me what I need to do because I don’t want to be that dot.”

We presented the performance improvement for one physician (“Dr B”). Given the limited scope of this study, we obviously cannot present this individual, qualitative finding as a generalizable finding, and we made no such suggestion. We can say, however, that the experience described here was quite representative of others in our practice and that it suggests some interesting directions for further study.

**Implications for Our Organization:** Physicians, even those with a sincere desire to improve patient satisfaction, are often stymied by a lack of meaningful guidelines and best practices for how to achieve it beyond a vague admonition to “do better.” The literature contains many examples of expert opinion on methods for improving patient satisfaction or best practices for constructing patient satisfaction surveys, but scientific studies are far less common. Physicians seeking tested, evidence-based approaches to improving satisfaction have had relatively little to go on, and they have justifiable concerns about how ineffective changes may hurt

| Table 5. Characteristics of physicians with weak productivity and weak patient satisfaction |
|-------------------------------------|---------------------------------|
| Lack of “being there” emotionally |
| Lack of smiling                     |
| Abrupt actions                      |
| Behavior changes when not interested in the “case” |
| Patients kept waiting and wondering |
| No handshake                        |
| Sense of interrogating to get a diagnosis |
| No attempt to match the patient’s energy |

**Provider office visit checklist**

**Positive entrance and introduction**
- Gentle knock before entering the exam room
- Smile
- Give warm/pleasant greeting; use patient’s preferred name and acknowledge others in the room
- Introduce self; acknowledge new patient status
- Shake hands/initiate touch (if culturally appropriate)
- Apologize if the patient has waited for more than 15 minutes
- Sit down and face patient, not computer
- Adopt a posture that is open and inviting
- Establish and use eye contact with patient and companions or caregivers
- Create a personal connection: convey knowledge of patient history, greet follow-up patients like old friends, or use small talk to break the ice
- Maintain a professional appearance (ie, wear closed-toe shoes, clean lab coats)

**Active listening and agenda setting**
- Demonstrate knowledge of patient history or reason for visit
- Ask “How can I help you today?”
- Allow patients to tell their stories without interrupting
- Listen: ask probing questions; respond empathetically; legitimize the patient’s concerns
- Speak in a manner that patients can understand (ie, use nontechnical terms, speak slowly and distinctly for hard-of-hearing patients, summarize when necessary)
- Clarify the patient’s agenda and negotiate what can be accomplished today
- Wait to logon to computer until you’ve greeted the patient and made a connection
- Have the computer screen visible to both you and patient; acknowledge and explain to the patient what you are doing on the computer; ask for permission if you are going to type the history of present illness with the patient present
- Explain what’s going to happen during the visit/procedure
- Never look at your watch during the encounter
- Maintain an efficient but not rushed pace
- Ask permission to take outside phone calls and apologize for any interruptions

**Physical examination/diagnosis/plan**
- Wash or sanitize hands before and after physical exam, in front of patients
- Verbalize what is being examined
- Attend to the patient’s comfort and privacy
- State positive and negative findings; explain what’s happening to the patient’s body and why
- Use models, photos, and diagrams to explain problems and procedures when possible
- Present treatment options to the patient (empower patient to make choices)
- Confirm understanding and agreement with patient; address concerns or frustrations
- Be explicit about good intentions
- Explain side effects of medication
- Elevate your colleagues
- Verbalize your team approach; hand off your plan in front of patients if possible
- Ensure the patient knows what will happen next and whom to contact if s/he has further questions
- Ask “Have we addressed the reason for your visit?” or “Did you get enough information?” or “Is there anything else I can help you with today?” before ending the encounter
- Provide patient instructions and an after-visit summary

**Graceful exit**
- Deliver a reassuring smile
- Shake hands (if culturally appropriate)
- Thank patient for coming and give a warm goodbye
- Invite follow-up business
Patient Experience and Physician Productivity: Debunking the Mythical Divide at HealthPartners Clinics

As individuals, it is difficult to ascertain how others perceive us. The observer’s assessment of posture, facial expression, emotional reactions, and other variables was often eye opening, and many physicians and staff were surprised by what was shared with them afterward.

Conclusions
This pilot study was relatively modest in scope, however, and findings were derived in part from qualitative observation. We make no assertion about the broad applicability of these findings to wide-scale, systemic improvements in practices or care systems. The findings help dispel commonly held myths about the exclusivity of productivity and patient satisfaction, suggesting that 1) there are many physicians who excel in both areas simultaneously, and 2) there are different characteristics associated with varying levels of performance. We do assert, however, that our work has helped our own physicians improve while reinforcing the need for further development of evidence-based methods for improving the patient experience while enhancing—not sacrificing—productivity.

Disclosure Statement
The author(s) have no conflicts of interest to disclose.

Acknowledgment
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References

Figure 5. Experience framework for HealthPartners Medical Group.
According to the artist: “On a lazy sunny afternoon in early Fall while lounging in my backyard reminiscing with my visiting sister, we were suddenly interrupted by a dramatic yet graceful swoosh! Our attention immediately shifted toward the sound of a jay in flight. The jay had swooped down and settled on a fencepost just a few yards from an opened bag of peanuts carelessly strewn on a small poolside table in my neighbor’s yard. After a long, still pause the jay sprang into action darting straight for a lone peanut in clear view. Then with lightening speed, the jay secured its perch atop a towering pine. There in the safety of the clouds, the jay proudly flaunted its golden trophy between its slender beak.”

Dr Davino-Ramaya is a Practice Leader in Evidence-Based Medicine and a Clinical Practice Guidelines’ Methodologist for Quality Management and Systems for Northwest Permanente in Portland, OR.
The Uncertainty Room: Strategies for Managing Uncertainty in a Surgical Waiting Room

Anne M Stone, PhD; John C Lammers, PhD

Abstract

Objective: To describe experiences of uncertainty and management strategies for staff working with families in a hospital waiting room.

Setting: A 288-bed, nonprofit community hospital in a Midwestern city.

Methods: Data were collected during individual, semistructured interviews with 3 volunteers, 3 technical staff members, and 1 circulating nurse (n = 7), and during 40 hours of observation in a surgical waiting room. Interview transcripts were analyzed using constant comparative techniques.

Results: The surgical waiting room represents the intersection of several sources of uncertainty that families experience. Findings also illustrate the ways in which staff manage the uncertainty of families in the waiting room by communicating support.

Conclusions: Staff in surgical waiting rooms are responsible for managing family members’ uncertainty related to insufficient information. Practically, this study provided some evidence that staff are expected to help manage the uncertainty that is typical in a surgical waiting room, further highlighting the important role of communication in improving family members’ experiences.

Hospitals are responsible for providing a great number and variety of services in a competitive environment. Typically these services are tied to medical procedures, which, although routine from the point of view of the hospital, are unfamiliar sources of concern for patients and their families. Moreover, insurance companies and managed care firms rely on patient satisfaction surveys that include items regarding the experiences of family members during the hospital experience to make contact and reimbursement choices. Thus, remaining competitive in the market requires hospital managers to attend not only to patients’ clinical needs but also to the social and emotional needs of patients and their loved ones.

Family members are likely to feel uncertain as they wait for their loved one to come out of surgery, despite attempts to create comfortable waiting spaces. Much research on waiting rooms has focused on physical changes (eg, lowering the volume of the television, having a pot of coffee available, and providing more comfortable chairs). Some studies have highlighted the important role that staff play in supporting family members through a difficult time. Communication scholars in particular have examined experiences of uncertainty in a variety of health contexts and have argued that people often experience uncertainty “when details of situations are ambiguous, complex, and unpredictable” and when “information is unavailable or inconsistent.” Managing uncertainty is a complex challenge that research suggests falls to staff who work in the surgical waiting room. This case study aimed to identify challenges in managing uncertainty, if any, that staff noticed in a surgical waiting room. In addition, we sought to identify the strategies that staff used to manage the challenges they perceived family members experienced in an effort to reveal specific communication behaviors that exist in what we call the uncertainty room.

Methods

Participants

Data were collected during individual, semistructured interviews with the staff of a Midwestern hospital’s surgical services waiting room. Staff included three volunteers, three technical staff, and one circulating nurse. Participants were notified about the study through an e-mail from a hospital director and were recruited by one of the authors (AMS). The volunteers were retired women who volunteered either three times a week or once every other week. Volunteers were responsible for speaking with families in the waiting room and escorting families to the preoperative or postoperative rooms. The technical staff had worked in the waiting room for varied lengths of time, up to nine years. The technical staff were responsible for scheduling, answering phones, and communicating with the operating room and with families. The circulating nurse acted as the liaison between the operating room and the waiting room.

Setting

In advance of our interviews, we observed behavior in surgical waiting rooms for 40 hours for background information. On the basis of visits to several hospitals, the waiting room in our study was fairly typical. The waiting room we observed was designated for nonambulatory patients undergoing a range of invasive procedures, including open heart, gastric bypass, and emergency operations. Other rooms were designated for more routine ambulatory procedures, such as colonoscopies, and yet another room was for families of patients in intensive care. Small seating alcoves made it possible to accommodate with a modicum of privacy about 50 friends

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or family members of patients undergoing procedures. A desk near the door served as the station at which staff could receive and disseminate information about the progress of patients’ treatments. Several small consultation rooms were provided for physicians to meet with family members, but these were never used during our observations. Instead, physicians commonly spoke with friends and family members in the open public area in front of the reception desk. Reading materials and light refreshments were provided. Most people waited patiently, but a quiet sense of concern pervaded the room. It appeared that those who were waiting were monitoring patients’ progress for others: cell phone calls to and from the waiting room were very common, and the most common comments were variations of, “No, she is not out yet, but I will let you know when I hear something.”

**Interview Schedule**

Each participant engaged in one semistructured interview. We asked participants a number of open-ended questions to elicit accounts of everyday experiences in the waiting room. Follow-up questions were used to better understand participants’ responses. The interview protocol contained three main sections. First, participants were asked to generally describe their role in the waiting room. Finally, participants were then asked to think about their experiences of uncertainty related to their role in the surgical waiting room. Participants were asked about the relationships between the waiting room staff and the surgeons. This analysis focuses on staff experiences of uncertainty and the strategies staff developed for managing the uncertainty they perceived family members experienced during their time in the waiting room.

**Procedures and Data Analysis**

This project was approved by institutional review board committees from the University of Illinois and the hospital with which we partnered. I (AMS) approached hospital staff and asked them to participate in one semistructured interview during the workday. Before each session, the purposes of the interview were explained, questions previewed, and participants gave informed, written consent. Interviews ranged from 15 minutes to 30 minutes and were digitally recorded and transcribed verbatim, resulting in 57 pages of transcripts. All personal identifying information was removed from the transcripts, and pseudonyms have been assigned to narratives. As I (AMS) conducted interviews, I labeled key concepts that emerged from the data and used constant comparative analysis to distinguish patterns and themes in the data. This process allowed us to identify a key challenge for surgical waiting room staff as well as strategies that the staff developed to manage this challenge. Next, I (AMS) developed a coding scheme and applied it to the remainder of the interview transcripts. We examined the transcripts to assess the credibility of the coding scheme. The participation of multiple researchers coding the data contributes to the credibility and trustworthiness of our research.10

**Results**

Hospital staff noted that a major challenge to overcome in the surgical waiting room is related to communicating with families. Staff perceived that families in the waiting room do not have sufficient information about their loved one’s surgery, which breeds uncertainty. Staff reported that people waiting for a loved one in the surgical waiting room had questions about the procedure that were often unanswered by the surgeon. Family members rely on the waiting room staff to communicate information that, because of hospital regulations, they cannot disclose. Participants commented that family members and friends often do not understand how long the procedure will take, from preoperative preparation through postoperative recovery. Staff suggested that misunderstandings about the length of the surgery result from communication between surgeons, waiting room staff, and family members, and nurses and volunteers have to contend with the aftermath of confusion and upset in the waiting room. For example, Jean, a volunteer, said, “We usually tell them [the families] the time of the surgery, what’s scheduled” and include the caveat that “it could be less, could be more.” Megan, a circulating nurse, noted that when the surgeon talks about the length of the surgery, the family members assume that they will be able to visit with their loved one after that time has elapsed. “They [the families] don’t understand,” she said, “why they can’t go see their loved one.” Hospital regulations require that surgical patients be moved to a different area of the hospital to recover after the surgery and surgeons often want their patients to come out of anesthesia before their loved ones visit, which means additional wait time. Waiting room staff reported that family members who do not receive this explanation appear to experience a great deal of anxiety about the procedure and why it is “taking so long.”

Staff reported that because family members seem to have insufficient information about their loved one’s operation, staff were tasked with managing the uncertainty family members experienced. Staff were able to meet the challenge of insufficient information by communicating support. Participants described several ways they were able to manage the uncertainty related to insufficient information. The obvious solution was to provide information to fill in the gaps that create uncertainty, but participants described organizational constraints that often impede staff members’ ability to properly meet family members’ perceived needs. The Health Insurance Portability and Accountability Act (HIPAA), for example, provides clear guidelines about what health information staff can disclose and to whom.11

Organizational constraints forced staff in the surgical waiting room to communicate support to manage uncertainty, particularly uncertainty related to insufficient information, in less obvious ways. First, providing a distraction was a way to support family members. Volunteers in particular reported
that their professional identity limits the amount and type of information they can discuss with families. In other words, despite knowing that family members may be nervous about their loved one’s procedure, volunteers avoid medical topics and opt to distract family members. Volunteers like Cindy “talk about things that would cheer them [the family members] up.” Other volunteers described how knowledge of local events (eg, sports) helped spark conversation that served as a distraction for family members.

Reassuring family members through emotional support was another way of managing the uncertainty associated with insufficient information. In moments when emotional support seemed appropriate, staff would reassure the family that the length of time the surgeon mentioned was an estimate, and longer procedures do not necessarily portend bad news. A circulating nurse described how “once in a while you get cases that take a lot longer than anticipated, and of course that really concerns the family. They [the family] think that the worst thing they’ve ever heard of is happening, so you have to keep reassuring them that the patient is fine. It’s just taking the doctor a little bit longer.” Others echoed the importance of reassurance, describing it as “an important part of our job.”

Finally, waiting room staff managed some of the uncertainty family members experienced by providing tangible assistance. Participants like Jean said they provided the families with whatever they needed, including wheelchair service, chaplain service, a place to sleep or a blanket, and someone to walk them to the postoperative floor. Something as simple as taking the time to physically walk someone to the postoperative floor, participants noted, was an important source of support, because it alleviated some uncertainty about where to go to meet the patient and placed that responsibility on the staff.

**Discussion**

Staff reported that families in the waiting room experience uncertainty as a result of insufficient information. Information may be insufficient because it is not provided or because the patient’s family is not able to understand it. Research on uncertainty has clearly demonstrated that there are various ways in which it can be managed; at times it is appropriate to increase uncertainty, and at other times it may be appropriate to reduce uncertainty. This case study highlights an everyday scenario where both increasing and reducing uncertainty may be appropriate. In particular, staff roles as either volunteers or technical staff determine the type of information that they can communicate in the surgical waiting room. Volunteers neither have access to nor are allowed to communicate private patient information with the family, and they have developed communication strategies to manage uncertainty within those constraints. This has been described by other researchers in terms of the “division of labor” in health care settings. One of the ways that volunteers managed family members’ uncertainty was distraction. Other reports have described distraction as a way to “manipulate the uncertainty of others” and cited examples in organizations where it is better to point someone toward the favorable or more positive aspects of a situation than to leave them to dwell on the less positive or worrying aspects. Staff perceived that family members do not have the right amount or type of information to manage their uncertainty as they wait for their loved one to come out of surgery, and consequently they have developed strategies to manage the uncertainty associated with waiting. These communicative strategies suggest that there are ways to improve the experience of family members in surgical waiting rooms. First, hospital managers could develop training modules for staff that describe strategies for managing uncertainty related to family members having what they perceive as insufficient information. With more research into what characterizes effective support messages, managers could highlight communication as an important characteristic of a successful waiting room environment. Second, stress associated with waiting may be mitigated by training staff to help family members acknowledge that they have questions and then use the staff’s expertise. Finally, family members may appreciate advice about how to communicate their experience of uncertainty to family and to friends who are not at the hospital but feel they need information.

This case study also highlights the importance of the family member’s experience, which suggests that information designed specifically for the family is essential to improving the waiting room experience. Developing a pamphlet for family members that addresses some of the concerns they may have about the waiting experience may help facilitate conversations with staff so that concerns are clearly articulated as they come up. This type of empowerment for family members has the potential to eliminate some of the frustrations that come with waiting.

There are several limitations of this research that should be addressed in future projects. First, this study relied on a small group of surgical waiting room staff. A larger sample would bolster the strength of the results and possibly allow other needs and solutions to be identified. Further, interviewing family members to outline their specific challenges and sources of uncertainty would further explicate what “insufficient information” truly means to those waiting. Future research might entail interviews with family members before their loved one is scheduled for surgery to identify any concerns they have about waiting and postoperative follow-ups to ask about their experience. Other research that accounts for the motivations and intentions of surgeons would offer an important perspective. Finally, examining other types of waiting rooms, in both medical and nonmedical settings, as points of comparison with surgical waiting rooms may allow researchers and hospital managers to develop more detailed protocols to better serve patients and families coping with uncertainty.

**Conclusion**

Staff in surgical waiting rooms are responsible for managing family members’ uncertainty related to insufficient information.
Practically, this study provided some evidence that staff are expected to help manage the uncertainty that is typical in a surgical waiting room, further highlighting the important role of communication in improving family members' experiences.

Disclosure Statement
The author(s) have no conflicts of interest to disclose.

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References

Symphony
To live content with small means; to seek elegance rather than luxury, and refinement rather than fashion; to be worthy, not respectable, and wealthy, not rich; to listen to stars and birds, babes and sages, with open heart; to study hard; to think quietly, act frankly, talk gently, await occasions, hurry never; in a word, to let the spiritual, unbidden and unconscious, grow up through the common—this is my symphony.

— William Henry Channing, 1810-1884, American Unitarian clergyman, writer, and philosopher
This painting reflects the day-to-day clinical tools usually taken for granted as a means to an end of patient care. The ebullient style is used to reflect a joyous celebration of medical technology.

Mr. Salahudeen is a Fourth-Year Medical Student at Texas Tech University Health Sciences Center. He has a degree in Neuroscience with a minor in Art Studio from Tulane University.
ORIGINAL RESEARCH & CONTRIBUTIONS

How Do Emergency Physicians Interpret Prescription Narcotic History When Assessing Patients Presenting to the Emergency Department with Pain?

Casey A Grover, MD; Gus M Garmel, MD, FACEP, FAAEM

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Abstract

Context: Narcotics are frequently prescribed in the Emergency Department (ED) and are increasingly abused. Prescription monitoring programs affect prescribing by Emergency Physicians (EPs), yet little is known on how EPs interpret prescription records.

Objective: To assess how EPs interpret prescription narcotic history for patients in the ED with painful conditions.

Design/Main Outcome Measures: We created an anonymous survey of EPs consisting of fictitious cases of patients presenting to the ED with back pain. For each case, we provided a prescription history that varied in the number of narcotic prescriptions, prescribing physicians, and narcotic potency. Respondents rated how likely they thought each patient was drug seeking, and how likely they thought that the prescription history would change their prescribing behavior. We calculated $\kappa$ values to evaluate interobserver reliability of physician assessment of drug-seeking behavior.

Results: We collected 59 responses (response rate = 70%). Respondents most suspected drug seeking in patients with greater than 6 prescriptions per month or greater than 6 prescribing physicians in 2 months. Medication potency did not affect physician interpretation of drug seeking. Respondents reported that access to a prescription history would change their prescribing practice in all cases. $\kappa$ values for assessment of drug seeking demonstrated moderate agreement.

Conclusion: A greater number of prescriptions and a greater number of prescribing physicians in the prescription record increased suspicion for drug seeking. EPs believed that access to prescription history would change their prescribing behavior, yet interobserver reliability in the assessment of drug seeking was moderate.

Introduction

Pain is a common problem for which patients seek care in the Emergency Department (ED), accounting for up to 42% of all visits.\textsuperscript{1,2} As pain control in the ED is often inadequate, increasing emphasis has been placed on pain relief.\textsuperscript{3,4} Narcotic prescribing has increased to the point that the US, constituting 4.6% of the world population, uses 80% of the world’s opiate supply, including 99% of the world’s hydrocodone supply.\textsuperscript{5}

In addition, the use of prescription medications for nonmedical reasons has increased. Approximately 7 million Americans over the age of 12 years use prescription medications for nontherapeutic reasons each year, with nearly 50 million Americans having used prescription drugs recreationally during their lifetime.\textsuperscript{6,7} Prescription drug abuse has become an epidemic in the US, and not without major consequences. Adverse events from the nonmedical use of prescription medication account for more than 700,000 ED visits annually, and deaths due to narcotic overdose have tripled since 1996, with nearly 14,000 opiate-related deaths in 2006.\textsuperscript{8,9} Deaths resulting from prescription opiate medication account for three-fourths of deaths due to all prescription medications.\textsuperscript{10} Patients who present to the ED to obtain medication for nontherapeutic reasons are common, estimated to be as high as 20% of all ED patients.\textsuperscript{11} Most of the literature on “drug-seeking patients” in the ED consists of anecdotal data or small studies, giving Emergency Physicians (EPs) little information on how to identify these individuals.\textsuperscript{12-15}

The increasing prevalence of prescription medication abuse, particularly narcotic abuse, makes it important for EPs to be able to identify patients presenting to the ED seeking medication for nontherapeutic purposes. Numerous scoring systems have been developed to identify patients with narcotic addiction, but they were developed outside the ED and often involve long, complex surveys that are too cumbersome to use in the ED.\textsuperscript{16-22} Prescription monitoring programs have emerged as a means of identifying patients trying to obtain medication for nontherapeutic reasons.\textsuperscript{23-26} The use of prescription monitoring programs in the ED has been shown to affect prescribing behavior,\textsuperscript{27} and in one study such a program changed EP prescribing practice in more than 60% of cases.\textsuperscript{28} Although most states in the US have prescription monitoring programs, little is known about how to clinically interpret the information obtained in prescription records in the ED.

