Editor’s Note
Ensuring Correct Interpretation of Diagnostic Test Results

Today, physicians order a wide array of diagnostic laboratory and imaging tests for their patients, including genetic evaluations. To make sense of the growing number of diagnostic testing opportunities, one might expect that physicians, in turn, have grown in their ability to accurately interpret test results.

The Research Letter by Manrai and colleagues finds this not to be the case. They replicated a classic study and found that only 23% of physicians and physicians-in-training correctly answered a single question testing their interpretation of a diagnostic test result. While this study was limited to a convenience sample from a single academic teaching hospital, it is not too far out on a limb to suggest that today’s physicians need to better prepare to interpret diagnostic test results, including stronger training in statistics and clinical epidemiology.

In addition, this study reminds us that disease prevalence matters for testing, as does test accuracy (both sensitivity and specificity). However, these important pieces of information are often lacking at the bedside when we make a decision to order a test. Generally, prevalence is considered as only “rare” or “common.” And how often are physicians aware of diagnostic tests’ sensitivity and specificity? We need resources that make this information more easily and readily available.

In the meantime, before ordering any test, we must ask ourselves if it is even necessary. Assuming there are efficacious treatments for the disease being tested, what are our thresholds for “ruling out” disease on the low end and “ruling in” disease on the high end of probability, and then, what is the pretest probability of the disease? If your pretest probability falls between those thresholds, is the test accurate enough that a positive or negative test finding will result in a posttest probability that crosses these thresholds? If the test result is not going to change your clinical management, there is no reason for the patient to undergo testing in the first place.

The persistent inability of physicians to reliably manage this cognitive exercise implies that our educational programs need to do a better job at teaching numeracy skills. Because imprecise diagnostic decision making is leading to excessive testing, patient harm, and excessively costly care, we must raise the bar and master these cognitive skills.

Joseph S. Ross, MD, MHS


Characteristics of Medical Professional Liability Claims Against Internists

Medical professional liability (MPL) claims are a major concern for internists and may influence clinical practice.1 Greater awareness of the details and outcomes of these lawsuits, including claims paid, may inform clinical decisions and risk management. Accordingly, we examined a unique registry of nearly 250,000 closed cases to better characterize the medical liability landscape.

Methods | All data presented in this report were collected by the PIAA (formerly the Physician Insurers Association of America), a trade association that represents domestic and international medical professional liability insurance companies. The Data Sharing Project is a data registry of MPL claim information that is voluntarily submitted to the PIAA by its member companies. The PIAA member companies process an estimated 28,000 closed claims per year, representing 62.2% of the 45,000 estimated annual MPL claims brought yearly.2

Per the PIAA, alleged departures from the appropriate standard of care are defined as medical misadventures and divided into 18 categories.3 These may be errors or omissions of diagnosis, treatment, procedure performance, supervision, or timeliness that cause putative injury to patients. One category, “no medical misadventure,” involves cases in which the primary cause of the lawsuit may include legal or documentation issues such as failure to obtain informed consent or equipment failure. Claims are attributed to the specialty of the primary defendant and limited to internal medicine physicians and their subspecialties; of note, claims attributed to cardiologists and gastroenterologists were not available since procedure-based clinical specialties are placed in different risk groupings within the data registry. Institutional review board approval was not needed for this study.

Results | From 1985 through 2009, of the 247,073 closed lawsuits reported to the PIAA, 33,747 (13.7%) were attributed to internal medicine physicians; 8,461 (25.1%) resulted in claims paid. The most common medical misadventure causes for claims appear in the Table, including errors in diagnosis (8,925 [26.4%]), which involves alleged errors in diagnosing lung cancer, acute myocardial infarction, colon cancer, and breast cancer; no misadventure (8,581 [25.4%]); improper performance of a procedure (3,730 [11.1%]); and medication errors (2,865 [8.5%]).
was wide variation among MPL claims that resulted in payment. For instance, 40.1% of MPL claims due to failure to refer and 38.1% for failure to perform a procedure resulted in payment, whereas MPL claims with no medical misadventure resulted in payment in only 4.8% of cases. Median payment was at least $100 000 per paid claim across nearly all categories.