The goals of this investigation were to assess, using a survey instrument, how EPs interpret prescription narcotic history when assessing patients presenting to the ED with pain. We aimed to understand how variations in the number of narcotic prescriptions, number of prescribing physicians, and potency of the narcotic in the prescription history affected how likely EPs perceived a patient as demonstrating drug-seeking behavior. We also sought to assess how useful EPs believed that access to prescription history was in assessing patients in the ED with pain, and how well EPs agreed on whether a patient was drug seeking.

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How Do Emergency Physicians Interpret Prescription Narcotic History When Assessing Patients Presenting to the Emergency Department with Pain?

Methods

Study Design and Setting

This study consisted of an anonymous voluntary online survey at one academic medical center in California. The ED in this suburban area sees approximately 51,000 patients per year. Demographically, 54% of patients are between the ages of 18 and 65 years, and 27% of patients are age 17 years or younger; 48% of patients are white, and 29% of patients are Latino. The survey consisted of 6 fictitious case vignettes, each presenting the same case of a 35-year-old man in the ED with a chief complaint of low back pain. This patient reported that he had a history of a “slipped disk” and routinely took narcotic pain medication but had run out of medication and could not see his regular physician for a few days.

For each of the six cases, a prescription history for the prior two months was provided. Each prescription history contained the following information for each case: date that each prescription was filled, name of the medication, dose of the medication, number of pills prescribed, and the name of the prescribing physician. This is comparable with data provided by the California Prescription Drug Monitoring Program, except that the California program also provides the patient’s date of birth and address, the name of the pharmacy at which the patient filled the prescription, and the prescribing physician’s license and Drug Enforcement Administration numbers. As we believed that most of the assessment of whether a patient exhibits drug-seeking behavior lies in the number of prescriptions, the potency of medication, and the number of prescribing physicians, we did not include this additional information in the data provided in our survey.

Each case varied in the number of prescriptions per month, the number of prescribing physicians, and the potency of the narcotic. A summary of the prescription histories from each of the 6 cases appears in Table 1. The low-potency narcotic in our survey was hydrocodone-acetaminophen at a dose of 5 mg and 500 mg, respectively, and the high-potency narcotic was oxycodone, 5 mg. The order of the 6 cases was the same for each respondent, and the survey software allowed respondents to review questions in any order and to modify previously submitted answers before submission.

To the best of our knowledge, there has been no earlier study of how the availability of a prescription history affects assessment by an EP of whether a patient is exhibiting drug-seeking behavior. We created six clinical vignettes on the basis of what we considered were likely scenarios that might be encountered in the ED. We also tried to vary the number of prescribing physicians prescriptions and medication potency in an attempt to find a threshold at which EP suspicion for drug-seeking behavior would change. These vignettes were not validated, although they were reviewed extensively and pilot-tested with our research advisers.

Respondents were asked to read each case, including the prescription history. After reviewing each case, respondents were asked 2 questions: “How likely do you think this patient is drug seeking?” and “How much would having the information in the prescription record change your prescribing practice?” For each question for each case, respondents were asked to rate their answers on a scale from “1” to “4,” with “1” being very unlikely, “2” being unlikely, “3” being likely, and “4” being very likely.

Although it is controversial and lacking standard definition, we chose to use the term drug seeking because it is used frequently in clinical practice and in the medical literature. Every physician has a different understanding of what constitutes drug-seeking behavior. Because our research objective was to learn how EPs assess prescription history in patients presenting with a painful condition, we believed that using this term accurately reflects what occurs in clinical practice. Additionally, our research aim was to determine whether EPs consider a prescription history useful rather than to identify how this information affects prescribing practice. As such, we did not ask our respondents what medication they would prescribe in each case, or if the prescription history would make them more or less likely to prescribe opiate medications.

We created the survey using online survey software (SurveyMonkey, www.surveymonkey.com; Palo Alto, CA; 2011). It was available for responses for a one-month period. We intended for the survey to take less than five minutes, and respondents were given this information. There was no financial incentive for participating, and no penalty for not participating.

We sent out a link to the online survey via recruitment e-mail to all resident physicians in the Emergency Medicine (EM) residency affiliated with an academic West Coast Medical Center. We sent the same recruitment e-mail to all attending EPs working more than two shifts per month at this same Medical Center. One reminder e-mail with a link to the online survey was sent two weeks after the initial recruitment e-mail.

Data Collection and Analysis

We collected data using SurveyMonkey online survey software and imported the raw data from the online software to a computer spreadsheet (Excel 2007, Microsoft, Redmond, WA) for review and analysis.

For data analysis, we chose Case 1 as the index case, because it represented what we perceived to be a prescription history for a patient receiving regular care from a primary care physician or pain management physician. We then made individual comparisons between the physician responses for each of the remaining cases and Case 1, to isolate the effect of changes in each of the 3 variables (number of prescriptions per month, number of prescribing physicians in the record, and strength of the narcotic). For example, Case 1 and Case 2 differ in that

Table 1. Prescription histories for each case in the survey

<table>
<thead>
<tr>
<th>Case</th>
<th>No. of prescriptions per month</th>
<th>No. of prescribing physicians</th>
<th>Narcotic potency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>2</td>
<td>1.5</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>6</td>
<td>Low</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>1</td>
<td>High</td>
</tr>
</tbody>
</table>
Case 1 involved 3 prescriptions per month, whereas Case 2 involved only 1.5 prescriptions per month. Comparing Cases 1 and 2 allowed us to analyze how a change in the number of prescriptions per month affected physician assessment. Each comparison consisted of comparing the average response value for Case 1 to the average response value for each of the remaining cases. For reference, a summary of the prescription history in each case is provided in Table 1. Because categorical data were collected, p values for each comparison were calculated using the Wilcoxon rank sum test. To assess the interobserver reliability within our responses, we calculated the Fleiss $\kappa$ values. For each scenario, we calculated the $\kappa$ values to assess the likelihood of drug seeking.

Statistical analysis was performed using Microsoft Excel 2007 and open-source online statistical software (Statcato 0.9.10).

**Results**

We received responses from 30 attending EPs out of 48 attending EPs who worked at this Medical Center, and from 29 EM residents of 36 EM residents in the program, giving us a total response rate of 70%. The response rate for residents was 81%, and that for attendings was 63%. Of the resident respondents, 28% were Postgraduate Year (PGY) 3, 38% were PGY 2, and 34% were PGY 1.

### Table 2. Physician assessment of likelihood that the patient was drug seeking

<table>
<thead>
<tr>
<th>Case</th>
<th>Average response score</th>
<th>Percentage of change vs index case</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index case</td>
<td>3.1</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Case 2 (1.5 prescriptions per month)</td>
<td>2.4</td>
<td>- 22.0</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Case 3 (6 prescriptions per month)</td>
<td>3.5</td>
<td>12.1</td>
<td>0.02*</td>
</tr>
<tr>
<td>Case 4 (3 prescribing physicians)</td>
<td>3.3</td>
<td>7.7</td>
<td>0.13</td>
</tr>
<tr>
<td>Case 5 (6 prescribing physicians)</td>
<td>3.7</td>
<td>19.0</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Case 6 (high-potency narcotic)</td>
<td>2.9</td>
<td>- 7.0</td>
<td>0.13</td>
</tr>
</tbody>
</table>

* On a scale from “1” to “4,” with “1” being very unlikely, “2” being unlikely, “3” being likely, and “4” being very likely.

**Discussion**

In our anonymous online survey of resident and attending EPs at a single academic Medical Center, we found that a greater number of prescriptions per month and a greater number of prescribing physicians per month increased physician suspicion for drug-seeking behavior. On the basis of the data in Table 2, the scenarios in which our respondents most suspected drug-seeking behavior were Cases 3 (6 prescriptions per month) and 6 (6 prescribing physicians in a 2-month period). In both cases, our respondents predicted the likelihood of drug seeking greater than or equal to 3.5 of 4. This finding suggests that our respondents believed that the patient in these cases was very likely to be drug seeking. A greater number of prescribing physicians in the prescription history increased suspicion for drug-seeking behavior slightly more than did a greater number of prescriptions per month. Despite our study’s limitations, these data suggest that 6 or more prescriptions per month and 6 or more prescribing physicians on a prescription history should raise concern that a patient presenting to the ED is trying to obtain prescription medication for nontherapeutic reasons.

We decided *a priori* not to assess in what fashion the information in a prescription history affects prescribing behavior. Rather, our survey determined that EPs believed that access
to prescription records was helpful and would change their prescribing practice when assessing patients presenting to the ED with pain in all of our fictitious cases. Therefore, whether EPs should access a patient’s prescription history each time a patient presents to the ED with an acute painful episode is worth considering. Although it may take a few extra moments on a busy shift, routinely accessing such information (if available) may be a powerful tool to screen for patients with concerning narcotic use.

Pseudoaddiction has been defined as an iatrogenic condition resulting from inadequate pain management, in which patients exhibit drug-seeking behaviors to obtain medication to relieve their pain. When patients receive adequate analgesia, these behaviors typically cease. The behaviors exhibited by patients attempting to obtain prescription medication who suffer from pseudoaddiction are nearly identical to those suffering from addiction, making it extremely difficult to differentiate between the two conditions. These conditions are even more difficult to differentiate in the acute care setting. Our survey did not attempt to differentiate between addiction and pseudoaddiction. Instead, we focused our study on drug-seeking behavior regardless of the cause, because we felt that this more likely reflects what is encountered in the ED.

The assessment of whether a patient is drug seeking has been completely subjective before the development of prescription monitoring programs. It would seem that the provision of an objective prescription history would allow physicians to better determine whether a patient is drug seeking. However, our survey demonstrated that our respondents had only moderate agreement in this assessment. It is unclear exactly why the interobserver reliability of this assessment was so poor. Although this may be the result of variation in how EPs choose to assess pain in their clinical practice or variable clinical experience with drug-seeking patients, it is possible that some of our respondents did not have enough experience using a prescription history. However, our comparison of the assessment of drug-seeking behavior between attending and resident physicians did not show a significant difference. This lack of experience appeared more likely to be related to overall inexperience with prescription monitoring programs rather than inexperience related to level of training. Further experience with prescription monitoring programs and research on drug-seeking behavior may improve EP use and interpretation of such programs in the future.

Limitations

Our study had several limitations. First, our survey had a limited number of respondents and was confined to one academic Medical Center, which limits the generalizability of these data. Our survey consisted of physicians of varying experience levels. Nearly 50% of our respondents were EM residents, which may limit the ability of our data to be generalized to the general EP population as well. Another limitation is that our cases were simulated cases only. Although we found statistically significant differences in EP concern for drug seeking based on differences in a patient’s prescription history, these differences may not be clinically significant, because seeing a patient in person is very different from reading a case presentation on a computer. Additionally, the use of nonvalidated clinical vignettes may be a source of potential bias. Furthermore, the initial case presentation of a young man with chronic back pain presenting to the ED requesting narcotic pain medication may be a source of bias, as it is by itself concerning for drug-seeking behavior.

We also looked at physician suspicion of whether a patient is drug seeking and whether physicians thought the information in the prescription record would be helpful; we did not survey our respondents to see what they would actually prescribe to the patient in each case. Furthermore, asking our respondents whether they thought a patient was drug seeking might have increased their suspicion in all cases for drug-seeking behavior. Along this same line, both authors have been involved with research on drug-seeking behavior in the past, and perhaps knowing that the research study was being performed by our research group increased suspicion for drug-seeking behavior in all cases.

None of our survey cases included a patient who had zero previous narcotic prescriptions, which might have provided additional information on how prescription histories are interpreted. Finally, the term drug seeking lacks a uniform definition, which might lead to inconsistencies related to a physician’s response to an online, anonymous survey.

Conclusion

In our anonymous survey of 6 fictitious cases of a 35-year-old man presenting to the ED requesting narcotics for low back pain, a greater number of prescriptions per month and a greater number of prescribing physicians listed on the prescription record increased EP suspicion for drug-seeking behavior. In addition, our survey demonstrated EPs believed that access to narcotic prescription history was likely to change their prescribing behavior. However, there was only moderate interobserver reliability in the EP assessment of whether patients were demonstrating drug-seeking behavior.

Disclosure Statement

The author(s) have no conflicts of interest to disclose.
How Do Emergency Physicians Interpret Prescription Narcotic History When Assessing Patients Presenting to the Emergency Department with Pain?

Acknowledgment
Kathleen Louden, ELS, of Louden Health Communications provided editorial assistance.

References

Door
Opiate, n. An unlocked door in the prison of Identity. It leads into the jail yard.

— The Devil’s Dictionary, Ambrose Bierce, 1842-1913, American editorialist, journalist, satirist, and author
Anesthesiology Leadership Rounding: Identifying Opportunities for Improvement

Dietrich Gravenstein, MD; Susan Ford, RN; F Kayser Enneking, MD

Abstract

Introduction: Rounding that includes participation of individuals with authority to implement changes has been advocated as important to the transformation of an institution into a high-quality and safe organization. We describe a Department of Anesthesiology’s experience with leadership rounding.

Methods: The Department Chair or other senior faculty designate, a quality coordinator, up to four residents, the ward charge nurse, and patient nurses participated in rounds at bedside.

Results: During a 23-month period, 14 significant opportunities to improve care were identified. Nurses identified 5 of these opportunities, primary team physicians 2, the rounding team 4, and patients or their family members another 3. The anesthesiology service had sole or shared responsibility for 10 improvements.

Conclusion: A variety of organizations track specific measures across all phases of the patient experience to gauge quality of care. Chart auditing tools for detecting threats to safety are often used. These measures and tools missed opportunities for improvement that were discovered only through rounding. We conclude that the introduction of leadership rounding by an anesthesiology service can identify opportunities for improving quality that are not captured by conventional efforts.

Introduction

Leadership rounding has been touted as essential to a comprehensive program to improve quality. The Institute for Healthcare Improvement believes leadership rounding to be one of the key elements in engaging physicians and staff in meaningful efforts to improve health care delivery.1 Most often, involvement at the chief executive, nursing, operating room, or medical officer level is described. Leadership rounding within a unit has been shown to reduce staff turnover rate and to have a positive influence on nurses’ perceptions of the patient safety climate within the unit.2,3 The Department of Anesthesiology at the University of Florida introduced leadership rounding at the level of the departmental chair to search for areas where delivery of care could be improved. These rounds led to a startling number of interventions both within the department and throughout many other units in our hospital. This is the first report of a Department of Anesthesiology using leadership rounding to improve quality.

Methods

Beginning in January 2010, the Chair of the Department of Anesthesiology assembled a multidisciplinary group to visit postsurgical patients and discuss opportunities for quality improvement with them, their families, nurses, and ancillary staff. Members of the leadership rounding team included the department chair, the departmental quality coordinator, two to four residents, the bedside nurse, and a ward manager. If the chair was not available, another senior faculty member led the team. The residents who joined the rounds were assigned to locations that did not have early clinical starts (eg, the postanesthesia care unit and preoperative evaluation clinic). Typically, rounding included up to five patients and occurred once every week. Patients were selected for rounding according to their surgery date (within three days), the unit they were on, and which anesthesiology personnel provided their care. This ensured that all patient care areas and faculty members would be reviewed.

A single interview form was used (Figure 1). In addition, a standard audit of the records related to the anesthesiologic management of each patient was also systematically checked. Any deficiencies found during the review of anesthesiology-related documentation (the preoperative evaluation, consent and time-out forms, the anesthesiology record, and the postoperative anesthesia evaluation) were recorded on the form. The postoperative anesthesia evaluation contains anesthesiology-specific questions that relate to the patient’s (and patient’s family’s) perception of the quality of the anesthesiology care they experienced (Table 1).

Additionally, the rounding team brought administrators face-to-face with patients, their families, and the nurses providing postoperative care. This allowed for impromptu observation of how the patient was convalescing, and for bedside discussions with the group about frustrations and successes. This open-interview component, led by the depart-
ment chair, encouraged family members and clinicians to comment on the hospital experience in the context of their value system and expectations, which may not have been captured by the questions on the form. These remarks were included in the comments section of the form. Finally, a note was sent to all the clinicians involved in each patient’s care, informing them of the findings of the leadership rounds with their patient and whether those findings exceeded, met, or fell short of expectations. Recipients included department faculty, residents, anesthesiologists, nursing managers, and surgical or medical department chairs when appropriate. Furthermore, these letters were included in the annual evaluations of the involved departmental faculty. A sample letter is shown in Figure 2. Our clinical improvement coordinator followed-up issues identified on leadership rounds.

Results

Over 23 months, 14 significant opportunities for improving care were identified. Table 2 summarizes the cumulative accomplishments of the weekly rounds, which typically lasted 1 hour. Table 3 lists the opportunities for quality improvement that were identified during rounds, who identified the issues, and what actions were taken in response. Nursing staff identified 5 of these opportunities, primary team physicians 2, the rounding team 4, and patients and their family members another 3. The anesthesiology service had sole or shared responsibility for 10 improvements.

Corrective actions were implemented in a variety of ways to reach a wide circle of stakeholders. Education (development and standardization of best practice to secure arterial line, incentive spirometer use, dependent Foley placement, consistent sequential compression device use, and implementation of standardized signage across all units) was accomplished separately from the Chair’s letter by means of e-mail distributed to the entire faculty, residents, and anesthesiologists. Additionally, findings and supportive literature were presented at quarterly departmental quality-improvement conferences and to hospital leadership at the Physicians’ Quality and Safety Executive Committee.

The rounding team requested improvements requiring capital purchases (orthopedic stretcher chairs, pediatric cribs, and interchangeable monitors) through the Chief Quality and Chief Financial Officer and justified them with the discoveries made during rounds.

We made changes to procedures, protocols, processes, and forms (adoption of airway trays, perioperative pain control protocol, critical contact badge cards, serial consent forms, uniformity of instruction sheets across clinics, secure custody of patient valuables, facilitation of postoperative anesthesia evaluation, addition of incentive spirometry to anesthesia order set, and uniform transport policy). Participation of all stakeholders was required to develop these improvements. Approval from the Legal Department was obtained, and the final institutional Forms Committee ensured compliance with existing forms, policies, and procedures.

The improvements in education, equipment, forms, policies, procedures, and processes took months to complete but have effectively addressed the deficiencies and complaints they targeted.

Discussion

University Health System Consortium and Centers for Medicare and Medicaid Services have identified numerous, wide-ranging measures that it has linked to quality of care.4,5 Performance across these measures is individually and collectively graded and compared to other institutions’ performance and then reported on a scorecard.0 The Centers for Medicare and Medicaid Services enable

<table>
<thead>
<tr>
<th>Participants/outcomes</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients interviewed</td>
<td>119</td>
</tr>
<tr>
<td>Residents participating</td>
<td>42</td>
</tr>
<tr>
<td>Faculty leaders</td>
<td>9</td>
</tr>
<tr>
<td>Intensive care units visited</td>
<td>7</td>
</tr>
<tr>
<td>Other surgical units</td>
<td>10</td>
</tr>
<tr>
<td>Procedure unit (MRI)</td>
<td>1</td>
</tr>
<tr>
<td>Quality improvement actions</td>
<td>14</td>
</tr>
<tr>
<td>Letters sent out by chair</td>
<td>75</td>
</tr>
</tbody>
</table>

MRI = Magnetic resonance imaging.

Figure 1. Elements of rounding interview.

DOS = date of surgery; DX = diagnosis; IS = incentive spirometer; MR = medical record number; OP = operative; OR = operating room; PACU = postanesthesia care unit; POAE = postoperative anesthesia evaluation; SCD = sequential compression devices.

Figure 2. The text of a postvisit letter sent to care team members (names and dates have been removed).
consumers to compare hospitals on this basis (www.hospitalcompare.hhs.gov). Designing an electronic medical record to capture those measures specified by regulatory agencies is straightforward. What this metric reporting approach lacks, however, is the ability to expose lapses of care or quality that fall outside of the specific areas mandated for reporting. Performance improvement is stifled if it is restricted to measures that can be easily quantified. Efforts guided by greater emphasis on the patient’s service experience (eg, Hospital Consumer Assessments of Healthcare Providers and Systems) can begin to address patient perceptions, and, conceivably, the quality of care they actually receive.

The postoperative patient and bedside nurse interviews that are an integral part of our quality rounds are valuable sources for identifying patient-centered opportunities for improving quality. The interviews provided a welcomed forum for nurses and other staff who interact with patients to provide insights on safety issues and ideas for improving the quality of anesthesia and institutional care.

One of the key motivations of the Chair for initiating these quality rounds was specifically to give anesthesiology residents a human context for the work they do. However, resident involvement in these rounds accrued many more benefits. Thus, we believe integration of resident physicians to be a key element of this project. Our graduate medical education office deemed resident physician involvement in these rounds a model of institutional commitment to a culture of improved safety and quality.

Despite a well-established, continual quality-improvement program, the addition of leadership rounding resulted in discovery of 14 significant opportunities for improving care over a 23-month period. Remarkably, bedside nursing staff identified 5 of these opportunities, primary team physicians 2, the rounding team 4, and patients and their family members another 3. The anesthesiology service had sole or shared responsibility for 10 improvements. This distribution of participants underscores the value of diversity in a rounding team, involvement of patients and their families, and participation of leaders who are able to follow through and effect the necessary improvements.

**Conclusion**

Use of a traditional method for assessing outcomes the Rounding Team can also identify opportunities for improving quality in anesthesia that are not captured by patient safety reports and not included in nationally reported quality metrics. Leadership rounding in anesthesiology can provide valuable metrics for inclusion in an electronic medical record, an audit for compliance with documentation, tangible evidence of leadership’s commitment to quality, and feedback O

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<th>Table 3. Opportunities for quality improvement identified during rounds</th>
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BICU = burn intensive care unit; D/C = discharge; N = nursing staff; MD = physician involved with patient care; OR = operating room; P/F = patient or family member; PICU = pediatric intensive care unit; POAE = postoperative anesthesia evaluation; R = rounding team; SICU = surgical intensive care unit; TSRPT = transsphenoidal resection of pituitary tumor.
Leadership rounding has the potential to uncover lapses of care that may otherwise have remained invisible to even robust quality-improvement systems.

Disclosure Statement
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Acknowledgment
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References

Doing Things
Management is doing things right; leadership is doing the right things.
— Peter Drucker, 1909-2005, Austrian-born American management consultant, educator, and author
Abstract

The ethics of physician-patient confidentiality is often fraught with contradictions. Privacy boundaries are not always clear, and patients can leave an interaction with their physicians feeling uncomfortable about the security of their private medical information. The best way to meet confidentiality and privacy management expectations that patients have may not be readily apparent. Without realizing it, a physician may communicate a patient’s information in ways that are inconsistent with that person’s perceptions of how his/her medical information should be treated. A proposed model is presented as a tool for physicians to better serve the privacy and confidentiality needs of their patients. This model depends on the communication privacy management (CPM) perspective that emerged from a 35-year research program investigating how people regulate and control information they consider private and confidential. A physician’s use of this model enables the ability to establish a confidentiality pledge that can address issues in understanding the best way to communicate about privacy management with patients and more likely overcome potential negative outcomes.

Research shows that managing privacy boundaries is a delicate balancing act. If the regulation of privacy and confidentiality in medical encounters is conducted without consciousness, awareness, and curative intention, the outcome can be counterproductive for patients and physicians, with the potential to compromise ethical and care standards.

Communication Privacy Management and Patient-Physician Relationship

Communication privacy management (CPM), is a theoretically driven perspective derived from a 35-year social-behavioral research program investigating how people manage private information. In this report, the CPM perspective is applied to better understand the basis for ethical predicaments in confidentiality between patients and physicians. Briefly, CPM argues that managing privacy and confidentiality means navigating between the need for autonomy and the need for connectedness with others. Navigating is necessary because people want to take others into their confidence (granting access), yet desire to keep a measure of autonomy and privacy (resulting in concealing or protecting information). CPM uses a privacy boundary metaphor representing where private information is located and identifies how the privacy management system operates.

In considering the physician-patient relationship within the CPM perspective, physicians have potentially two privacy boundaries they regulate with patients. They have their own personal privacy boundaries and judgments about situations where personal disclosures are made to patients. Physicians also serve as guardians or co-owners of their patients’ private medical information and are included within the patient’s privacy boundary surrounding that information. As co-owners, physicians have a complicated role in that they have to make decisions about issues such as the best treatment plan or a prognosis on the basis of information they gather from tests, and they must deliver that information to the patient. In doing this, physicians often have to judge when to share information with the patient about his/her case, how much to share at any given stage of treatment, what to share, and who else to tell about the patients’ confidential medical information. Because the medical information belongs to the patients, they feel that the physicians’ choices about these issues necessarily need to
include conversations with them. The reason these issues arise is illustrated in the evidenced-based principles of CPM theory. There are three main CPM principles: 1) privacy ownership, 2) privacy control, and 3) privacy turbulence.7,9-10

*Privacy ownership* refers to the fact that people believe their private information belongs to them and they *own* the right to control access to that information. When “original” owners grant access, they create authorized co-owners or confidants who are expected to act responsibly by fulfilling the original owner’s expectations for third-party access. Physicians are granted authorized co-ownership or guardian status by patients so that they can administer medical care.

*Privacy control* defines the system that regulates access and protection of privacy boundaries surrounding information considered personal and within an individual’s jurisdiction to regulate. Privacy control is enacted through using privacy rules that regulate access and protection; for example, a patient might say, “I talk only to my doctor about my HIV status and no one else.”

Privacy rules are developed on the basis of motivations, assessments of risks and benefits, orientations toward privacy, and situational demands. Thus, needing to trust a physician to gain health care can motivate a patient to reveal information. For the patient, granting access likely includes judging risks and benefits of allowing complete or partial access. Nevertheless, when the patient discloses information, the physician becomes an authorized co-owner or guardian and, with that, comes an implied expectation that the physician will “care” for the information in the way the patient expects. If these expectations about responsible treatment of the information are violated, *privacy turbulence* results in the physician-patient relationship.

### Personal-Professional Boundaries in Confidential Physician-Patient Relationships

Whereas the physician’s confidant role is professionally, ethically, and legally guided, it is also determined by the interface of the physician’s own privacy rules—about maintaining personal and professional boundaries—with individual patient privacy rules. Stemming from professional training, physicians develop their own set of privacy rules and management strategies to regulate their emotions and personal information.3,12 Physicians learn ways to keep their feelings within their own privacy boundary and under their own control. By using an effective privacy regulation process, physicians are able to protect their own privacy while maintaining a professional physician-patient boundary in the name of objectivity. Having a clear sense of demarcation between the personal and professional is necessary and can afford a physician the ability to better serve in the role of confidant for patients.

The road to effective navigation of both patient and physician privacy boundaries may be predicated on the physician’s ability to learn how to be more reflective about communication in patient care.52 From the literature, we find that physicians trained to have a greater awareness of where boundary lines can become blurry—particularly with emotional objectivity and

| Table 1. Communication privacy management confidentiality negotiation system |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| **Question** | **Physician perspective** | **Patient perspective** |
| **Who?** Identification of physician and medical treatment team | Name and describe the main team members for the patient (eg, physician partners, nurses, physician assistants, residents, medical students). Discuss general policies of information sharing. | Ask the patient who s/he sees as individuals who should know about his/her medical information. Who is the patient willing to accept as part of his/her treatment team and why? |
| **Why?** Discussion of confidentiality | Indicate the importance for the physician-patient relationship to know how the patient is thinking about protection of and access to his/her medical information. | Determine who the patient considers part of his/her health care team and why (eg, a family member). Ask about rules for disclosure of private information for each of the people the patient names (eg, mother). |
| **What?** Roles and functions in information sharing | Explain what the role and function of each member of the medical team is and why that person’s role is important to the patient’s treatment. Discuss parameters for information sharing for each member. | Establish what role or function of sharing information the patient is willing to allow for each team member playing a part in his/her care. Ask about the patient’s information access and protection rules and determine why they exclude certain people. |
| **Where and when?** Sharing of patient’s private medical and personal information | Identify where, when, and how a patient’s confidential information will be necessarily shared and with whom (eg, team meetings). Discuss circumstances when information will likely be shared and why, the typical times information will be shared, how the information will be communicated (eg, electronic medical records), and individuals likely to be told. | This step is part of discerning the patient’s privacy rules for disclosure and protection. S/he will tell you how s/he wants his/her information shared, when, and with whom, or how s/he wants the information protected. This step includes family members, friends, ex-spouses, and others the patient may or may not want to know his/her information. Ask the patient’s preferences and have ready explanations for situations that s/he might identify that hamper the ability to provide good patient care. |
| **Negotiation** Finding out and telling expectations for sharing and protecting patient information | Recognize that this is the opportunity for a discussion with the patient about information s/he owns and wants control over. Doing so shows respect and increases a sense of trust for the patient. | The physician’s concern about a patient’s sensitive information will increase patient confidence in the physician and lead to a better physician-patient relationship. |
empathy—are more able to communicate effectively. Physicians’ sharing personal emotions, concerns, and experiences can have both positive and negative effects on the physician-patient relationship. Consequently, the judgments made need to rely on clear guidelines with sensitivity to the impact that sharing (ie, crossing a privacy boundary) and not sharing have for the process of patient care.12

**Blurring Privacy Boundaries in Physician-Patient Relationships**

Both patients and physicians encounter privacy management predicaments. When physicians make inappropriate or unrelated personal disclosures to patients, the patient may feel baffled about the confidant’s role a physician is playing. A study found that more often than would be expected, primary care physicians tend to disclose unsolicited and contextually irrelevant personal information to their patients.13 McDaniel et al14 found that 85% of primary care physicians made such disclosures that had little to do with the patients’ cases. Interestingly, this research also shows that after physicians disclosed, patients did not necessarily turn the conversation back to the reason they were seeking medical care; nor did the physicians. Furthermore, patients did not find that the physician’s disclosure was helpful in any way.

Receiving disclosures of a personal nature from physicians may put the patient in an awkward position. There is an embedded expectation of responsibility for the patient as the physician’s confidant. Consequently, unless the disclosure is contextually relevant to the patient’s case or can potentially be used therapeutically, a physician’s personal disclosure can compromise the ability to establish a professional trusting relationship with the patient.6 For example, if physicians reveal their personal marital problems when listening to a patient’s description of medical issues affecting his/her marriage, the patient might feel compelled to comfort the physician.15 In these situations, an implicit confidentiality promise that patients often

<table>
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<th>Table 2. Negotiated confidentiality: teaching hospital case example</th>
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<td><strong>Question</strong></td>
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<td><strong>Who? Identification of medical staff</strong></td>
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HIPAA = Health Insurance Portability and Accountability Act
assume between themselves and physicians becomes reversed and the patient is the confidant with implied responsibilities to the physician.

However, disclosures reinforcing concepts that focus on taking the perspective of the patient can have a powerful impact on how privacy boundaries are regulated. Reinforcing concepts such as normalcy (eg, “Your concerns are not uncommon; many of my pregnant patients have the same fears”), empathy (eg, “I share your frustration that we have not been able to adequately manage your pain, but we are committed to finding a solution”), and encouraging hope (eg, “I know quitting smoking is difficult because I’ve done it, and I believe when you are ready, you will too”) can facilitate effective disclosure for the physician, maintain a useful relationship, and positively influence health outcomes.

Considering these issues speaks to the importance of locating expectations about managing confidentiality and reflecting on how role shifting can disrupt the patient’s assumptions about physician behavior when in a confidential medical relationship. Explicitly inquiring about the patient’s expectations concerning how private and confidential information will be managed sets the path to increasing trustworthiness and the ability to actively attend to the patient’s desires for privacy management. Doing so also helps to guard against the possibility of mistaking where the borders are between the professional and the personal boundaries.

As this report transitions into presenting a confidentiality negotiation system, it is important to make note of the position on privacy taken in this article as compared to the Privacy Rule of the Health Insurance Portability and Accountability Act (HIPAA). Whereas HIPAA is geared toward providing legal protections for an individual’s personal health information, this essay goes beyond the borders of biomedical intent stipulated by the act. Instead, the argument here focuses on learning how people talk and interpret messages in building relationships concerning regulating their confidential private information.

Confidentiality Negotiation System: Differences Navigated

Physicians and patients operate on a different set of assumptions about how the health care system works. For physicians, navigating in the health care system is part of their daily routine. Physicians rely on the admission process and paperwork to outline requests for private information that, for them, is normative. Patients understand they must provide access to their private medical information, but they have less experience with this system than do the physicians. Furthermore, patients uniformly do not believe all their private information somehow belongs to and should be shared with the physician. The incommensurate experiences that the patient and physician may have illustrate underlying issues that can result in miscommunication and violated expectations for privacy management. The outcome can lead to what CPM refers to as “privacy turbulence.” Because of these communications, trust may be damaged and difficult to restore.

Physicians must be equipped with effective ways to overcome barriers and to negotiate useful privacy decisions. Through training, physicians can improve their understanding of the patient’s privacy orientation and learn new ways of negotiating an agreed-on set of privacy rules to better serve the patient’s needs. The five-point model and case study application discussed in the next section illustrate key aspects of confidentiality negotiations, with the goal of establishing a CPM confidentiality pledge. This model is geared to quickly identify the main points of discussion for physician-patient interaction about confidentiality. Obviously, the length of time invested depends on an individual physician’s needs and desires regarding the extent of implementing the model.

Communication Privacy Management Confidentiality Pledge Model

A confidentiality pledge advocates that patients and physicians openly discuss the ways patients want their information treated. Constructing this pledge seems best used in an initial face-to-face interaction with the patient as the physician is becoming familiar with the case. In this way, going forward from this initial encounter, the physician is illustrating a level of care and concern for the patient’s wishes regarding information considered private. Doing so creates a heightened sense of trust for the patient. Likewise, the pledge also raises awareness of where there are privacy boundary lines for both physician and patient, thus thwarting breaches of confidentiality that can lead to negative outcomes in patient care. A patient’s reluctance to engage in conversations about protection of his/her confidentiality may clue the physician into the level of trust or lack thereof that a patient is feeling. In addition, not wanting to share private information may signal other potential problems that could be related to the patient’s condition. Considering these possibilities likely helps the physician recognize more attention is needed to unearth the reasons a patient feels reluctant. The basic model can serve as a template to pursue a more in-depth discussion if necessary.

The proposed model gives a clear and concise vision of how to address these problems before they become obstacles, thereby increasing the potential for beneficial patient care. As Table 1 illustrates, using the CPM Confidentiality Negotiation System to develop a confidentiality pledge can be achieved with a five-point model that asks who, what, where, when, and how. This model shows how to discern ways in which patients define the disclosed medical information as confidential. In addition, it identifies where the borders are located in patients’ privacy boundaries surrounding confidential information and aids in judging the level of needed control that patients want over their information. Furthermore, the model sets parameters for areas most likely to concern confidential information, namely, seeking permission to tell information, and creating informational co-owners or shareholders (eg, clinicians, team members and other personnel, family members, and friends). The model also identifies circumstances in which the patient and physician negotiate protection of and access to information, including how, when, and why information might be protected or granted access. Doing so communicates an understanding of

A confidentiality pledge advocates that patients and physicians openly discuss the ways patients want their information treated.
Navigating Ethics of Physician-Patient Confidentiality: A Communication Privacy Management Analysis

权利拥有权（在个人，但不必要地法律术语），授予有能力行使控制权的信息，当他人此外（例如，医生）是给予许可来提出决定的病人的行为。

表2提供了一个教学医院的案例研究分析，以说明医生如何在与患者沟通时解决隐私管理问题。这种案例说明医生应为患者对信息表达的具体情况或期望。通过实践和政策的共享，患者的信息应由医疗专业人员，根据交流的界限，帮助患者设定隐私管理。在交往中，患者应参与沟通与医疗专业人员，以说明信息的分享或不分享，与某些家庭成员是同样。在这些情况下，医生可以更好地理解患者的期待，提供对隐私问题的沟通。

结论

一个对医疗专家的角色为机密性是定义并培养对信息的处理的有关的沟通、信任、表达和行为。在未来的沟通中，医生应主动沟通这些问题，减少患者对隐私的潜在担忧。

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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References

Evaluation and Management of Vertebral Compression Fractures

Daniela Alexandru, MD; William So, MD

Abstract

Compression fractures affect many individuals worldwide. An estimated 1.5 million vertebral compression fractures occur every year in the US. They are common in elderly populations, and 25% of postmenopausal women are affected by a compression fracture during their lifetime. Although these fractures rarely require hospital admission, they have the potential to cause significant disability and morbidity, often causing incapacitating back pain for many months. This review provides information on the pathogenesis and pathophysiology of compression fractures, as well as clinical manifestations and treatment options. Among the available treatment options, kyphoplasty and percutaneous vertebraloplasty are two minimally invasive techniques to alleviate pain and correct the sagittal imbalance of the spine.

Introduction

Vertebral compression fractures (VCFs) of the thoracolumbar spine are common in the elderly, with approximately 1.5 million VCFs annually in the general US population. Approximately 25% of all postmenopausal women in the US get a compression fracture during their lifetime. The prevalence of this condition increases with age, reaching 40% by age 80. Population studies have shown that the annual incidence of VCFs is 10.7 per 1000 women and 5.7 per 1000 men. Men older than age 65 years are also at increased risk of compression fractures. However, their risk is markedly less than that of women of the same age.

Vertebral compression fractures are as common in Asian women as in Caucasian women, and less common in African-American women.

Although less severe than hip fractures, VCFs can cause severe physical limitations. Chronic back pain, which is associated with these kinds of fractures, leads to functional limitations and significant disability. Multiple adjacent VCFs can lead to progressive kyphosis of the thoracic spine, resulting in a number of comorbidities, such as decreased appetite resulting in poor nutrition and decreased pulmonary function. The progressive decline in health status likely contributes to increased morbidity and mortality in patients with VCF compared to the general population.

VCFs also significantly increase medical costs: the estimated annual cost of VCFs in the US is $7.46 million.

Etiology of Vertebral Compression Fractures of the Spine

The most common etiology of VCFs is osteoporosis, although trauma, infection, and neoplasm can also lead to VCFs. Postmenopausal women have the greatest risk because of hormonal changes that can lead to osteoporotic bone. Decreased bone mineral density because osteoporosis disrupts the bone microarchitecture and alters the contents of noncollagenous proteins in the bone matrix. This structural deterioration of the tissue leads to fragile bones that are prone to fractures. It is estimated that approximately 44 million Americans have osteoporosis and that an additional 34 million Americans have low bone mass.

Studies have suggested that having 1 VCF increases the risk of future VCFs. Lindsay et al reported that, irrespective of bone density, having 1 or more VCFs leads to a 5-fold increase in the patient’s risk of developing another vertebral fracture. Other studies have also found that having 1 compression fracture increases the risk of another compression fracture by 5 fold, and having 2 or more compression fractures increases the risk of having another fracture by 12 fold. The relative risk for developing VCFs also increases with decreased bone mineral density: if bone mineral density is decreased by 2 standard deviations, the risk of developing a VCF increases by 4 to 6 times.

Presentation and Complications From Vertebral Compression Fractures

Compression fractures of the thoracolumbar spine have a flexion compression mechanism of injury. This mechanism usually involves the first column (anterior longitudinal ligament and anterior half of the vertebral body). Pain is the main symptom (Table 1); neurologic deficits tend to be quite infrequent, because such a fracture does not involve retropulsion of bone fragments into the vertebral canal. Compression fractures of the vertebral bodies are particularly worrisome in patients with severe osteoporosis. Fractures occur in these patients during trivial events, such as lifting a light object, a vigorous cough or sneeze, or turning in bed. It has been hypothesized that fractures in vertebral bodies occur because of an increased load on the spine cause by contraction of paraspinal muscles. It has been suggested that approximately 30% of compression fractures in patients with severe osteoporosis occur while the patient is in bed.

Patients with moderate osteoporosis can injure their spine by falling off a chair, tripping, or attempting to lift a heavy object. The most likely cause of a spinal compression fracture in those without osteoporosis is severe trauma, such as an automobile accident or a fall from a great height. When patients younger than age 55 years present with compression fractures, malignancy should be considered as a possible cause of the fracture.
Vertebral compression fractures have an insidious onset and may produce only low-grade back pain. Over time, multiple fractures may lead to progressive loss of stature and continuous contraction of the paraspinal musculature to maintain posture. This combination results in fatigued muscles and pain that may continue even after the original compression fractures have healed.\(^{27}\)

Patients with multiple compression fractures and progressive loss of vertebral body height may develop excessive thoracic kyphosis and lumbar lordosis.\(^{30-32}\) In severe cases of kyphosis, pressure exerted by the thoracic cavity on the pelvis can cause impaired pulmonary function, a protuberant abdomen, and early satiety and weight loss. Other complications of compression fractures include constipation, bowel obstruction, prolonged inactivity, deep vein thrombosis, increased osteoporosis, progressive muscle weakness, loss of independence, kyphosis and decreased height, crowding of internal organs, respiratory disturbances (e.g., atelectasis, pneumonia, and prolonged pain), low self-esteem, and emotional and social problems; these patients are also more likely to be admitted to a nursing home.\(^{21,29,30-31}\) Patients with compression fractures have a 15% greater risk of death compared to those who do not have a compression fracture.\(^{21,20,31}\)

VCFs can lead to segmental instability when the vertebral body collapse is more than 50% of the initial height. With one segment collapsed to the point of instability, the adjacent levels have to support the additional load. This increased strain on the adjacent segments may result in degeneration of the spine and/or additional VCFs.\(^{32}\)

A significant majority of fractures, 60% to 75%, occur around the thoracolumbar region. This segment is between T12 and L2 and is considered a transition zone from the more rigid thoracic vertebral column to the relatively mobile lumbar vertebral column. This anatomic relationship makes the thoracolumbar junction more prone to fractures than the rest of the spine.