Discussion | These findings, particularly regarding payment probabilities and mean payment amounts, are similar to those seen in the analyses of other primary care1 and medical subspecialty physicians.5,6 The key contribution of the Data Sharing Project is identifying the clinical characteristics of these claims: these data confirm that internists are vulnerable to claims related to what they do commonly—evaluation and management activities (medical histories and physical examinations)—and for the commonly fatal diseases that they are expected to diagnose, such as acute myocardial infarction and lung, colon, and breast cancers. Insight into these MPL claims patterns may help internists craft practice patterns and changes that will result in fewer patient injuries and lower MPL claims.

Sandeep S. Mangalmurti, MD, JD
John Gordon Harold, MD
Parul Divya Parikh, MPH
Frank T. Flannery, MD, JD
William J. Oetgen, MD, MBA

Author Affiliations: Bassett Heart Care Institute, Bassett Medical Center, Cooperstown, New York (Mangalmurti); Cedars-Sinai Heart Institute, Cedars-Sinai Medical Center, Los Angeles, California (Harold); PIAA, Rockville, Maryland (Parikh); Center for Legal Medicine, Walter Reed National Military Medical Center, Bethesda, Maryland (Flannery); American College of Cardiology, Washington, DC (Oetgen).

Corresponding Author: Sandeep S. Mangalmurti, MD, JD, Bassett Heart Care Institute, Bassett Medical Center, One Atwell Road, Cooperstown, NY 13326 (sandeep.mangalmurti@bassett.org).


Author Contributions: Drs Mangalmurti and Oetgen had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Mangalmurti, Harold, Flannery, Oetgen.

Acquisition, analysis, or interpretation of data: Harold, Parikh.

Drafting of the manuscript: Mangalmurti, Harold, Oetgen.

Critical revision of the manuscript for important intellectual content: Harold, Parikh, Flannery, Oetgen.

Statistical analysis: Parikh.

Administrative, technical, or material support: Flannery, Oetgen.

Study supervision: Mangalmurti, Harold, Flannery, Oetgen.

Conflict of Interest Disclosures: None reported.

Disclaimer: The views expressed in this report are those of the authors and do not necessarily represent the official position of the military services or the Department of Defense.


Prophylactic Defibrillators in Patients With Severe Chronic Kidney Disease

Heart failure (HF) and chronic kidney disease (CKD) are increasing in prevalence individually and in combination. It is unclear whether the survival benefits associated with prophylactic implantable cardioverter defibrillator (ICD) implantation in traditional populations extends to individuals with severe CKD (stage ≥4 or estimated glomerular filtration rate [eGFR] <30 mL/min/1.73 m²) given their underrepresentation in clinical trials and elevated risk of non–cardiac-related death. The absence of data and presence of competing risks complicates decision-making in this population. This study assessed the association between prophylactic ICD implantation and survival in individuals with severe CKD.

Methods | This study was approved by the institutional review board of Sunnybrook Health Sciences Centre. Patients with HF and non–dialysis-dependent severe CKD undergoing prophylactic ICD implantation in the Ontario ICD database from February 2007 through November 2011 were identified. Patients with HF, defined using the Framingham criteria, and severe CKD not receiving an ICD were identified in the Enhanced Feedback for Effective Cardiac Treatment (EFFECT Phase II) study from 2004 through 2005. Only patients with a documented ejection fraction of less than 35%, surviving at least 40 days postdischarge, and assessed by a cardiologist were included.

A propensity-score matched cohort of patients with and without ICD (hereinafter, ICD group and non-ICD group) was created using a greedy, nearest-neighbor matching algorithm. Variables in the propensity score included sex, eGFR, QRS duration, atrial fibrillation, prior revascularization, medications, comorbidities, and number of hospitalizations for HF or myocardial infarction (MI) in the preceding 5 years. In addition, patients were matched from the time of their last hospitalization for HF or MI.

Kaplan-Meier estimates of survival were determined for each group and compared using the stratified log-rank test. A robust variance estimator was used to account for the matched nature of the sample. The Cox model was adjusted for baseline covariates whose standardized difference exceeded 0.1 in the matched sample. All analyses were performed using SAS statistical software (version 9.3; SAS institute Inc), with a 2-tailed \( P < .05 \) indicating statistical significance.