**Risk Factors for Vertebral Compression Fractures**

The most important risk factor for VCF is osteoporosis, but there are a number of others, both modifiable and nonmodifiable.\(^{35}\) (Table 2). Modifiable risk factors include activities and behaviors that the patient can change, such as alcohol consumption, tobacco use, osteoporosis, estrogen deficiency, early menopause, bilateral salpingo-oophorectomy, premenopausal amenorrhea for more than one year, frailty, impaired eyesight, insufficient physical activity, low body weight, dietary calcium deficiency, and dietary vitamin D deficiency.\(^{33,35}\) (Table 2). Nonmodifiable risk factors include advanced age, female sex, Caucasian race, dementia, susceptibility to falling, history of fractures in adulthood, history of fractures in a first-degree relative, previous steroid treatment,\(^{35}\) and previous treatment with anticonvulsants (Table 2).

Managing modifiable risk factors, including treatment for osteoporosis, is the first step in preventing VCFs.\(^{31}\) Interestingly, obesity is protective against fractures, as it decreases the risk of bone loss: high stress on the bone induces a stronger bone remodeling response.\(^{20}\) In addition, obesity leads to increased quantities of sex hormones, especially estrogen, which promotes osteoblast activity. The hyperinsulimemia associated with obesity leads to decreased production of insulin-like growth factor binding protein-1 (IGFBG-1), thus increasing levels of IGF-1 protein, which stimulates the proliferation of osteoblasts.\(^{32}\)

**Detecting Osteoporosis**

The most reliable method of detecting osteoporosis, and thereby identifying patients at risk for compression fractures, is to measure bone mineral density.\(^{36}\) Currently, the standard method of measuring bone mineral density is dual-energy x-ray absorptiometry.\(^{36}\) This test has become the gold standard because it can measure central bone mass and has excellent specificity. Bone mineral density T scores represent the standard deviation from the mean peak value in young adults. According to the World Health Organization, a T score less than -2.5 is indicative of osteoporosis.

**Table 1. Symptoms and complications of vertebral compression fractures**\(^{21,21,30,42}\)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Complications</th>
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<tbody>
<tr>
<td>Sudden onset of back pain</td>
<td>Continuous low-grade back pain</td>
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<tr>
<td>Intensity of pain increases during standing or walking</td>
<td>Thoracic kyphosis and lumbar lordosis</td>
</tr>
<tr>
<td>Intensity of pain decreases when lying on the back</td>
<td>Impaired pulmonary function</td>
</tr>
<tr>
<td>Pain increases during palpation over the affected level</td>
<td>Protuberant abdomen, and early satiety and weight loss</td>
</tr>
<tr>
<td>Decreased spinal mobility because of pain</td>
<td>Increased osteoporosis because of inactivity</td>
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<tr>
<td></td>
<td>Deep vein thrombosis because of inactivity</td>
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<tr>
<td></td>
<td>Decreased respiratory capacity because of kyphosis, which in turn leads to atelectasis pneumonia</td>
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<td>Low self-esteem and emotional and social problems</td>
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**Table 2. Risk factors for vertebral compression fractures**\(^{7,21,30}\)

<table>
<thead>
<tr>
<th>Modifiable</th>
<th>Nonmodifiable</th>
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<tr>
<td>Alcohol consumption</td>
<td>Advanced age</td>
</tr>
<tr>
<td>Tobacco use</td>
<td>Female sex</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>Caucasian race</td>
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<tr>
<td>Estrogen deficiency</td>
<td>Dementia</td>
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<tr>
<td>Early menopause</td>
<td>Susceptibility to falling</td>
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<tr>
<td>Bilateral salpingo-oophorectomy</td>
<td>History of fractures in adulthood</td>
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<tr>
<td>Premenopausal amenorrhea for more than one year</td>
<td>History of fractures in a first-degree relative</td>
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<td>Frailty</td>
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than -2.5 indicates osteoporosis, while T scores from -1 to -2.5 indicate osteopenia or decreased bone density, and T scores greater than -1 are normal.

**Classification of Vertebral Compression Fractures**

VCFs can be classified in three categories: wedge, biconcave, and crush. Wedge fractures are the most common, accounting for more than 50% of all VCFs. These fractures occur in the midthoracic region and are characterized by compression of the anterior segment of the vertebral body (Figure 1a and 1c). Biconcave compression fractures are the second-most common, accounting for approximately 17% of all VCFs (Figure 1b and 1c). In these fractures, only the middle portion of the vertebral body is collapsed, whereas the anterior and posterior walls remain intact. The least common VCFs are crush compression fractures. They account for only 13% of VCFs. In these fractures, the entire anterior column, including anterior and posterior margins, is collapsed. Complex fractures account for the remaining 20% of VCFs.

**Imaging Modalities**

Several imaging modalities are available for evaluation of patients with suspected compression fractures. Plain radiographs are the initial diagnostic modality (Figure 1a). Other imaging modalities include computed tomography (CT) scan (Figure 1b) and magnetic resonance imaging (MRI) scan (Figure 1c). CT scans are primarily used for areas where plain films suggest there may be injury. They can help detect instability of an anterior wedge compression fracture, and occult bony injuries. CT is ideal for imaging complex fractures and determining the degree of vertebral compression.

More complex imaging modalities, such as CT myelography and magnetic resonance imaging (MRI), are not necessary unless the patient has a neurologic deficit. In special cases where the compression fracture is because of an infectious or malignant process, more advanced MRI techniques can be used. MRI is helpful for better visualization of cord compression and ligamentous disruption. High signal intensity indicates cord injury. MRI is also useful in evaluating the age of the VCF. New injuries can be identified by a T2 signal because of an increased signal intensity from water in the vertebral body. CT myelography for assessment of cord compression is indicated when MRI is contraindicated, such as in patients with a pacemaker. Imaging modalities other than plain films should always be used in patients with neurologic deficits, as multiple compression fractures can cause enough kyphotic angulation to lead to cord compression and progression to complete loss of neurologic function.

**Treatment of Osteoporosis**

Prevention and treatment of osteoporosis is one of the first steps in managing VCFs. Postmenopausal women with osteoporosis should be treated with 1500 mg calcium and 400 IU vitamin D daily. Serum testosterone should be tested in men with compression fractures to rule out hypogonadism. Osteomalacia should be suspected if alkaline phosphatase level is elevated. Cigarette smoking should be discouraged, and alcohol should only be consumed in moderation. A daily weight-bearing exercise program should be recommended. Newer treatment options like bisphonates have been shown to reduce the risk of fractures. In randomized clinical trials, alendronate has been found to reduce the risk of vertebral fractures by 50% in postmenopausal women. Other agents with clinical evidence of efficacy include raloxifene, parathormone, and calcitonin.

**Nonsurgical Treatment**

Nonsurgical management is one of the preferred approaches for treatment of VCFs. Conservative management includes a short period of bed rest followed by gradual mobilization with external orthoses. Since VCFs are flexion-translation injuries, spine alignment along anterior and posterior margins, is collapsed. Complex fractures account for the remaining 20% of VCFs.

**Imaging Modalities**

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compression injuries, a hyperextension brace is used. These braces are usually beneficial for the first few months, until the pain resolves. Although younger patients tolerate bracing well, elderly patients generally do not, because of increased pain with bracing. Thus, elderly patients tend to require more bed rest. Immobility predisposes patients to venous thrombosis and life-threatening complications such as pulmonary embolism. It can also lead to pressure ulcers, pulmonary complications, urinary tract infections, and progressive deconditioning. In addition, it has been reported that bone mineral density decreases 0.25% to 1.00% per week in patients who are on bed rest. To reduce pain and thus promote early mobilization with conservative management, appropriate analgesics should be prescribed. Narcotics should be reserved for patients who receive inadequate relief from regular analgesics. A major concern with narcotics is physical dependence and other adverse effects, like gastrointestinal dysmotility and cognitive deficits. Physical therapy and rehabilitation are also important factors that expedite healing.

For patients with pathologic compression fractures, a course of radiotherapy may be indicated if the tumor is radiosensitive. Radiotherapy provided pain relief in approximately 50% of patients with VCFs due to myeloma or prostate or breast cancer. Operative Management

Operative management of VCFs has gained popularity, as it produces rapid, significant, and sustained improvements in back pain, function, and quality of life. Surgical intervention is indicated for those patients with intractable back pain failing conservative therapy or where there is evidence of impending or existing neurologic deficit, or where the spinal deformity is extremely severe. However, operative management of elderly patients does carry increased risk because of comorbidities.

There are several surgical options for the management of painful osteoporotic fractures. Vertebral augmentation through minimally invasive techniques such as kyphoplasty and percutaneous vertebroplasty are among the most popular. Other methods include use of the Osseokinetic Fix Spinal Fracture Reduction System (Alphatec Spine; Carlsbad, CA) and internal bracing. More invasive techniques, such as anterior and posterior decompression and stabilization with placement of screws, plates, cages, and rods are also available. These procedures, however, are challenging because it is difficult to achieve adequate fixation in osteoporotic bone.

Percutaneous vertebroplasty is one of the favored methods of treating painful VCFs. It encompasses augmentation of the vertebral body by injection of polymethylmethacrylate (PMMA). This method has been successful in treating pain, even eliminating the need for pain medication in some cases. Short-term results indicated that 75% to 100% of patients can have good to moderate pain relief after vertebroplasty, which also increases functional ability by stabilizing the fracture and preventing further vertebral collapse.

Vertebroplasty is most effective in compression fractures less than 6 months old. Its objective is not to restore the height of the vertebral body; in static fractures the average increase in anterior body height is only 2.5 mm. Contraindications of this procedure include infection of the vertebral body, coagulopathy, bone fragment retroplacement, and allergy to any of the substances used during the procedure, including PMMA cement and sometimes contrast agent. A number of potential serious complications of intraosseous injection of bone cement have been reported in the literature. One such complication is cement leakage, which ranged from 3% to 75%. Leakage into the spinal canal may result in neurologic deficit, such as radiculopathy or spinal cord compression. In addition, there was an increased incidence of new VCFs in the adjacent segments after vertebral body augmentation procedures. This is currently thought to be because of the increased stiffness of the treated vertebra compared to the adjacent vertebral bodies.

Despite the early encouraging results of vertebroplasty for VCFs, in 2009 Buchbinder et al found that vertebroplasty offered no benefit to patients with fresh and painful VCFs. In this placebo-controlled study, researchers performed sham surgery, which included percutaneous insertion of the needle and opening the PMMA monomer mixture to release the odor present during the real operation. MRI in 78 patients confirmed that vertebral compression fractures had been treated, and no improvement in symptoms was observed in patients who received vertebroplasty. Patients in both groups had similar, significant reductions in overall pain and similar improvement in physical functioning, quality of life, and perceived recovery. A similar study also showed that vertebroplasty and a sham procedure had equivalent results.

Another option for vertebral body augmentation is kyphoplasty. This involves placement of an inflatable balloon tamp in the fractured vertebral body. The balloon is inflated using a contrast agent so that position and inflation can be confirmed with image-intensified fluoroscopy. The inflation creates a cavity that can later be filled with PMMA or other types of bone cement. The risks associated with this procedure are similar to those of percutaneous vertebroplasty, however lower rates of cement leakage into the spinal canal have been reported. Kyphoplasty offers the potential for reversing spinal deformities: height restoration can be improved postoperatively by 50% to 70%, with a segmental kyphosis improvement of 6° to 10°. Thus, kyphoplasty has the potential to prevent the pulmonary and gastrointestinal complications associated with severe kyphosis. Kyphoplasty is most successful at restoring the height of the fractured vertebral body if it is performed within 3 months of the occurrence of fracture or onset of pain. Short-term results show that 85% to 100% of patients have good to moderate pain relief. Wardlaw et al found that kyphoplasty had improved functional recovery compared with nonsurgical treatment. Contraindications of kyphoplasty are similar to those of percutaneous vertebroplasty and include infection of the vertebral body, coagulopathy, bone fragment retroplacement, and allergy to any of the substances used during the procedure, including cement and contrast agent. Garfin et al found that short-term complications from this procedure were related to cement extravasation...
and damage from heat and pressure on the spinal cord and nerve roots. New techniques have been developed to minimize the risks of complications from kyphoplasty. Vesselplasty was developed in 2009 to decrease the rate of cement leakage: the inflatable balloon is left in the patient and filled with cement, thus reducing the risk of cement leakage. Alternatives to PMMA were also explored. An expandable polymer bone tamp, Sky Bone Expander (Disc-O-Tech Medical Technologies, Ltd; Herzliya, Israel), appeared to have good initial results. Cortoss (Orthovita; Malvern, PA), a bioactive, injectable, nonresorbable composite consisting of highly cross-linked resins and reinforcing bioactive glass fibers, was also found to have a more physiologic load transfer, and patients treated with Cortoss were less likely to be hospitalized for new vertebral compression fractures.

Conclusion

Compression fractures affect many patients worldwide and are most common in elderly populations, especially postmenopausal women. These fractures often cause incapacitating back pain and morbidity. The most important step in treating compression fractures is prevention and treatment of osteoporosis. When vertebral compression fractures become symptomatic and cause disability, several treatment options are available, including kyphoplasty to alleviate pain and correct the sagittal imbalance of the spine.

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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References

22. Lindsay R, Ruge RT, Strauss DM. One year outcomes and costs following a vertebral fracture. Osteoporos Int 2005 Jun;16(6):778-84. DOI: http://dx.doi.org/10.1007/s00198-004-1646-x
25. Garfin SR, Reiley MA. Minimally invasive treatment of osteoporotic vertebral body compression fractures. Spine J 2002 Jan...
Evaluation and Management of Vertebral Compression Fractures

Feb 2(1):1-4. DOI: http://dx.doi.org/10.3760/cma.j.isn.1008-1275.2010.05.003


Osteoporosis

If the compact osseous tissue becomes porous from the widening of the Haversian canals, the condition is termed osteoporosis … In the vertebrae and in the bones of the extremities, both concentric and eccentric atrophy take place, the bony trabeculae being thereby in places thinner or even entirely absorbed.

— A Text-Book of Special Pathological Anatomy, Ernst Ziegler, 1849-1905, German pathologist
A 68-year-old woman presented to the Emergency Department with left facial weakness (Figure 1). She reported upper and lower motor facial weakness. She was diagnosed with left-sided Bell’s palsy and treated with steroids. She returned two days later with chief complaint of left ear pain and swelling. She denied having fever or hearing loss. Ramsay Hunt syndrome (Herpes zoster oticus) by strict definition is a peripheral facial nerve palsy accompanied by an erythematous vesicular rash on the ear (zoster oticus) or in the mouth. The triad of ipsilateral facial paralysis, ear pain, and vesicles in the auditory canal and auricle is typically present (Figure 2). Various clinical presentations of facial paralysis and rash such as such tinnitus, hearing loss, nausea, vomiting, vertigo, and nystagmus can be present. This has been attributed to close proximity of the geniculation ganglion to the vestibulocochlear nerve within the bony facial canal. In a prospective study of patients with Ramsay Hunt syndrome, 14% developed vesicles after the onset of facial weakness. Thus, Ramsay Hunt syndrome may initially be indistinguishable from Bell’s palsy. The facial paralysis seen in Ramsay Hunt syndrome is typically more severe than Bell’s palsy, attributed to herpes simplex virus with a decreased probability of complete recovery. Retrospective studies have shown earlier administration of steroids along with antivirals within 3 days of symptom onset have 75% rate of full recovery versus only 30% if combined therapy is started 7 days after onset of symptoms. The typical combined therapy involves a 7- to 10-day course of famciclovir (500 mg, 3 times daily) or acyclovir (800 mg, 5 times daily), along with oral prednisone (60 mg daily for 3 to 5 days).

References

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ECG Diagnosis: Flecainide Toxicity

Flecainide acetate is a Vaughan-Williams class IC antiarrhythmic and a sodium channel blocking agent used mainly for the treatment of supraventricular dysrhythmias.1 Adverse cardiac effects include moderate negative inotropic action and depression of all major conduction pathways.2 With increasing concentration, flecainide’s action on conduction pathways is manifested on electrocardiogram as an increased PR interval and QRS duration. Toxicity is suggested when a 50% increase in QRS duration (0.18 sec) or 30% prolongation in PR interval (0.26 sec) occurs. The QTc interval can also be prolonged in cases of flecainide overdose.3 Treatment of acute flecainide overdose includes administration of activated charcoal (for patient presenting early in course of ingestion), administration of sodium bicarbonate (reverses action of sodium channel blockade), pressors (eg, dobutamine) for profound hypotension, and transthoracic or transvenous pacing.1,4

References

Figure 1. 12-lead Electrocardiogram from a 46-year-old woman with flecainide toxicity.
Demonstrates prolonged PR and QTc intervals with widened QRS complexes, right bundle branch block, and left posterior fascicular block patterns (flecainide level 2.0 µg/mL; normal range 0.20-1.0 µg/mL).

Figure 2. 12-lead Electrocardiogram from same patient obtained 24 hours later.
Demonstrates a normal sinus rhythm with resolution of the prolonged PR and QTc intervals, and narrowing of the QRS complexes (flecainide dose held for 24 hours).
CASE STUDY

From Morbid Obesity to a Healthy Weight Using Cognitive-Behavioral Methods: A Woman’s Three-Year Process With One and One-Half Years of Weight Maintenance

James J Annesi, PhD, FAAHB; Gisèle A Tennant, MSc

Abstract

Background: Obesity is a national health problem regularly confronting medical professionals. Although reduced-energy (kilocalorie [kcal]) eating and increased exercise will reliably reduce weight, these behaviors have been highly resistant to sustained change.

Objective: To control eating using theory-based cognitive-behavioral methods that leverage the positive psychosocial effects of newly initiated exercise as an alternate to typical approaches of education about appropriate nutrition.

Method: A woman, age 48 years, with morbid obesity initiated exercise through a 6-month exercise support protocol based on social cognitive and self-efficacy theory (The Coach Approach). This program was followed by periodic individual meetings with a wellness professional intended to transfer behavioral skills learned to adapt to regular exercise, to then control eating. There was consistent recording of exercises completed, foods consumed, various psychosocial and lifestyle factors, and weight.

Results: Over the 4.4 years reported, weight decreased from 117.6 kg to 59.0 kg, and body mass index (BMI) decreased from 43.1 kg/m² to 21.6 kg/m². Mean energy intake initially decreased to 1792 kcal/day and further dropped to 1453 kcal/day by the end of the weight-loss phase. Consistent with theory, use of self-regulatory skills, self-efficacy, and overall mood significantly predicted both increased exercise and decreased energy intake. Morbid obesity was reduced to a healthy weight within 3.1 years, and weight was maintained in the healthy range through the present (1.3 years later).

Conclusion: This case supports theory-based propositions that exercise-induced changes in self-regulation, self-efficacy, and mood transfer to and reinforce improvements in corresponding psychosocial factors related to controlled eating.

Introduction

Only 32% of the US adult population is presently at a healthy weight (body mass index [BMI] less than 25 kg/m²). Obesity, defined as a BMI of 30 kg/m² or greater, is now present in 34% of adults, with some subgroups reaching 50% prevalence. The probability of health risks, such as hyperlipidemia, hypertension, and type 2 diabetes, increase with the degree of overweight, with morbid obesity (BMI 40 kg/m² or greater) associated with the greatest likelihood of such problems.

Although an increase in physical activity and a reduction in energy (kilocalorie [kcal]) intake will reliably reduce weight, maintaining these behaviors has been remarkably difficult in our obesogenic environment, which frequently promotes inactivity and overeating. Recently, researchers have questioned whether efforts at weight loss through attempting changes in eating behavior remain justified given their predictable pattern of failure beyond the short term. Even with bariatric surgery, behavioral changes required to maintain the weight initially lost are difficult to sustain. It is clear that simply providing individuals with education in healthy eating and exercise is insufficient; however, such efforts persist as the dominant helping modality. It is suggested that such ineffective and atheoretical techniques be replaced by methods driven by variables derived from accepted health behavior-change theory. Although less frequently applied, theory-driven approaches have demonstrated improved effects; however, they also have lacked an ability to sustain weight loss and reductions in health risks when their focus is on severe energy restrictions (ie, “diets”), which is typical.

Exercise is a strong predictor of maintained weight loss; however, the basis for this is unclear. Although often used as an adjunct to dieting, some researchers suggest that the benefits of exercise go well beyond associated energy expenditures (which are often minimal in deconditioned individuals), and may foster psychosocial changes that carry over to improved eating. In the Winter 2012 issue of The Permanente Journal, we proposed a behavioral weight-management intervention based on social cognitive theory and self-efficacy theory, with exercise as an initial and central component. Consistent with those theories, findings supported that treatment-induced improvements in individuals’ self-regulatory skills, self-efficacy, and mood improved both their exercise and eating behaviors. Very importantly, psychosocial changes associated with the supported exercise transferred to better-controlled eating and weight loss. It was thought that these psychosocial changes would also enable long-term behavioral changes and a sustained healthy weight. In agreement with such thinking, the present case supports that with appropriate intervention and monitoring, these effects can be sustained for many years.
with previous findings,\(^1\)\(^4\) logging of both exercise and eating, and their implications for feedback on goal attainment and making behavioral adjustments when indicated, was a central tenet. The maintenance of weight loss by deferring reduced-energy eating until regular exercise and associated changes in targeted psychosocial factors is first established was thus supported. The following single case report illustrates this approach and provides an instructive example of its processes and effects.

**Case Report**

A white woman, age 48 years, with morbid obesity (BMI of 43.1 kg/m\(^2\)) initially wanted to change her sedentary lifestyle into a physically active one. A later goal (after 4 months of maintaining regular exercise) was to reduce her weight by half by also modifying her diet. Her physician supported those goals and communicated their links to improvements in her health. She joined a YMCA in the southeastern US that incorporated a standardized cognitive-behavioral protocol based on tenets of social cognitive theory and self-efficacy theory.\(^1\)\(^1\)\(^2\) (The Coach Approach). This protocol previously had demonstrated success at reducing the typically high rates of dropout from newly initiated exercise.\(^1\)\(^3\) The Coach Approach has been fully described elsewhere.\(^1\)\(^5\) To summarize briefly, it consists of six 1-hour sessions over 6 months that address an array of self-regulatory and self-management skills (eg, productive self-talk, self-reward, preparing for specific barriers, recovery from lapses). Long-term goals are identified, documented, and broken down into process-oriented short-term goals where ongoing progress is tracked graphically. Behavioral contracting is also used when specific expectations (eg, “increase weekly cardiovascular exercise from 60 to 90 minutes”) are agreed on and formalized. A proprietary computer program serves to standardize the process.

The certified wellness specialist who facilitated the woman’s one-on-one Coach Approach appointments continued meetings every 4 to 6 weeks beyond its completion to facilitate and support changes in eating behaviors, as well as to revise exercise modalities and volumes. Common themes throughout the meetings were as follows: 1) using self-regulatory skills (productive self-talk, self-reward, etc), 2) building self-efficacy (ie, feelings of ability and mastery) around health behavior change, 3) improving mood (eg, anxiety, depression, fatigue, vigor), and 4) logging all exercises completed via another computer program (FitLinxx, Shelton, CT) and logging consumption of food and associated kcal in a personal journal. According to the theoretical basis of the behavior-change processes, self-regulatory skills were intended to address common barriers that challenge maintained exercise and appropriate eating (eg, discomfort, social pressure). Taking long-term goals (eg, “lose 50 lb [22.7 kg] within 1 year”), breaking them down into short-term process goals (eg, “have soup prior to a meal to curb hunger”; “participate in at least 1 group exercise class each week”), and viewing progress through constant logging of corresponding data were intended to promote self-efficacy. Exercise alone, sometimes supplemented with mind-body modalities (eg, tai chi, yoga), was intended to improve both short-term and long-term mood.

The 4 months of exercise before the subject initiated energy reduction would theoretically enable a transfer of exercise-related improvements in self-regulation skills, self-efficacy, and mood to attain
CASE STUDY

From Morbid Obesity to a Healthy Weight Using Cognitive-Behavioral Methods: A Woman’s Three-Year Process With One and One-Half Years of Weight Maintenance

and sustain improvements in eating behaviors and a maintained healthy weight. More specifically, improved self-talk and feelings of behavioral control would transfer from adapting to exercise to adapting to controlled eating, whereas exercise-induced mood changes would improve emotional eating. Daily goals for energy intake were modified approximately every 3 months on the basis of current weight. For example, when the woman’s weight was 118 kg (Month 1), the daily goal was 1800 kcal. When her weight was 68 kg (Month 30), the goal was 1300 kcal. Guidelines were followed to reduce daily energy intake between 500 and 1000 kcal below the projected energy requirement for weight maintenance, but not below 1200 kcal.6

Data available for our analyses were derived from physician records; the FitLinxx exercise recording device; and the personal food log, which also included responses to items on self-regulation, self-efficacy, and mood initiated within The Coach Approach (adapted from validated inventories). Responses to these items ranged from 1 to 10, with 1 denoting an extreme negative response (eg, not at all; never) and 10 denoting an extreme positive response (eg, extremely; often). Weekly self-weighing was cross-checked with physician records for accuracy. Recording of energy intake and expenditure was cross-checked with validated calorie conversion tables, which adjusted for the present weight.17 The 6-month Coach Approach treatment was included in the YMCA membership, and a fee for the additional individual meetings was paid by the subject.

**Analyses**

We first reported the observed pattern of weight loss, contrasting it with accepted prediction models. Next, energy intake and energy expenditure through exercise were assessed. We then evaluated responses to the items related to the psychosocial factors of interest and assessed whether they predicted exercise or eating behaviors, or both. Finally, we evaluated the associations of changes in weight with measures of cardiovascular function and blood chemistry findings. In supplementary analyses, we assessed the relationship of several lifestyle behaviors, which were possibly associated with both weight and other health risks,18,19 with the observed changes in weight. Because the subject’s goal was to reduce weight by 50% (from 118 kg to 59 kg), the 3.7 years (44 months) to attain this was termed the “weight-loss phase,” and the 0.7 year (9 months) recorded after that was termed the “weight-maintenance phase.” However, in actuality, a healthy weight (BMI less than 25 kg/m²) was reached in 3.1 years (37 months) and remained through the period reported (an additional 1.3 years [16 months]). For some planned analyses, data were aggregated by quarter-year, beginning with the weight-loss phase.

**Weight and Energy Change**

Weight fluctuated by less than 1 kg during the 4 months before the subject’s alteration of kcal intake (January 2008). During the 3.7 years of the weight-loss phase, weight was reduced from 117.6 kg (BMI = 43.1 kg/m²) to 59.0 kg (BMI = 21.6 kg/m²), a 49.8% reduction. During Quarter 1 of the weight-loss phase, energy intake was 1792.1 kcal/day (standard deviation [SD] = 281.9). It was significantly reduced to 1452.9 kcal/day (SD = 207.2) during Quarter 15 (t = 9.25, p < 0.001, 95% confidence interval [CI] = 266.8, 411.6). Although not tracked by the subject at this point, the projected

<table>
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<th>Maintenance phase</th>
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*Height was 1.65 m throughout the 6.5 years.
--- indicates that the corresponding variable was not measured or reported at this time.
BMI = body mass index; bpm = beats per minute; HDL = high-density lipoprotein; LDL = low-density lipoprotein.
energy intake required to maintain her original weight was approximately 2300 kcal. The mean energy expenditure from exercise was 232.1 kcal/day (SD = 203.3) (80.4% from cardiovascular exercise; 19.6% from resistance exercise), and did not significantly differ over time. The observed pattern of weight loss was nearly identical to the projection based on a recent algorithm by Hall and colleagues, where there was an expectation of 50% of overall weight loss attained within the first year, and 95% of overall weight loss occurring by the end of the third year. In the present case, 52.0% of the woman’s 58.6-kg weight loss was lost in the first year and 94.6% was lost by the end of Year 3 (Figure 1). Use of the present data in the Harris-Benedict equation (which estimates kcal needed to maintain one’s weight) suggested that a mean energy deficit of 393 kcal/day occurred. If the commonly used “3500 kcal deficit = 1 lb (0.45 kg) loss” was applied throughout the weight-loss phase, the expected weight loss would have been 74.6 kg (27% greater than the loss observed, Figure 1). The linear bivariate relationship between the difference in energy intake and energy expenditure (from exercise), and weight, was strong ($r = 0.73$, $p < 0.001$). This indicated that most of the variance in weight was accounted for by this composite factor (exercise plus reduced-energy intake).

Within the 0.7-year weight-maintenance phase reported, its first quarter (Quarter 12) was contrasts with its final quarter (Quarter 15). There was an additional significant reduction in weight of 1% ($t = 7.85$, $p < 0.001$; 95% CI = 0.7, 1.2) from a mean of 60.2 kg (SD = 1.0) to a mean of 59.3 kg (SD = 0.6). There was also a significant increase in daily energy expenditure from exercise ($t = 4.69$, $p < 0.001$; 95% CI = 74.3, 182.2) from a mean of 193.0 kcal (SD = 143.6) to a mean of 321.2 kcal (SD = 217.9). There was no significant change in energy intake per day (mean = 1523.5 kcal, SD = 371.0 to mean = 1469.8 kcal, SD = 302.4).

**Effects of Psychosocial Variables**

Scores on items associated with self-regulation (eg, productive self-talk, self-reward, preparing for specific barriers, recovery from lapses) for exercise, self-efficacy (ie, feelings of ability and mastery) for exercise, mood (eg, anxiety, depression, fatigue, vigor), self-regulation for controlled eating, and self-efficacy for controlled eating all considerably improved over 3.7 years. After that, a plateau was observed, without any confounding ceiling effects. Consistent with previous research, substantial mood improvements occurred within 6 months. All other variables demonstrated a more linear increase throughout the weight-loss phase, with each score reported as “1” at the start of treatment, increasing to “8” (for self-efficacy and mood items) and “9” (for self-regulation items). On the basis of previous research using a social cognitive framework, scores for self-regulation for exercise, self-efficacy for exercise, and mood were simultaneously entered into a multiple regression equation as predictors of energy expenditure from exercise during 1.5 years (because this was the goal period to increase exercise volume). A large portion of the variance in energy expenditure from exercise (76%) was accounted for in our analysis. Also consistent with the previously referred-to behavioral research, self-regulation for controlled eating, self-efficacy for controlled eating, and mood scores were entered as predictors of energy intake during 3.7 years (because there was a goal to continue reduction in energy intake during the entire weight-loss phase). A large portion of the variance in energy intake (75%) was also accounted for. Although directionality of those associations could not be assessed, the strong relationships between self-regulation for exercise and self-regulation for eating ($r = 0.93$, $p < 0.001$), and self-efficacy for exercise and self-efficacy for eating ($r = 0.96$, $p < 0.001$) supported theoretical propositions concerning carryover effects from exercise to eating behaviors.

**Effects on Markers of Health Risks**

Physician records during 6.5 years were used to contrast mean values from before the weight-loss phase (September 2005 through November 2007) with mean values from the weight-maintenance phase (post-weight-loss phase: January 2012 through March 2012). Improvements in mean systolic blood pressure (from 129 to 119 mm Hg), diastolic blood pressure (83 to 82 mm Hg), total cholesterol (223 to 205 mg/dL), high-density lipoprotein (HDL) cholesterol (60 to 93 mg/dL), low-density lipoprotein (LDL) cholesterol (144 to 100 mg/dL), triglycerides (145 to 62 mg/dL), and fasting blood glucose (88 to 86 mg/dL) levels were found (Table 1). Improvements in total cholesterol/HDL ratio (3.7 to 2.2) and resting heart rate (95 to 62 bpm) were especially noteworthy.

Relationships of each of these variables with weight were in the expected direction, with significant correlations found for resting heart rate ($r = 0.94$, $p < 0.001$) and diastolic blood pressure ($r = 0.57$, $p = 0.016$), and a marginally significant relationship for systolic blood pressure ($r = 0.43$, $p = 0.064$). Strong correlations, but with minimal available data, were found between weight and levels of triglycerides ($r = 0.92$), LDL cholesterol levels ($r = 0.72$), total cholesterol/HDL ratio ($r = 0.97$), and fasting glucose levels ($r = 0.77$). Systolic blood pressure and LDL cholesterol levels changed from high to normal ranges, whereas diastolic blood pressure and total cholesterol levels remained in high ranges.

**Effects of Lifestyle Factors**

Self-reported consumption of water ($r = -0.84$, $p < 0.001$; mean = 7.2 glasses/day, SD = 0.9) and time viewing television ($r = 0.50$, $p = 0.030$; mean = 0.5 hours/day, SD = 0.3), but not sleep (mean = 6.6 hours/day, SD = 0.3), were significantly associated with weight during the weight-loss phase.

**Discussion**

Although atypically high compliance with energy reduction, exercise, and data recording was demonstrated, this case report indicates relationships between theory-based psychosocial factors, behavioral changes, and weight reduction that may inform the treatment of obesity. The highly successful results
that were observed suggest value in a behavioral theory-based approach to weight-management intervention that emphasizes improvement in use of self-regulatory skills, perceptions of ability to improve health behaviors (self-efficacy), and mood that are forged within an exercise context and carried over to improvements in eating behaviors. Specifically, a loss of 31 kg was demonstrated in the first year, with a total of 59 kg lost in 3.7 years (50% of the initial body weight). After reducing morbid obesity to a healthy weight in slightly more than 3 years, the healthy range was maintained for the additional 1.3 years reported. Exercise was maintained at approximately 1600 kcal/week (the equivalent of approximately 5.5 and 3.5 hours/week of moderate and vigorous walking, respectively), which is consistent with recommendations for weight control given by the National Institutes of Health. Energy intake restriction was never extreme, with sufficient kilocalories always consumed for nutritional requirements to be met. Over the weight-loss phase, weight loss averaged well less than 0.45 kg (1 lb) per week. Consistent with social cognitive and self-efficacy theory, self-reported self-regulation, self-efficacy, and mood predicted both exercise and energy intake, where these improvements led to a gradual, but stable, reduction in weight. Although water consumption and time viewing television were significantly associated with weight in the expected direction, it was not possible to determine if this was because of a covariance with other variables assessed, or if they were independent determinants. The subject reported that, for her, reducing television time was more associated with less nighttime snacking than increased sleep (which has been frequently hypothesized). As expected, the observed weight reduction was strongly associated with improvements in other health risk factors.

Findings suggest the viability of an alternate tactic to the predictably poor results derived by attempting to educate individuals on the need to eat better and exercise more. Comments about specific aspects of the present approach made by both the wellness professional and the subject suggest its practicality in the "real world." For example, the wellness professional said “[the subject] was able to use the skills and techniques regarding exercise triggers and relate them to her eating. She realized that she had the power to change her negative thoughts about doing exercise, and we transferred this to controlling her eating.” The subject said, “I use the dissociation technique from The Coach Approach [for exercise] to help me distance myself from the discomfort of hunger and/or eating when I’m anxious, nervous, sad, bored, etc”; and “The tracking is a way to stay honest, truthful, and correct immediately when I go off course. My mantra is track, weigh, adjust, adjust, course correct, back on track, stay on track, repeat.” Interviews with the subject at termination of the analyses also provided anecdotal support for key tenets of the process. For example, without prompting, she indicated in her own words that exercise-induced improvements in mood countered emotional eating, ongoing revisions of the behavioral contract facilitated a strong focus on short-term exercise and nutrition goals to be maintained, and self-rewarding (eg, obtaining a haircut or massage) for measured progress reinforced both “feelings of ability” and “commitment.”

**Conclusion**

Within the obesogenic environment that pervades, it now seems abundantly clear that sustained success in weight loss and maintenance requires more innovative behavioral approaches. These include new methods for empowering individuals with self-regulatory skills to adapt to the many barriers to a physically active lifestyle and controlled eating, facilitating confidence in their abilities to reach goals and adopt healthy behaviors over the long-term, and improving mood states that may effectively counter emotional and otherwise uncontrolled eating. Thus, medical professionals who frequently confront diagnoses of obesity in their patients but are limited in their time and resources for behavioral treatment, might consider referral options that adequately address the processes presently reported on. Community-based organizations with a focus on health promotion and following evidence-based behavior-change approaches, such as the one described here, may offer efficient and cost-effective opportunities for such referrals. Such an approach has the advantage of using replicable behavior-change processes that are highly adaptable to an individual’s goals, interests, and competencies. Possibly, further assessment and standardization of the approach described in the present case study and in other research will facilitate strategies that can be easily disseminated for intervention of obesity, a disorder increasingly being treated by surgical and other invasive methods.

**Disclosure Statement**

The author(s) have no conflicts of interest to disclose.

**Acknowledgment**

Kathleen Louden, ELS, of Louden Health Communications provided editorial assistance.

**References**

CASE STUDY

From Morbid Obesity to a Healthy Weight Using Cognitive-Behavioral Methods:
A Woman’s Three-Year Process With One and One-Half Years of Weight Maintenance

An Epidemic

According to the surgeon general, obesity today is officially an epidemic; it is arguably the most pressing public health problem we face, costing the health care system an estimated $90 billion a year. Three of every five Americans are overweight; one of every five is obese. The disease formerly known as adult-onset diabetes has had to be renamed Type II diabetes since it now occurs so frequently in children. A recent study in the Journal of the American Medical Association predicts that a child born in 2000 has a one-in-three chance of developing diabetes. (An African-American child’s chances are two in five.) Because of diabetes and all the other health problems that accompany obesity, today’s children may turn out to be the first generation of Americans whose life expectancy will actually be shorter than that of their parents.

— The Omnivore’s Dilemma: A Natural History of Four Meals, Michael Pollan, b 1955,
American author, journalist, activist, and professor of journalism
Reflection of El Capitan in the quiet autumn water of the Merced River is captured in this photograph at the gates of the valley. It is one of the most iconic views in Yosemite National Park.

Mr Larsen is a Clinical Microbiologist at the Northern California Kaiser Permanente Regional Laboratory.
CASE STUDY

A Rhinitis Primer for Family Medicine

Eric Macy, MD, MS, FAAAAI

A Composite but Very Common Case

Ms Jones is a 35-year-old woman who has lived in San Diego for 12 years. She has had, in her own words, “sinus” since about age 15. Her family has a history of “sinus” on her mother’s side. She has noted nasal congestion that worsens when around strong odors and perfumes. She often notes a runny nose. Changes in weather and travel bother her. She is often fatigued. She had severe nasal itching and sneezing, but only for several weeks in September at age 22, the second year she was in Baltimore, MD for graduate school. She has never had significant nasal itching or sneezing in San Diego. She grew up in Boulder, CO, where she also did not note nasal itching or sneezing. She is a nonsmoker. She currently wakes up with a headache and/or has photophobia about 4 days a month. She commonly self-medicates with over-the-counter “allergy” and “sinus” preparations. She feels transiently better after 2 cups of coffee in the morning. Her multiple previous head and sinus computed tomography (CT) scans results have always been “normal” despite her obvious clinical “sinus” problems. She has received multiple courses of antibiotics over the years, particularly when her headaches are worse after viral upper respiratory infections. If she tells her physician her “sinus” is worse, she gets a prescription of antibiotics almost every time. She has had delayed-onset rashes associated with sulfamethoxazole and amoxicillin. She saw an allergist in San Diego when she was 27, who told her she was allergic to pollens. She was given pollen immunotherapy for 3 years and noted no improvement in her symptoms. She then saw a head and neck surgeon for her nasal congestion and facial pain. A rhinoplasty was performed when she was 30. The sides of her nose now collapse when she breathes in and her nasal congestion has been worse since the operation. The rhinoplasty had no beneficial effect on her facial pain or headaches and her nose still runs. She then saw a neurologist when she was 34 years old who correctly diagnosed her with migraine and vasomotor nasal symptoms but recommended onabotulinumtoxinA injections, which she could not afford. Her head magnetic resonance imaging was normal. She then changed insurance because of her employer and she now is seeing you, her new Family Medicine physician at her new accountable care organization.

Eric Macy, MD, MS, FAAAAI, is an Allergy Specialist and Researcher in the Department of Allergy at the San Diego Medical Center. He is a Partner Physician with the Southern California Permanente Medical Group, and an Assistant Clinical Professor of Medicine at the University of California, San Diego. E-mail: eric.m.macy@kp.org.

Commentary

Symptoms can have multiple underlying causes. Correctly attributing symptoms to the underlying pathophysiology can be difficult and is at the heart of clinical medicine. More time spent up front, correctly diagnosing the problem(s), helps limit return visits. This improves both the patient’s and the physician’s satisfaction. This can also help limit overtesting and overtreatment, and reduce the cost of medicine, and improve patient outcomes.

Rhinitis and related problems, such as facial pressure and nasal congestion, are a very common reason people seek medical care. Ten percent to 20% of all patients have some, if only mild, allergic rhinitis symptoms. Patients look at direct-to-consumer ads touting how “allergy” and “sinus” pills will clear their heads and alleviate their “sinus” headaches. They see ads from physicians pushing the newest “revolutionary” surgical procedure or other “therapy” to open up their sinus passages and relieve their headaches, and they want it now.

It is often hard to do the right thing in clinical medicine. A patient comes in to see you and “knows” s/he has a “sinus” infection because his/her face hurts. S/he essentially demands an antibiotic. Remember your oath to first do no harm. When evaluating an individual with nasal symptoms, try to avoid accepting without question the diagnosis that the patient gives you, particularly if s/he is seeing you for the first time for the problem (Table 1). If a patient tells you s/he is having a “sinus” problem and s/he is really having a migraine, you are doing them a great disservice if you do not ask a few questions to tease out the important points and then adequately treat all of the real problems. S/he will also keep coming back for the problems if they have not been addressed.

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CASE STUDY

A Rhinitis Primer for Family Medicine

Very Basic Nasal Anatomy and Physiology

The nose is essentially a wet, pleated filter with a rich vascular bed (Figure 1). The holes in the front of the face are the anterior nares and the narrowest point, just behind the openings, are the anterior nasal valves. Vasodilation in the head causes nasal congestion. In healthy individuals, one side of the nose is typically more vasodilated than the other and shifts on a several-hour cycle. Alternating nasal congestion is, to some degree, physiologic. Lying down increases nasal congestion because there is less gravity pulling the venous return out of the head. Everyone’s nose is more congested at night. Elevating the head of the bed reduces nocturnal nasal congestion.

The nose works to raise the humidity of inspired air to 100% relative. There has to be more blood flow to the nose, and more mucus production, to humidify cold air. An average adult nose makes about 2 cups of nasal mucus daily. The mucus normally goes down the throat and is swallowed. Some people find this irritating at times and try to spit it out. This can become a habit. “Postnasal drip” is not a pathologic condition, it is normal physiology. Throat irritation, vocal cord irritation, and associated coughing may be pathologic.

Cilia line the nasal mucosal surfaces and beat posteriorly in a coordinated fashion to clear the nose of particulate matter trapped in the mucus. It takes about 20 minutes for mucus to travel from the front of the nose to the base of the tongue. Viral infection, intranasal drug abuse, and surgery disrupt ciliary function. The paranasal sinus cavities have no sensory nerves in their lining. This is why chronic sinusitis in individuals with immunodeficiency is not painful.