Results | A total of 108 unique pairs of patients (87% of eligible patients in ICD group) were matched (Table). Imbalances in age, eGFR, and prior MI hospitalization within 5 years were corrected with the matching procedure. Kaplan-Meier curves revealed a significant survival benefit associated with prophylactic ICD implantation (Figure). Cox regression analysis indicated a significant increased risk for non–cardiac-related death among patients with severe CKD not receiving ICDs (adjusted hazard ratio 1.17; 95% CI 1.03 to 1.34; \( P = .016 \)).

### Table. Baseline Characteristics of the Matched Study Cohort

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>ICD</th>
<th>Control</th>
<th>Standardized Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>69.0 (9.9)</td>
<td>74.7 (10.1)</td>
<td>0.57</td>
</tr>
<tr>
<td>Male, sex</td>
<td>69 (63.9)</td>
<td>70 (64.8)</td>
<td>0.02</td>
</tr>
<tr>
<td>Hypertension</td>
<td>78 (72.2)</td>
<td>84 (77.8)</td>
<td>0.13</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>69 (63.9)</td>
<td>71 (65.7)</td>
<td>0.04</td>
</tr>
<tr>
<td>Previous revascularization</td>
<td>51 (47.2)</td>
<td>56 (51.9)</td>
<td>0.09</td>
</tr>
<tr>
<td>Previous MI hospitalization within 5 y</td>
<td>51 (47.2)</td>
<td>62 (57.4)</td>
<td>0.20</td>
</tr>
<tr>
<td>Time from last MI hospitalization, median (range)</td>
<td>559 (7-1662)</td>
<td>546 (8-2373)</td>
<td>0.57</td>
</tr>
<tr>
<td>Previous HF hospitalization within 5 y</td>
<td>100 (92.6)</td>
<td>101 (93.5)</td>
<td>0.04</td>
</tr>
<tr>
<td>Time from last HF hospitalization, median (range)</td>
<td>162.5 (1-1653)</td>
<td>174 (1-1653)</td>
<td>0.68</td>
</tr>
<tr>
<td>eGFR, mean (SD), mL/min/1.73 m²</td>
<td>23.3 (6.1)</td>
<td>23.1 (5.9)</td>
<td>0.03</td>
</tr>
<tr>
<td>QRS duration, mean (SD), msec</td>
<td>138 (29)</td>
<td>135 (37)</td>
<td>0.11</td>
</tr>
<tr>
<td>History of atrial fibrillation</td>
<td>41 (38.0)</td>
<td>46 (42.6)</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Medication use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACE inhibitor or ARB</td>
<td>81 (75.0)</td>
<td>75 (69.4)</td>
<td>0.12</td>
</tr>
<tr>
<td>( β )-Blocker</td>
<td>94 (87.0)</td>
<td>95 (88.0)</td>
<td>0.03</td>
</tr>
<tr>
<td>Statin</td>
<td>76 (70.4)</td>
<td>72 (66.7)</td>
<td>0.08</td>
</tr>
<tr>
<td>Diuretic</td>
<td>101 (93.5)</td>
<td>98 (90.7)</td>
<td>0.10</td>
</tr>
<tr>
<td>Amiodarone</td>
<td>26 (24.1)</td>
<td>28 (25.9)</td>
<td>0.04</td>
</tr>
<tr>
<td>Digoxin</td>
<td>33 (30.6)</td>
<td>31 (28.7)</td>
<td>0.04</td>
</tr>
<tr>
<td>Aspirin</td>
<td>72 (66.7)</td>
<td>69 (63.9)</td>
<td>0.06</td>
</tr>
<tr>
<td>Warfarin</td>
<td>37 (34.3)</td>
<td>33 (30.6)</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Charlson Comorbidity Index</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>106 (98.1)</td>
<td>13 (12.0)</td>
<td>3.44</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>10 (9.3)</td>
<td>0.45</td>
</tr>
<tr>
<td>≥2</td>
<td>0</td>
<td>81 (75.0)</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin II receptor blocker; eGFR, estimated glomerular filtration rate; HF, heart failure; ICD, implantable cardioverter defibrillator; MI, myocardial infarction.