How to Approach the Workup of Patients Presenting with Rhinitis Symptoms

There are 4, often overlapping, syndromes or conditions that result in what patients perceive as “nose problems” or rhinitis (Table 2). Rhinitis is a common presenting complaint with which Family Medicine Physicians need to be familiar. Individually, these syndromes have chronic population prevalence rates of 5% to 25%. Collectively, symptoms associated with these syndromes have annual incidence rates near 100%. Most individuals do not seek medical care for rhinitis. With clinically significant nasal symptoms bad enough that an individual seeks medical care, there is often a complex interplay between 2 to 4 of these common syndromes, with or without other rarer cofactors. This is one of the times you need to resist Occam’s razor and not account for all of the symptoms with a single diagnosis (see Sidebar: Questions Patients May Ask You about Their Rhinitis That Hint at Underlying Diagnoses). Virtually all patients with allergic rhinitis have some irritant or nonallergic rhinitis also. Many migraine sufferers with vasomotor symptoms will have those symptoms exacerbated by irritant rhinitis, allergic rhinitis, or a pre-existing nasal valve effect. About 10% of individuals with migraines have clinically significant environmental allergy, and about 25% of individuals with environmental allergy have recurrent headaches, many with migraines.

Diagnosis and Management of Irritant Rhinitis

In Southern California and other parts of the US with poor air quality, as determined by the Environmental Protection Agency, irritant rhinitis has the highest-population prevalence of all the causes of rhinitis. Irritant rhinitis is one of the main reasons that we have air-quality problems. This is why we need to resist Occam’s razor and not account for all of the symptoms with a single diagnosis (see Sidebar: Questions Patients May Ask You about Their Rhinitis That Hint at Underlying Diagnoses). Virtually all patients with allergic rhinitis have some irritant or nonallergic rhinitis also. Many migraine sufferers with vasomotor symptoms will have those symptoms exacerbated by irritant rhinitis, allergic rhinitis, or a pre-existing nasal valve effect. About 10% of individuals with migraines have clinically significant environmental allergy, and about 25% of individuals with environmental allergy have recurrent headaches, many with migraines.

Table 1. Clinical Pearls

<table>
<thead>
<tr>
<th>Allergies itch</th>
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<tbody>
<tr>
<td>Antihistamines (less-sedating) only alleviate itching</td>
</tr>
<tr>
<td>Most rhinitis is irritant or nonallergic and nasal steroids do not help</td>
</tr>
<tr>
<td>Do not order food allergy tests for nasal symptoms or headaches</td>
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<tr>
<td>There is no such thing as a free lunch or a sinus headache</td>
</tr>
<tr>
<td>Migraines are often associated with vasomotor nasal symptoms</td>
</tr>
<tr>
<td>People hate to breathe through their mouth</td>
</tr>
<tr>
<td>People seek medical care for pain</td>
</tr>
<tr>
<td>People often call facial pain “pressure”</td>
</tr>
<tr>
<td>When someone seeks medical care for rhinitis, there is usually more than one thing going on</td>
</tr>
<tr>
<td>Do not treat clinically diagnosed sinusitis with antibiotics</td>
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</table>

Figure 1. The nasal cavity.

laws. Changes in temperature and humidity are two of the more common irritants that can also exacerbate irritant rhinitis. Irritant rhinitis is very common in patients with obstructive sleep apnea syndrome who are using continuous positive airway pressure. Other common factors associated with irritant rhinitis are particulate matter, dust, cleaning solvents, perfumes, other strong odors, and viral infections. Think of colds and clinically diagnosed rhinosinusitis as a subgroup of irritant rhinitis.

An average person catches about 4 viral upper respiratory infections per year, with children catching more colds than adults. Acute viral nasopharyngitis should never be treated with antibiotics. Antibiotics should only be used if sinus x-rays show air-fluid levels after at least 2 weeks of symptoms. True sinusitis is a rare complication of acute viral nasopharyngitis. Viral infections disrupt mucociliary clearance, and fluid can transiently accumulate in paranasal sinus cavities. If osteomeatal obstruction occurs for several days, there can be a clinically significant overgrowth of preexisting bacteria. In about 80% of individuals with clinically diagnosed rhinosinusitis, green, brown, or bloody mucus with nasal congestion, and the sensation of facial pain or fullness, symptoms clear within 2 weeks without antibiotics. A prospective trial showed that 3 days of antibiotics work as well as 10 days of antibiotics for clinically diagnosed rhinosinusitis. A prospective trial of 240 adults in England showed neither nasal steroid and/or antibiotics significantly helped clinically diagnosed rhinosinusitis.

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Specific clinical symptoms and physical findings</th>
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| Irritant rhinitis | Runny nose  
Congestion  
Nasal mucosal erythema |
| Migraine with vasomotor rhinitis symptoms | Runny nose  
Congestion  
Pain or pressure anywhere in the head  
Often normal nasal exam |
| Nasal valve effect | Nasal congestion worse with brisk inhalation  
Nasal congestion better when flaring the anterior nasal valve area open |
| Allergic rhinitis | Nasal itching  
Palatal itching  
Bilateral conjunctival itching  
Multiple sneezes in a row  
Pale nasal mucosa |

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Suggested therapy</th>
</tr>
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</table>
| Irritant rhinitis | Avoid irritants such as dust, fumes, smoke, smog, odors, and chemicals, and humidity and temperature changes as much as possible.  
Avoid chronic topical nasal decongestant use.  
Use nasal saline rinse (Neti pot or bulb syringe) for general irritation and excess nasal mucus.  
Use less-sedating antihistamines for mild itching.  
Use anticholinergic antihistamines for severe itching or for both itching and runny nose.  
Use topical anticholinergics (nasal ipratropium) for watery runny nose. |
| Migraine with vasomotor rhinitis symptoms | Avoid chemicals in foods that can affect blood vessel diameter or trigger migraine such as caffeine, alcohol, decongestants, tyramine in aged cheeses, nitrates, and monosodium-glutamate.  
Treat facial pain with pain medication.  
Use triptans for acute and infrequent migraine.  
Use divalproex sodium, sodium valproate, topiramate, metoprolol, propranolol, or timolol for migraine prevention.  
Use tricyclic antidepressants for frequent migraine to help reduce frequency and severity, to improve sleep, and to dry the nose through their anticholinergic side effects.  
Use topical anticholinergics (nasal ipratropium) for watery runny nose. |
| Nasal valve effect | Avoid chronic topical nasal decongestant use.  
No medical therapy is helpful for nasal congestion caused by a nasal valve effect.  
Use Breathe Right tape to prop the sides of nose open.  
Consider surgery to enlarge the anterior nares or stent the anterior nares open. |
| Allergic rhinitis | Promote allergen avoidance because it prevents all allergy symptoms.  
Routinely use nasal steroids to block mast cell-mediated allergic inflammation and raise the exposure threshold necessary to provoke clinical symptoms.  
Use less-sedating antihistamines if breakthrough itching or sneezing.  
Refer patient to the Allergy Department if symptoms are uncontrolled after one month of routine daily nasal steroid use. |
Questions Patients May Ask You about Their Rhinitis That Hint at Underlying Diagnoses

Irritant Rhinitis
- Why does my nose bother me with exposure to perfumes, strong odors, weather changes, or smog?
- Why am I allergic to everything?
- Why do nasal steroids not help my allergies?
- Why do I catch so many colds?
- Why has my nose been irritated since I started using a continuous positive airway pressure mask for my sleep apnea?
- Why was I never allergic to anything until I moved to Los Angeles?

Migraine-Associated Vasomotor Symptoms
- Why is my nose stuffy and runny when I have frontal facial pain and pain around my eyes?
- Why do I always have sinus headaches?
- Why do weather changes, alcohol, and international travel make my allergies worse and give me headaches?

Nasal Valve Effect
- Why can’t I breathe easily through my nose at night?
- Why do the sides of my nose collapse when I try to breathe in?
- Why has my nose been even stuffer since my rhinoplasty?
- Why does Breathe Right tape help me breathe better?

Allergic Rhinitis
- Why do I have nasal and throat itching with sneezing when I am around my cat?
- Why has my nose itched and I have often sneezed 6 times in a row since early childhood?
- Why did my nose and eyes itch every September when I lived on the East Coast, but not since I moved to Southern California?

There are also several much less common reasons that it is good to know a little about. These have population prevalence rates of less than 5%.

Rhinitis Medicamentosa
- Why is my nose always stuffy unless I use my over-the-counter decongestant nose spray (oxymetazoline)?
- Why is my nose even stuffer the day after I use my decongestant nose spray?

Nasal Turbinate Hypertrophy
- Why is my nose always stuffy, day and night?
- Why does Breathe Right tape not help my stuffy nose?

Nasal Polyps
- Why did my sense of smell go away 2 years ago?
- Why do I have these clear, grapelike sacks of mucus in my nose?

Nonallergic Rhinitis with Eosinophilia
- Why do nasal steroids help my runny nose and nasal congestion even though several allergists have told me I do not have any allergies?

There are many other very uncommon causes that can produce rhinitis symptoms and here are just a few of the more interesting.

Humoral Immune Deficiency
- Why have I had air-fluid levels noted on sinus x-rays and two different pneumonias noted on chest x-rays in the past 3 years?

Aspirin-Exacerbated Respiratory Disease
- Why does my nose stuff up, I get extremely short of breath, and almost die when I ingest any aspirin or any other nonsteroidal anti-inflammatory drug?

Primary Ciliary Dyskinesia
- Why do I get sinus infections, cannot have children, and my heart is on my right side?

Rhinosinusitis. Nasal saline rinse, oral decongestants, and pain medications are the treatments of choice for clinically diagnosed rhinosinusitis. If green, brown, or bloody mucus with nasal congestion and a sensation of facial pain or fullness persist for more than 2 weeks, then check sinus x-rays. A single Waters’ view is generally adequate. Sinus CT scans should not be ordered because of the significant and unnecessary radiation exposure associated with them. If maxillary air-fluid levels or frontal or maxillary opacification is present, then amoxicillin for 10 days is generally adequate therapy. If clinical symptoms along with air-fluid levels or opacification persist 1 month later, then a referral to an allergist is a reasonable next step. Referral to the Head and Neck Surgery Department for sinus symptoms should be avoided unless there is a surgically correctable problem identified in advance. Head and neck surgeons may obtain sinus CTs before surgery, but leave it up to them.

General treatment of irritant rhinitis is based on avoiding irritants as much as possible. Nasal saline rinsing can help get the irritant particles out of the nose. Antihistamines can help with itching and sneezing. Anticholinergics can help with a watery runny nose. Nasal steroids work by slowly depleting the nose of mast cells, the cells active in allergy. They do not help speed healing of the damage caused by viral infections or irritants. The immediate symptom relief some individuals note with nasal steroid sprays is just a rinsing effect from the propellant, which is essentially nasal saline.

Diagnosis and Management of Migraine-Associated Vasomotor Rhinitis

Vasomotor nasal symptoms occur in about 50% of individuals with underlying migraine and may be a very prominent symptom, even with relatively mild migraine pain. The key factor is identifying the underlying migraine. If there are recurrent headaches, associated with photophobia, worse with motion, and associated with nausea, the diagnosis of migraine is clear. If there is a sensation of facial pressure and nasal congestion
with a runny nose, it might not be so clear that migraine is a significant cofactor. If there are prolonged episodes of pain, verify the lack of maxillary sinus air fluid levels, via a single Waters’ view sinus x-ray. Sinus x-rays should not be done for facial pain lasting hours to several days. Management of the migraine generally reduces the nasal symptoms (Table 3). A key question to ask is, “In an average month, how many days does your face hurt, or do you have pressure or pain in your head?” You will be surprised how often people suffer with migraine in silence and are happy you are addressing their real problem.

Diagnosis and Management of Nasal Congestion Associated with a Nasal Valve Effect

Look at the sides of the nose during brisk nasal inhalation. If the sides of the nose collapse, there probably is a clinically significant nasal valve effect. Perform a Cottle test. Place your fingers on the patient’s face about 1 cm lateral of the anterior nares and pull gently outward while the patient is inhaling through the nose. There should be a dramatic increase in nasal airflow if there is a clinically significant nasal valve effect. Rounding out the airway in the nasal valve area, from the crushed oval shape present with a clinically significant anterior nasal valve effect into a circle, increases the cross-sectional area for airflow. If there is no significant increase in airflow and there is restricted airflow, then consider severe nasal septal deviation, turbinate hypertrophy, adenoidal hypertrophy, foreign body, or nasal polyps as the cause of nasal congestion (Table 3).

Diagnosis and Management of Allergic Rhinitis

Clinically significant environmental allergy symptoms are defined as nasal and palatal itching, sneezing, and/or conjunctivitis associated with exposure to airborne water-soluble protein allergens and the presence of antigen-specific IgE directed against those proteins. Antigen-specific IgE can be determined by prick skin testing or by enzyme-linked immunosorbent assay (ELISA) blood allergy testing. Just a positive blood allergy or skin test result does not define clinical allergy. About half of environmental ELISA or skin-test positive individuals do not have either clinical symptoms with exposure or significant environmental exposure, thus no clinical allergy. No treatment is needed for isolated positive allergy tests without clinically significant nasal allergy symptoms (Table 3). The scale on the commercial ELISA used by Kaiser Permanente (KP) Southern California immunology laboratory runs from <0.35 kilounits of antibody per liter (KUA/L) to >100 KUA/L. Generally, values less than 1 KUA/L are not clinically significant. About 40% of 13,000 sequential environmental ELISA panels done by KP Southern California between December 2011 and April 2012 were completely negative. The ELISA panels used in KP Southern California include 2 grass pollens, 2 weed pollens, 2 tree pollens, 3 mold spores, mite, dog, cat, and roach. Only about one-third of environmental ELISA panels by KP Southern California have any significant positives. This level of positive test results is only slightly higher than what is noted in random population blood sampling. Food allergy testing does not help predict or manage nasal allergy symptoms. Ordering environmental and food allergy panels should be limited to allergists.

If a person has positive allergy test results and congestion, but no itching or sneezing, just treating the allergy with avoidance and nasal steroids will often not help the congestion. Antigen-specific IgE testing should not be done for environmental antigens that are not present where the patient is living. Skin testing a person for ragweed pollen allergy in San Diego is just as useless as ELISA testing a person for olive tree pollen in Boston. Food allergy testing should never be done for rhinitis symptoms and never done as a screening test for allergy. If you are thinking food allergy because someone has oral itching and hives when they ingest a particular food on more than one occasion, please refer them to the Allergy Department. Avoidance is probably the best treatment for environmental allergy resulting in rhinitis symptoms in Southern California. Pol len levels are generally only transiently measurable in the spring in Southern California during wet years and, in some years, not significantly elevated at all.

Routine use of nasal steroids is the treatment of choice, after avoidance, for allergic rhinitis. The steroid nasal spray used today essentially works 2 weeks into the future. Nasal steroids deplete nasal and pharyngeal mucosa of mast cells. Since mast cells mediate the allergic reaction, intranasal steroids raise the threshold for exposure to airborne allergens necessary to provoke clinically significant nasal and pharyngeal allergy symptoms. There are no pharmacologically significant differences between any of the nasal steroid preparations. Some individuals prefer dry powders or aerosols over liquids. Cetirizine is the less-sedating antihistamine of choice. Up to 20 mg of cetirizine a day can be used in adults and 5 to 10 mg a day can be used in children. Fexofenadine and loratadine are even less effective at blocking itching, but also less-sedating. Less-sedating antihistamines are only helpful for itching and sneezing because they lack significant anticholinergic activity which helps dry up nasal secretions. Antihistamines do not significantly improve congestion.

If a person has pure allergic rhinitis symptoms, antigen avoidance and nasal steroids are very likely to completely control the itching and sneezing. If nasal steroids fail to work, something else is going on.

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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Reference


Suggested Reading

Such Little Upstart Disorders

I am suffering from my old complaint, the hay-fever (as it is called). My fear is, perishing by deliquescence; I melt away in nasal and lachrymal profluvia. My remedies are warm pediluvium, cathartics, topical application of a watery solution of opium to eyes, ears, and the interior of the nostrils. The membrane is so irritable, that light, dust, contradiction, an absurd remark, the sight of a Dissenter—anything, sets me sneezing; and if I begin sneezing at twelve, I don’t leave off till two o’clock, and am heard distinctly in Taunton, when the wind sets that way—a distance of six miles. Turn your mind to this little curse. If consumption is too powerful for physicians, at least they should not suffer themselves to be outwitted by such little upstart disorders as the hay-fever.

— Letter to Dr Holland; Sydney Smith, 1771-1845, English author and Anglican cleric
EDITORIAL

From Medical Records to Clinical Science

Mikel Aickin, PhD; Charles Elder, MD, MPH, FACP

Abstract

Medical records contain an abundance of information, very little of which is extracted and put to clinical use. Increasing the flow of information from medical records to clinical practice requires methods of analysis that are appropriate for large nonintervention studies. The purpose of this article is to explain in nontechnical language what these methods are, how they differ from conventional statistical analyses, and why the latter are generally inappropriate. This is important because of the current volume of nonintervention study analyses that either use incorrect methods or misuse correct methods. A set of guidelines is suggested for use in nonintervention clinical research.

Introduction

Data are entered into electronic medical record (EMR) systems at an enormous rate, yet the return in clinical research information is meager. There are several reasons for this, at least one of which can be addressed using current knowledge: the relatively limited awareness of the methods that are available for analyzing data in nonintervention settings. The purpose of this article is to explain in nontechnical language the issues in nonintervention clinical research and the methods that might address them. The accompanying technical supplement (available online at: www.thepermanentejournal.org/issues/2012/fall/4911-medical-records.html) explains the same issues in the more complex language of probability.

It is fair to say that the dominant view among medical researchers is that the only way to obtain reliable information about therapeutic effectiveness is through the highly developed technology of the randomized clinical trial (RCT). How this situation came about will be outlined below. The important point here is that this mentality rules out EMR-based research on philosophical grounds, with no attention to the methods that have been developed over the past 30 years for obtaining, in nonintervention situations, nearly the same information that would have been obtained if there had been an intervention. The issues in nonintervention research are indeed complicated, and the solutions are neither simple nor foolproof. Exactly the same could be said of the RCT, but unlike EMR-based research, the development of RCT methods represent a substantial cultural investment that would be put at risk if we were to acknowledge its problems openly. The best way to support the expansion of EMR-based research is to address its problems directly.

This article will develop two important themes. One is that EMRs generally have much larger samples than could ever be obtained in clinical trials. It does not seem to be generally recognized that this fact alone opens the door to methods of analysis that are difficult or impossible to apply in the RCT setting. The second theme is that because the data in EMRs have already been collected, there is ample opportunity to apply multiple methods of analysis to the same data. This is strongly discouraged in RCTs, where the plan of analysis set out before data collection must be followed. Both of these have had a common result: the conventional analysis methods that are used in RCTs have been developed to deal with inadequate sample sizes and the narrow latitude they allow for analysis. The characteristics of the analyses presented here should become more appealing when one accepts that EMR-based research is free of both these limitations.

Why Electronic Medical Record-Based Research Is Difficult

The notion that data collected from clinical practice might inform medical science goes back at least to the 1890s. Pierre-Charles-Alexandre Louis was one of the first to argue for the organized, routine collection of data on patients and treatments, with the evident intent of overthrowing the ossified opinions of the great men of medicine in his day.1 Louis did nothing to explain how the resulting data should be viewed, nor how they might specifically alter medical practice. Inspired by Louis, Jules Gavarret wrote the first book on biostatistics in 1840. He drew on the “calculus of probability” that had been recently developed by figures such as Laplace and Poisson. The method employed by Gavarret would be difficult to distinguish from the modern technique of statistical confidence intervals. It is a measure of Gavarret’s failure in the 19th century that the British founders of modern statistics in the early 20th century were evidently unaware that they were rediscovering his work.

One of the themes in the development of modern biomedical research was the belief that medicine would become more scientific to the extent that it followed the principles of experimental sciences, such as physics and chemistry. Although there were multiple attempts to realize this goal, the first self-conscious use of the methods that we now associate with RCTs was the trial of streptomycin for tuberculosis, designed and carried out by Sir Austin Bradford Hill shortly after the Second World War. It soon became apparent to the pharmaceutical industry that the RCT was admirably suited to generating the information required for regulatory approval, and virtually all subsequent methodological development of the RCT was dominated by this application. As the

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RCT became more rigidly defined and easier to carry out in a routine fashion, the idea became fixed that the RCT was the method of medical science, and that all other approaches were flawed. From the standpoint of finding out whether a therapy works, the key feature of the RCT is that the treatments are assigned by the researchers. This is to be done in an understandable way that can be appropriately accounted for when the data are analyzed. This feature of the RCT stands in stark contrast to the practice of medicine. In a research study, treatments are assigned to learn which ones are better than which others, not to maximize the benefits to the participants. When researchers speak of intervention in this setting, they are talking about research interventions, not medical or clinical interventions (see Sidebar: Randomized Clinical Trial versus Electronic Medical Records Research).

The data in EMRs are collected during everyday medical practice, in which treatments are prescribed with the intent of producing benefits. From the research perspective, this is nonintervention research, meaning that there are no research interventions. The fundamental problem this creates is that it is not clear what kinds of data analysis are appropriate. The advantage of routine use of certain statistical methods that have become automatic in RCTs is now lost. Unfortunately, many researchers analyzing data from EMRs use precisely the same approaches that are appropriate to RCTs. Depending on the circumstances, these researchers may confuse the therapeutic situations they study, and at worst they can produce misleading results.

Measurement. To understand the primary problem of analysis in nonintervention studies, it is useful to have some special terminology. We will use capital letters to emphasize that we attach specific meanings to certain kinds of measurements. The first of these is Treatment, which refers to two or more different actions that could be taken with therapeutic intent. We also have Outcomes, which consist of one or more ways of measuring therapeutic benefits. The basic purpose of clinical science is to learn about the causal effects of Treatment on Outcome. We will have something to say about causation here, because this issue cannot be avoided (Figure 1).

Common Influences. One might think that it is only necessary to observe Treatments and Outcomes in practice, to see how they are related, and then proceed accordingly. This was more or less Louis’s approach. The chief threat to the validity of this path is Common Influences. A Common Influence is a factor that influences both the Treatment selection and the Outcome. A factor is some underlying condition, action, or state that can be measured. The idea is that as we move through a clinical population we will see the Common Influences changing from one patient to the next, and associated with these changes are changes in both the Treatments assigned to the patients and their subsequent Outcomes. If the Common Influences effectively select patients who are likely to have good clinical courses subsequent to specific Treatments, then a simplistic analysis of Treatments and Outcomes will ascribe the beneficial results to the Treatments, rather than to the action of the Common Influences. This is the primary problem with research in nonintervention situations (see Sidebar: Clinical Perspective; Common, Treatment, and Outcome Influences).

Analysis in the Absence of Intervention. It will come as no surprise that almost all of the methods for analyzing nonintervention data come from the social sciences. The opportunities for interventions in the social sciences, unlike medicine, are few and far between. Even when interventions can be mounted, it is still exceedingly difficult to eliminate Common Influences. It is, however, often possible to identify what some of the Common Influences are, and we will see that this is crucial in the clinical science setting as well.

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**Figure 1. Roles of variables that are important in the analysis of nonintervention studies.**

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<table>
<thead>
<tr>
<th>Randomized Clinical Trial versus Electronic Medical Records Research</th>
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<tbody>
<tr>
<td><strong>Randomized Clinical Trial</strong></td>
</tr>
<tr>
<td><strong>Question:</strong> Which treatment, A or B, is better for all qualifying patients?</td>
</tr>
<tr>
<td><strong>Method:</strong> Emulate a scientific experiment (clear definitions of patient population, therapeutic maneuvers, intervention rules, outcomes, and efficacy analysis).</td>
</tr>
</tbody>
</table>

| **Electronic Medical Records Research** |
| **Question:** How can the better treatment, A or B, be matched to an individual patient? |
| **Method:** Intensive investigation of naturally occurring clinical data (inclusion of all patients, multiple definitions of treatment and outcome, attention to patient subgroups, effectiveness analyses designed to reduce confounding). |
Outcome and Treatment Influences

There are two other categories of measurements that need to be included in this discussion. The first is Outcome Influences. These are factors that influence the patient’s medical results, independently of the Common Influences. Recall that a Common Influence affects the outcome, but it must influence the Treatment selection as well. An Outcome Influence is distinguished by the fact that it does not influence Treatment. The second category is Treatment Influences. These are factors that influence the selection of Treatment, independently of the Common Influences. Again, like the Common Influences they influence Treatment; they do not, however, influence the Outcome.

It is convenient for the purposes of exposition to consider the special case in which there are only two Treatment options to be compared, say A and B. It is natural to imagine that these Treatments occur with certain probabilities in the clinical population, and that we could estimate those probabilities on the basis of an EMR sample. It is also reasonable to imagine that we could refine this procedure by estimating the probability of A (or B) for patients with specified characteristics. The mathematical way to do this is to express these probabilities as functions of patient measurements, using customary methods of statistical modeling. Some of these measurements might be factors that do not change (like male or female gender), whereas others (like blood pressure) could depend on the time of measurement. The point is that we can generally develop formulas for predicting Treatment, based on any selected class of measurements. Any such formula that correctly expresses the probability of Treatment given a battery of predictors is a propensity score. It measures the propensity for treatment, expressed as the probability of Treatment A given the values of the predictor variables.

Now consider the following sequence of analytical actions. First, develop a propensity score for A based on some set of prediction variables. Since the probability of B is just 1 minus the probability of A, only one propensity score is necessary. (This is not true when there are more than two Treatment options.) Second, stratify the patient population into groups having the same propensity score. (Assume there are no problems here; if one were to compute the propensity scores to the last decimal, then presumably no two patients would share a score, and we want to rule out this triviality.) Third, in each of these propensity groups (patients with equal propensity scores) investigate the relationship between Treatment and the battery of prediction variables that were used to determine propensity score. You will find that within each propensity-score group, Treatment is independent of all these prediction variables. This important finding was discovered by Donald Rubin and Paul Rosenbaum.

Here is how this helps with the problem of nonintervention. Suppose that we could identify and measure all Common Influences. Suppose further that we use precisely this set of variables to construct propensity scores. According to the Rubin-Rosenbaum result, within each propensity-score group, Treatment is independent of the Common Influences. This means that in the small sample of a propensity group, the Common Influences have ceased to act as Common Influences, because they no longer influence Treatment.

This approach for doing away with Common Influences is so attractive that propensity scores have been endowed by various authors with properties they do not have. Indeed, there is considerable confusion in the biomedical literature about what propensity scores do, and how to use them, with the level of confusion depending on the credulity of each author. These mistaken views are 1) that the purpose is to accurately predict treatment, 2) that logistic regression is the only relevant statistical model, 3) that Treatment Influences should be included, and 4) that controlling for a propensity score is the same as controlling for all of its component variables. In order not to interrupt the flow of ideas at this point, these issues are developed further in the Sidebar: Misapprehension About Propensity Score Analysis.

Rubin and Rosenbaum developed the propensity score for the modest sample sizes that are typical of RCTs. One of the advertised benefits of propensity scores is that in the analysis one only needs to condition on a single value (the propensity score), irrespective of how many variables went into it. The situation is completely
Misapprehensions About Propensity Score Analysis

To Predict Treatment. The first misapprehension about propensity scores is that their purpose is to predict Treatment as accurately as possible. It is easy to see that this cannot be true. If one were able to predict Treatment perfectly using a battery of prediction variables, then each propensity-score group would have either every patient on Treatment A or every patient on Treatment B. There would be no basis for comparing outcomes within a propensity-score group, and so rather than eliminating the Common Influence problem, the analysis would have created a far greater problem.

The fact is that the variables that should determine the propensity score are the Common Influences, neither more nor less. If one were to mistakenly include an Outcome Influence in the propensity score, this would probably do no harm, although it is difficult to say in general what the consequences would be. On the other hand, including a Treatment Influence can be a serious mistake. The reason is that if an analysis is conditional on a propensity score, then it is also partially conditional on the Treatment Influence that was included in the propensity score. This means that the analysis might build in an association between Outcome and Treatment Influence, at least to some degree. But this amounts to converting a Treatment Influence into a Common Influence, precisely the opposite of what is intended.

Another type of variable that must be excluded from a propensity score is a Mediator. This is a variable that explains the mechanism by which the Treatment produces its effect. The idea is that the Treatment first alters the value of the Mediator, and then the change in the Mediator directly influences the Outcome. It is widely recognized that including Mediators in statistical models can reduce, obliterate, or even reverse a valid treatment effect, and presumably the same warning applies to their inclusion in propensity scores.

The Role of Logistic Regression. The second misapprehension is that since one only needs to predict Treatment A, a logistic regression is indicated. This is because logistic regression is the most frequently used method for assessing a yes/no outcome (e.g., Treatment A versus Treatment B). The Rubin-Rosenbaum result only applies to the correct formula for predicting A in terms of the prediction variables. It does not apply to a prediction formula that differs from the correct one. If the correct propensity score is not of logistic form, then the Rubin-Rosenbaum result may not hold for the logistic regression approximation to the true form. There are two reasons this is concerning. Practical research results suggest that using the wrong form for the propensity score can have serious consequences for the analysis. Secondly, one will typically try different batteries of prediction variables, but then the fitted logistic regressions are inconsistent with each other. (If you drop a variable from one logistic regression, then this should lead to a propensity score averaged over the dropped variable and conditional on all the retained variables, but this will never be of logistic form.) This inconsistency cannot occur if the correct form for propensity is used.

Pooled Analysis. The third misapprehension is that a pooled analysis is appropriate. The theory says that the beneficial effects of propensity-score matching happen within propensity groups, so group-level results should be used for the analysis. That is, the group becomes the unit of analysis. Many investigators obtain the propensity groups by matching patients from the two treatment groups. They then pool all the patient data and perform an analysis that would be appropriate if a randomized trial had been done. One problem with this strategy is that the theory does not imply that Common Influences will be independent of Treatment in the pooled sample. In fact, it can be shown that the only way this can happen is if the propensity score is independent of Treatment, which is precisely what would not happen if it were correctly defined. (Judging from the literature, this is widely unknown, so a demonstration is provided in the accompanying technical supplement available online at: www.thepermanentejournal.org/issues/2012/fall/4911-medical-records.html.) The second problem with pooling is that by matching patients on the basis of their propensity scores, a dependency is created between the members of each pair. The validity of the pooled analysis depends on the patients being independent of each other. This condition is violated by the induced correlation between matched patients, raising an important issue about whether the results of the pooled analysis are correct. These observations are relevant because the pooling fallacy is exhibited throughout the published applications of propensity scores.

Controlling for All Variables. The fourth misapprehension is that controlling for a propensity score is the same as controlling for all of the variables that went into it. In the common logistic case, conditioning on the propensity score is exactly the same as conditioning on a certain linear combination of the battery of prediction variables. It is obvious that fixing a linear combination is not the same as fixing each individual variable. Researchers misguided in this regard seldom check their propensity groups to see whether they are truly homogeneous with regard to Common Influences. If the logistic propensity score contains many variables, it is likely that many of them will not be matched across patients in a propensity group, which may undermine the analysis.

Reference

with Treatment and/or Outcome without having to identify the nature of the association. But we definitely want to know what Treatment causes what Outcome.

**Prediction**

One place to start this discussion is in clinical practice. Suppose that, following Louis, we carefully collect Treatment and Outcome data in a given clinic for one year. If the clinic does not change its method of operation and continues seeing patients from the same population, then we would have a good basis for saying what the relationship between Treatment and Outcome would be the next year. It is because the clinic will work the same way and on the same type of patients, and because the Treatment → Outcome relationship is causal, that our prediction is justified.

In practice, the way we apply the idea of causation is to assert that some process that happens under one set of circumstances will continue to happen under some other set of circumstances. This means that the phenomenon we observe is portable. When engineers test the strength of a building material in a laboratory (one set of circumstances), they fully expect that the material will have the same properties when it is used to build something (a separate set of circumstances). In the clinical example, the reason for observing the Treatment → Outcome relationship is to modify it if there is an indication to do so. If Treatment A seems to work better than Treatment B, then next year we should use A more than B, and things will improve. This will only happen, however, if the Treatment → Outcome relationship is causal, meaning that it can be ported from the first year to the next.

**Causation in Randomized Clinical Trials**

Randomized drug trials apply the principle of portable causation in the following way. The patient pool is randomized into two groups, one of which receives A, the other B. Group outcomes are summarized and compared at the end of the trial. The winning treatment is then recommended for everyone. The causal assumption is that the pattern seen in the trial is portable to clinical practice. The objections that are often raised here are 1) RCTs rarely sample the patient population in any meaningfully representative sense, and 2) treatment administered in a trial may differ in important ways from the “same” treatment administered in an ordinary clinical setting. Both of these arguments challenge portability, suggesting that causation is in fact a necessary assumption for an RCT, not a magical consequence of randomization, as is frequently claimed. The counterargument is that random selection of Treatment eliminates all potential Common Influences, whether they are known or not. This means 1) the search for Common Influences for a propensity score is unnecessary, and 2) Treatment is independent of potential Common Influences in the entire sample, not just in narrow propensity groups or MCGs.

**Causation in Electronic Medical Records Research**

EMR-based studies generally preclude facile causation arguments. If Treatment → Outcome relationships are observed, but they are partially produced by Common Influences, then the same pattern may not result if the method for selecting Treatments is changed. Thus, if identifying winning treatments is viewed as the purpose of medical research, we must consider the fact that the superior Outcomes observed with Treatment A may not be repeated when the Common Influences change. This is the core argument for removing Common Influences in EMR-based research. Researchers want to identify a Treatment → Outcome causal relationship that can be ported to a similar but different set of circumstances, but it is difficult to argue that this has been achieved unless Common Influences have been addressed. This is the fundamental reason why researchers using RCT methods of analysis in an EMR-based setting may be creating problems instead of solving them (see Sidebar: Clinical Perspective: Causation and Adjustment).

**Why Not Simply Adjust?**

The argument for propensity scores or MCGs may seem excessively complicated, raising the issue, why can we not use simple, conventional methods of analysis? Aren’t these methods far easier means of accomplishing the same thing?

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**Clinical Perspective: Propensity Scoring and Matched Comparison Groups**

On the basis of electronic medical record (EMR) data, it is possible to predict whether a patient will be assigned a certain treatment. For example, consider an EMR-based study assessing outcomes for men with clinically localized prostate cancer undergoing either radical prostatectomy or radiation therapy. Retrospective analysis of EMR data might suggest that certain characteristics, such as age, level of education, income, and tumor staging, predict which treatment will be assigned. Then, given the values for each of these factors (here in this case) for an individual patient, we can calculate the probability of the patient’s being assigned one treatment or the other. The formula for this probability is known as a propensity score.

Participants receiving different treatments can then be matched according to propensity score. For example, for each patient in the prostatectomy group, a radiation therapy patient with the same propensity score would be included. Suppose we were to then stratify the sample into groups having the same propensity score. It has been shown that, within each propensity-score group, treatment assignment is independent of each of the individual prediction variables. So, in our example, within each group of patients with identical propensity scores, treatment assignment will be statistically independent of age. This approach, then, allows us to effectively account for potential Common Influences in the setting of a nonintervention EMR-based study.

One drawback of this approach is that patients within a propensity-score group may differ drastically with regard to individual variables contributing to the propensity score. For instance, there could potentially be great heterogeneity of income for those assigned prostatectomy versus radiation, despite identical propensity scores. However, in EMR-based research, this pitfall can potentially be avoided by forming matched comparison groups of patients with similar or identical values for the entire battery of prediction variables. This is a unique advantage of EMR-based research because of the potential for very large samples.
By “conventional analysis,” we mean fitting customary linear models. An example is linear regression, in which the Outcome is regressed on a Treatment indicator and the presumed set of Common Influences. Virtually all models used in biomedicine are variants of linear regression. For example, logistic regression is also a linear model in which the natural log of the probability of an Outcome success is linear in the explanatory effects. The same may be said of proportional hazards modeling for survival, and a variety of other, more complex models.

The essential difficulty with any kind of modeling is that models only summarize the patterns observed in the data; they do not generally have the capacity to reverse flaws in the study design. For example, if one uses a method of sampling a population that is unrepresentative (it persistently oversamples some kinds of people and undersamples others), then taking the average of an Outcome and computing a confidence interval does not overcome the poor sampling in the design; it simply portrays the consequences. In the same way (albeit with more complexity), a regression equation does not have the ability to correct unwanted features of a design. In common language, when we include Common Influences in a regression equation, it is often said that we are adjusting for them. But it is unclear what this actually means. It certainly does not mean adjustment in the usual epidemiologic sense (to summarize outcomes in strata, then pool using stratum probabilities from a standard population), in which the intent is obvious and the method transparent.

The language that is usually used to interpret regression equations contributes to the confusion. When a regression coefficient is interpreted, it is often said that it captures the effect of changing the corresponding variable by 1 unit, while holding all other variables fixed. Although this is correct in the language of mathematics, it need not be correct in the data on which the regression is based. In a typical EMR study, each patient receives one of the available Treatments. No Treatments are changed, and so one must search elsewhere for the meaning of “changing Treatment.” Given how the regression equation is constructed, “changing” a Treatment means proceeding from a patient who has one Treatment to another patient who has a different Treatment. If there are Common Influences, then they will tend to change too (otherwise they would be independent of Treatment, and not be Common Influences). It is thus meaningless to talk about changing Treatment while holding Common Influences constant, because this is not possible with the data that the regression summarizes. Even more dangerous, however, is the implication of the conventional mathematical interpretation of a regression coefficient, that it captures the causal effect of changing treatment. This is because it is a short step from saying, “the effect of changing Treatment while holding Common Influences fixed” to saying “the causal effect of Treatment.”

The whole point of propensity scores or MCGs is to change the basis of the analysis, to recover to the extent possible the independence of Treatment and Common Influences that would have been achieved directly by randomization. The price to be paid for this is that the freeing of Treatments from Common Influences only happens in patient subgroups, either propensity-score groups or MCGs. This beneficial effect does not spread out over the entire patient sample and does not justify the fitting of overall models, as would be appropriate in an RCT.

If one is determined to fit an overall model to the entire pooled sample, then it appears to be necessary to make some assumptions about how the treatments were selected. Heckman laid the groundwork for such an approach in economics. His method has been adapted to apply to treatment groups in medical research. One of the simplest versions starts with a logistic regression of Treatment on the presumed Common Influences. This gives a propensity score p for each patient. In a regression model for the Outcome, an additional term is added: the product of the treatment indicator (t, a 0/1 variable) and a function of the propensity score. Specifically, the added term is: (t - p)·\[1/p\ln(p) - (1-p)/\ln(1-p)]/p(1-p).

Somewhat surprisingly, this simple change in the analysis often results in a substantial reduction in the bias in the treatment effect estimate, at the price of a decrease in its precision. The additional term in the previous paragraph has the form of an interaction between the treatment residual (the part of the treatment not predicted by the propensity score) and a function of the propensity itself, which is of course a function of the Common Influences. The success of Heckman’s procedure rather strongly suggests that performing an analysis that simply injects the propensity score directly into an explanatory linear model is not the correct approach, which is again concerning because of the flexibility with which this maneuver appears in the literature.

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**Clinical Perspective: Causation and Adjustment**

Consider the example of a randomized clinical trial (RCT) comparing drug A with placebo for management of depression. Suppose that the trial shows an improvement in depression scores for the treatment group, one that is both statistically and clinically significant. The assumption is that the relationship is causal, and that the treatment effect of drug A will thus be portable to other patient populations and clinical settings.

In reality, however, the sample recruited to such a clinical trial may not be broadly representative. For instance, if participants were recruited from psychiatric practices and then treated at a research clinic, all in 2008, results may not be generalizable to patients presenting to and treated in primary care settings in 2012. Thus, when interpreting RCT results, we may view portable causation as the underlying assumption, rather than the inherent consequence of randomization.

Statistical modeling cannot guarantee a portable result, and adjusting for covariates in a regression equation cannot correct shortcomings in the study design. In our example, then, primary care physicians in a community clinical practice may have difficulty applying the results of this trial to their patients.

An electronic medical records-based study of the same drug may have much larger samples, allowing for alternative statistical approaches. Treatment effects can be estimated for each homogeneous, matched comparison group, potentially providing insight into which types of patients are most likely to benefit from the intervention.
Summary: Steps for Conducting an Electronic Medical Research Study

The considerations we have laid out can be used in various ways for different types of EMR-based studies. We do not want to create a new orthodoxy for EMR research, because that is the last thing we need. But it does seem worthwhile to propose steps that should be employed unless there are reasons not to do so.

1. **Identify the Common Influences.**

There are many ways to detect statistical associations, so there are many ways to implement this step. It would certainly be appropriate to fit regression models (of various types) in which Outcomes were explained by Treatments and candidate Common Influences, and Treatments were simultaneously explained by the same Common Influences. In the case of a new Treatment compared to usual care, it might be more appropriate to look for factors that influence Outcomes among the usual care patients, and then turn to the whole sample to see whether they also influence selection of the new Treatment. In any case, a key point here is to remove Treatment Influences from the subsequent computation of propensity scores or forming of MCGs. Because of the importance of this step, previous research or clinical opinions may make critical contributions. Because analysis is potentially sensitive to the choice of Common Influences, multiple possibilities might be retained for subsequent analyses.

2. **Form propensity groups or MCGs.**

For each possible selection of Common Influences, create nonparametric MCGs if possible; failing this, create parametric propensity groups. A variety of methods for doing this have been developed, although they have been oriented toward settings with relatively few patients. The results of Step 1 should inform this process. In particular, they should suggest an appropriate form for the propensity score. Again, because of the sensitivity of the analysis, it may be wise to use several forms for the propensity score.

3. **Estimate a Treatment effect in each homogeneous patient group.**

Customary estimates, such as averages or fractions, will usually be appropriate. However, if the patient groups are large enough, more complex models might be used. In particular, if Outcome Influences vary in a patient group, then it seems wise to “adjust” for them in some fashion. (This raises the issue of whether Outcome Influences should be used for matching in MCGs; this question needs to be decided on a case-by-case basis.)

4. **Evaluate whether Treatment effects vary over homogeneous patient groups.**

With one Treatment effect estimate per patient subgroup, the subgroups themselves can be regarded as the units of analysis. Each subgroup has a set of measured characteristics (the values of the Common Influences, and possibly Outcome Influences), which can be related to Treatment effects using customary statistical methods. The reason this makes sense is that the Treatment effects have presumably been freed from the effects of Common Influences, so they represent genuine within-subgroup causal effects, and the issue is to see whether these effects vary in some systematic fashion across different homogeneous patient subgroups.

For an example following most of these steps, see Newgard et al. Similar approaches can be found in Stukel at al., Sun et al., Smeeth et al., Rutten et al., Polsky et al., and Pollack et al. Not all of the latter studies were equally careful to exclude Treatment Influences from propensity scores.

The presentation of final results depends on Step 4. If there is substantial homogeneity of Treatment effect across patient subgroups, then a very simple story can be told. This is in some ways the equivalent of a conventional RCT, without the cumbersome analysis to compensate for the absence of randomization. If Treatment effects differ in understandable ways across MCGs, then this may be important information that deserves careful presentation. Here is one case in which EMR research can clearly outdo the RCT, taking advantage of a larger number of patients to leverage more patient-specific clinical recommendations. In the worst scenario, the Treatment effects vary in ways that are neither explainable nor ignorable. In this case, one has to consider whether there are substantial problems in the source EMR data that have not been taken into account, despite the best attempts to do so.

An important theme in this summary is the employment of multiple strategies. This is in stark distinction to RCT analyses, where the conventional wisdom is that one should plan all analyses in advance and not deviate from that plan even in the face of considerable evidence that it can be improved. In nonintervention research, each specific approach to analysis has its own strengths and weaknesses, and it is only by trying several of them that one builds confidence in the final results.

**Conclusions**

There are methods for analyzing data from nonintervention studies that attempt to reveal what an intervention study would have found. These methods are more complicated, primarily because of the requirement that Common Influences be explicitly identified, rather than ignored, as is customary in RCTs. Ordinary multivariable and multivariate statistical methods are appropriate in the search for Common Influences, but they are generally inadequate for the purpose of final analysis, where MCGs or propensity-score groups must be used. A significant advantage of EMR-based research is the possibility of increasing the therapeutic focus of patient-specific treatment. This and other benefits of EMR research are consequences of the generally large patient samples and the fact that EMR data directly reflect clinical practice, which should be the goal of clinical science.

As suggested in the Introduction, the concepts of this essay are not new; they are simply underappreciated in EMR-based research. William Cochran, one of the statistical pioneers of methods for nonintervention studies, formulated many of these ideas, although he used different language and some approaches had not yet been developed when he did his work, in the 1950s and 1960s. His student Donald Rubin, who worked in the 1970s and 1980s, is responsible for many of those approaches. The dominance of the RCT in biomedical research has fostered the view that its methods, rather
than a response to its limitations, reflect universal principles that should be followed in all areas of clinical science. In the case of EMR-based research, this view is neither true nor helpful.

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References
2. Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. Biometrika 1984 Apr;71(1):41-55. DOI: http://dx.doi.org/10.1093/biomet/70.1.41

Counting

Some seem to have been misled by the term numerical system, which has been said to be that of M Louis. They seem to have thought that his peculiarity consists in this merely, that he counts . . . We call some experienced, scientific. Is it not by comparing individual cases, by adding what they have observed in one to what they have observed in another, by counting, that they have become so?

— Researches on the Yellow River, George Cheyne Shattuck Jr, MD, 1813-1893, American physician
In the case of communication methods for those who suffered from amyotrophic lateral sclerosis, I thought it would be helpful to find an effective way to communicate more. After 5 months in the intensive care unit (ICU), Mr P had amyotrophic lateral sclerosis (ALS), and he would answer by looking at one of the paddles. Staff members were to place the paddles in his field of vision and ask yes-or-no questions, and the other paddle was marked “no.”

When I (AMF) first saw Mr P, age 49 years, he was in his bed, near to me, quite still, but very active in moving his eyes and making physiognomic expressions, which were relatively subtle, of satisfaction or of discomfort. Since his admission to the intensive care unit (ICU) 5 months earlier, he had been dependent on mechanical ventilation and prolonged hospitalization. Mr P had amyotrophic lateral sclerosis (ALS) and a tracheotomy. He had gradually lost muscle movement and was inert except for eye movements, his only means of communication with the world.

Before I approached the patient, greeted him, and introduced myself, I was instructed by the ICU staff on the use of two small paddles that lay beside his bed. One paddle was marked “yes,” and the other paddle was marked “no.” Staff members were to place the paddles in his field of vision and ask yes-or-no questions, and he would answer by looking at one of the paddles.

Because I knew so little about him and his needs and desires, I thought it would be helpful to find an effective way to communicate more extensively. I knew that there were a number of communication methods for those who suffered from, for example, locked-in syndrome. The well-known case of Jean-Dominique Bauby, whose movement was restricted to one eye after a stroke, led staff of the hospital where he was confined for 15 months to develop a code of communication by blinking.1

The method that was used with Bauby is generally called Partner-Assisted Scanning (PAS) and uses a board with letters arranged according to their frequency in the patient’s language. The letters are arranged in lines, in order from the most common letters to the least common letters, in the direction of reading.2

We researched letter frequency in Portuguese, and Mr P’s primary language, and created a square table, 20 cm on each side, with 4 lines.

Mr P agreed that he would move his eyes to his right to indicate “no” and to his left to indicate “yes.” Having established this basic code, we started using the letter board. First, I explained to him that using the letter board would allow him to communicate more effectively and extensively. I asked if he would like to try this method, and Mr P signaled yes. After five months of hospitalization, this would be the first time he would try to form words to directly communicate preferences.

I thought it would be best to begin by asking him about what he wanted at that moment. “Mr P, you will tell me what you want, okay? Think about what you need, what you desire at this moment, and try to summarize it in one word. Let’s start this way, okay?” I asked if he understood my proposal and repeated it. I asked if he was able to see the letters on the board. I moved the board closer and farther away and repeatedly asked, “Closer, farther?” to find the distance most comfortable for him. I continued, “Is the first letter of what you want in the first line?” He moved his eyes to his left, “Yes.” I confirmed that he was able to hear me, “Can you clearly hear me?” After his confirmation, I looked intently into his eyes and began to slowly name the letters, “A, E, O, S, R...” After the letter R, he moved his eyes to the left, “R?” He again replied, “Yes.” In each letter, I always asked this question at least twice, to ensure the accuracy of the procedure. In about 10 minutes, we had already formed a word, “Remedy.”

In approximately 15 minutes, he had formed his first sentence after 5 months in the ICU, “Remedy for throat.”

The new possibility of communication with Mr P seemed to have a significant impact on his quality of life, which was so limited by the circumstances. The ability to communicate more effectively led to the most significant and profound interactions between Mr P and members of the ICU staff. First, I would ask him about desires we already knew of, and he would answer

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“yes” or “no”: if he wanted to be aspirated; if he wanted to change his position in bed; if he wanted to change the bed position; if he felt pain, nausea, thirst, hunger, sleepiness, dizziness, or sadness; if he wanted to watch television (and which channels and at what volume); if he wanted to listen to the radio, news, or music; or if he wanted to say something in particular through the letter board.

After accurately understanding his desires, I would then attempt to make him comfortable. In some cases, it was very simple and basic: just move his legs, arms, or bed position.

There were many intense, emotionally charged situations marked by pain, suffering, anguish, and relief. Once, early in our meetings, I was told that Mr P had asked several times, at dawn, in previous days, for withdrawal of mechanical ventilation. I went to him to investigate the incident: “Mr P, as soon as I arrived this morning, staff members told me that you asked them at dawn to turn off the devices. Is it true? Do you confirm? “No,” he answered—repeatedly. After confirming his negative response, I proposed the matter in another way: “Listen, what’s going on? Did you ask someone to kill you? Do you want to die? Is that it?” “Yes,” was his response, as tears streamed down his face. He wept intensely. “I understand, Mr P. You are suffering a lot, right? And for so long. Is that correct?”

More tears. Then, it became clear that turning off the devices would provoke a very painful death by suffocation. Mr P wanted to die, but in a less painful way. It was very difficult for me to hold back tears in the face of that powerful outpouring of grief and anguish. I reflected on this episode for a few days, thinking deeply about our limited existence in this world.

During a visit from his sister, who could not come frequently, he glanced at me, asking to say something. His first few letters of a new sequence were, “Ahu ... ” “Ahu ... what?” And, in an instant, I understood: “A hug? ... Is that it, Mr P?” He smiled without blinking. He wanted a hug from his sister. She, a little hesitantly, touched and hugged him, and both wept silently.

His sister left, and then one of his sons, who looked about 14 years old, came beside his bed. Mr P repeated the same request: “A hug,” I commented: “Today is hug day. A day of intense emotions.” Such is the immense value that a hug offers in certain circumstances.

There were other profound situations, and also some witty ones. Mr P, on several occasions, dictated to me numbers he wanted to play in the lottery. He first produced the sentence “I want to play,” and I realized shortly after that he was not referring to a board game or anything similar. Sometimes, I even went to the lottery place to play for him. At other times, I passed on the dictated numbers to his mother. It was common for me to call his family, informing them of his requests: his pillow, or the “radio/CD player” with his favorite discs. We talked about several subjects: soccer matches, elections, hobbies, and other interests. This communication was extremely important in rescuing his humanity, which had been lost in confusing mazes of muted anguish, the anguish that breathes quietly in the scary universe of an ICU.

Discussion

We used narrative medicine to assist a patient with ALS who was dependent on mechanical ventilation and prolonged hospitalization. We developed a more effective communication strategy, strengthening the therapeutic relationship and making the environment of the ICU less impersonal.

After implementing this new communication strategy, we noticed a humanizing effect that provided physical and psychological comfort to the patient within the limits imposed by his disease. We also observed increased sensitivity and empathy of staff in response to our patient’s condition and feelings. The priority given to Mr P’s care, and the improvement in his communication, contributed to more informal and interdisciplinary case discussion focused on quality of life inside our ICU. The primary goal of this report is to help readers consider ways of improving care through narrative medicine in a wide range of settings.

This case illustrates three aspects of our practice of narrative medicine: 1) we read Bauby’s story, and gained understanding from his representation of his unique experience; 2) this understanding informed our approach at Mr P’s bedside, effecting change in his clinical and familial relationships and in our clinicians’ personal understanding of illness and dying; and 3) our experience with this singular patient shed light on our predicaments of illness and health care.

Relieving unnecessary and unjustified suffering is an important role of clinicians. Healing and rehabilitation are not enough; we should also consider validation (assigning or legitimizing value) of patient feelings and desires. The duality of care and action has been inherent in medical practice since antiquity.

In past decades, technologic advances in medicine and medical training based on the biomedical model have focused on technical aspects that promote loss of individuality in the physician-patient relationship. Mechanistic action results in patient care that is fragmented and impersonal. Values, fears, beliefs, weaknesses, feelings, and emotions are often viewed as secondary, leading to dehumanization in medical practice.

In addition, therapeutic procedures in intensive care medicine have been guided by protocols established by methodical observation of population samples in large, prospective randomized studies. It is worth mentioning that the individuality of each person in these studies is dispelled by statistical methods designed to produce a representation of the sample as a whole. Study results are related to the sample (which is selected to represent the population), but not to the unique stories of each patient. Thus, there is a serious risk of regarding each individual as a mere inanimate, passive, and automatic object, and mistakenly viewing statistical summaries as unequivocal realities that do not allow exceptions. The main limitation involved in applying these evidence-based data in real-life scenarios becomes evident when the therapy approach is based only on statistical evidence and does not consider the individuality of each patient. Each case is unavoidably unique in its contexts and idiosyncrasies.

To rescue the individuality of the physician-patient relation-
ship, clinicians must develop the ability to listen to stories and to understand and honor their meanings. This is narrative competence: the capacity of human beings to acknowledge, to absorb, to interpret, and to react to stories. A new discipline at Columbia University in New York, narrative medicine, is based on this approach. The curriculum is designed to develop narrative skills in clinicians. Narrative medicine uses patient stories as a diagnostic, therapeutic, and educational tool. These narratives are much more than mere reports of signs and symptoms; feelings of patients and physicians are often their most important aspects. The patient is not seen as merely a case of disease, but as a story that arouses feelings in those who assist him or her. It is precisely this thoughtful narrative of feelings that is encouraged. Thus, clinicians who are able to narrate and to reflect on their feelings can provide more conscientious, humane, and compassionate care and are more accessible, generous, and helpful to their patients. In addition, exercising explicit awareness of one’s own feelings and experiences leads clinicians to be more generous with their emotions and with their peers.

Medical schools are increasingly incorporating narrative competence into their curricula. Studies have shown the benefits of using narrative medicine to improve a physician’s empathy for patients and to develop clinical skills, observation, self-knowledge, ethical sensitivity, intuition, diagnostic capacity, textual skills (knowing a story’s structure, embracing its multiple perspectives, and recognizing metaphors and allusions) and creative skills: narrative competence provides a broader context for developing professionalism.

Another important application of narrative medicine is managing dilemmas physicians experience, such as ethical conflicts in complex clinical scenarios. The reflection afforded by narrative—identifying and organizing a broad range of factors—facilitates resolution of such dilemmas. Thus, narrative medicine can be understood as a model of medical practice based on narrative skills, which are the starting point for reflection on one’s own clinical experiences, for conflict resolution in complex scenarios, and a way to recover individuality in the care of sick and dying patients, in addition to its well established role in medical education. Narrative medicine can be quite useful for physicians in ICUs in particular, because they are constantly exposed to existential, moral, ethical, legal, social, religious, and economic conflicts that directly affect their feelings, emotions, and psychological defense mechanisms. In these settings, narrative medicine promotes reflection about the complexity of the dilemma, leading to solutions that provide better holistic care and respecting each patient’s unique story.

Acknowledgment
Leslie Parker, ELS, provided editorial assistance.

References

Nothing Greater
There is no greater calling than to serve your fellow men. There is no greater contribution than to help the weak. There is no greater satisfaction than to have done it well.

—Walter Reuther, 1907-1970, American labor union leader
Financial Implications of Increasing Medical School Class Size


Taftler WL. Medical education—the challenge of distinguishing actual costs versus charges (tuition). Perm J 2012 Spring;16(2):73-4. DOI: http://dx.doi.org/10.7812/TPP/12-026

To the Editor,

During the last 50 years or more of an undergraduate college education has consistently grown at a rate that exceeded inflation. Some potentially contributory factors include the decreased time commitment of the average college professor to classroom teaching as research activities became more important to career advancement and the variety of subsidies, such as college loan programs, work-study arrangements, etc, that partially insulate the process from true economic market forces. Given the perceived value of a college education, there has been little pressure for colleges to be truly competitive on pricing for their students. Most economists will agree that if something is subsidized one tends to get more of it. One has to assume these same forces are also part of the rising cost of medical school. It is hard to tell if this article took that perspective into account or started with the underlying presumption that the present medical school cost structure was appropriate. As long as classes are filled and the admission process is so competitive, there is little incentive for schools to seriously address their cost structure and faculty time commitments.

Paul Bellamy, MD
Pulmonary and Critical Care Medicine
Kaiser Permanente, Woodland Hills

Response from Richard A Culbertson, PhD; Danny A Schieffler Jr, PhD; and Marc J Kahn, MD, MBA

We are pleased to receive Dr Bellamy’s comments on our paper and his observations regarding price inflation as represented by tuition in higher education in general and medical education in particular. We did not address the issue he raises regarding the appropriateness of the cost structure of the medical school, confining ourselves to the question of the relationship between tuition revenues received for increasing class size and the added cost of providing education for a larger class. As Bellamy correctly observes, classes are indeed full and the admission process is indeed competitive. Economists might well argue that this scenario represents an opportunity for profit generation, much as universities have done in recent years with their schools of law and business.

The fact remains that students are still willing to apply to medical school, and medical school represents a firm prospect of good financial return to the student, which would seem to encourage the charging of higher tuition without discouraging applicants. Medical education is often thought to have a relative inelasticity of demand, such that the demand for a seat in a medical school class is not particularly sensitive to price.

The irony of the current situation is that public policy makers, who might be logical sources of revenue for public schools, are encouraging the expansion of schools to meet projected deficits in the supply of available physicians. It is the schools themselves that must cover the gap between available revenues and added costs. Seldom does the state government provide the funds for what represents an “unfunded mandate.” As Dr Bellamy observes, if the problem cannot be addressed through added revenues, then the logical alternative is reduced expense. The take-away question is whether this will produce a diluted educational experience that is in the interest of neither good public policy nor the student.

Richard A Culbertson, PhD
Danny A Schieffler Jr, PhD
Marc J Kahn, MD, MBA

References

Response from William Taftler, MD

Dr Bellamy is quite correct in writing that the cost of undergraduate college education has consistently grown at a rate exceeding inflation. In fact, between 1985 and 2011, college tuition and fees went up 498.49% while the Consumer Price Index rose 114.85%. Similarly, over the past 13 years, medical school tuitions have also risen at about twice the rate of inflation (1.8 for private and 2.27 for public institutions). As a result, the total indebtedness of the average medical school graduate has risen from $13,500 in 1978 to $161,300 in 2011—almost 1200%!

Since finishing medical school in 1976 (incidentally with virtually no debt), I have been consistently involved in medical education—the first 6 years as a volunteer faculty member, and now (for the past 27 years) as a full-time academic. I have been directly responsible for medical education activities in a variety of roles within our institution and have also been involved with many other collaborative interinstitutional efforts to revise and refine curricula. Given this background, I am confident that the quality of medical education has significantly improved throughout the country. At the same time, I believe much of this needed improvement has been driven by the support of extramural educational grants from private funders such as the Clupeper Foundation and the Robert Wood Johnson Foundation as well as government funders such as the Health Resources and Services Administration and the National Institute of Health. Although institutional funding support for medical education has also risen, I believe the slope of that increase in no way parallels the slope of the increase in tuition charges.

Whereas there are many factors that have driven up tuition charges, there is a strong rationale for Dr Bellamy’s concern that the very effort to support students (by helping them pay tuition with easily accessible loans and grants) is one of the significant contributors to this phenomenon. Although such programs may have been initially helpful, one now might credibly argue that their long-term effect on tuition may actually have created a significant burden (if not an insurmountable impediment) to present and future generations of economically challenged students. In the end then, rather than helping students, these inflated tuitions have simply enabled many institutions to channel the funds to many other goals not directly tied to their educational mission. (Continued on next page.)
The Health Care Professional as a Modern Abolitionist


We were excited to read the commentary by Michael O’Callaghan in the Spring 2012 issue of The Permanente Journal about health care professionals stepping up as abolitionists. Health care professionals often come into contact with trafficked persons and can provide one avenue of escape. Both the author and the journal deserve applause for bringing attention to this large-scale atrocity.

Human trafficking for the purposes of sex or forced labor occurs in major urban areas in the US. Because of abuse, neglect, and low—if any—compensation, the victims often enter the physician’s office or Emergency Department with major health problems and no insurance to cover necessary services. That is, of course, conditional upon their being lucky enough to survive (or perhaps escape) their forced labor so that they can even access a clinician and present their ailment(s).

We agree with Dr O’Callaghan that more awareness must be raised among health care professionals about human trafficking, and that medical centers need to develop a team of health care professionals who are trained to help trafficking victims transition physically, mentally, and emotionally out of their enslavement into a productive civilian life.

On this front, we are excited to report that many biomedical research scientists adamantly agree that human trafficking is the scourge of our time. Biomedical researchers rarely encounter victims of trafficking who are in need of medical attention, but they comprise a crucial population of people who study the trends of human slavery, the unique health care necessities of trafficked victims, and the adverse economic impact of modern human slavery. We are part of a group of scientists, clinicians, social workers, and scholars who are starting a new science magazine called Cancer InCytes, which will promote cancer research, social justice, and the intersection of the two. We hope that this magazine will raise more awareness of social justice issues among those interested in cancer research, cancer treatment, and cancer survivorship. We are eager to provide a forum for questions to be asked, problems to be presented, and solutions to be considered.

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More letters available at: www.thepermanentejournal.org/issues/2012/fall#le

Streetsweeper

If a man is called to be a streetsweeper, he should sweep streets even as Michelangelo painted, or Beethoven composed music, or Shakespeare wrote poetry. He should sweep streets so well that all the host of heaven and earth will pause to say, here lived a great streetsweeper who did his job well.

— Reverend Martin Luther King, Jr, 1929-1968, Baptist minister, civil rights activist, 1964 Nobel Laureate for peace

References


Section A.

Objective 1. To inculcate the use of evidence-based medicine as part of the science of medicine
Objective 2. To stress the art of medicine via enhanced patient-physician communication, improved care experience for patients, and more satisfying caregiving experience for physicians and staff through better teamwork
Objective 3. To review appropriate updates on the diagnosis and treatment of clinical conditions
Objective 4. To describe infrastructure and systems improvements that lead to improvements in outcomes and patient care experiences

Physicians may earn up to 1 AMA PRA Category 1 Credit™ per article for reading and analyzing the designated CME articles published in each edition of TPJ. Each edition has four articles available for review. Other clinicians for whom CME is acceptable in meeting educational requirements may report up to four hours of participation. Please return (fax or mail to the address listed on the back of this form) to The Permanente Journal by February 28, 2012. Forms may also be completed and submitted online at: www.thepermanentejournal.org. You must complete all sections to receive credit. (Completed forms will be accepted until February 2014. Acknowledgment will be mailed within 2 months after receipt of form.)

Please return completed form by February 28, 2012

Section B. Referring to the CME articles and the stated objectives, please choose your level of agreement next to each statement as appropriate.

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Section C. What change(s) (if any) do you plan to make in your practice as a result of reading these articles?

Section D. (Please print)

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