IN RESPONSE: We agree that the SHARP study (1) was useful for establishing the prevalence of antimicrobial resistance among *H. pylori* in the United States. However, the SHARP analysis did not include the most important determinant of antimicrobial resistance: an individual's antimicrobial use. Therefore, we believe the factors associated with antimicrobial-resistant *H. pylori* in the SHARP study are useful for hypothesis generation, but their value for clinical decision making is highly suspect. The factors cited by Drs. Seow and Chew are likely to be markers for patients with higher antimicrobial use. For example, the higher frequency of metronidazole-resistant *H. pylori* infection among women is explained in our study by higher rates of metronidazole use. In addition, it is unclear how to apply Drs. Seow and Chew’s recommendation of using multiple risk factors to assess the risk for antimicrobial-resistant infection when those risk factors are contradictory, as would be the case for a person of low-risk ethnicity living in a high-risk geographic region. We believe that until antimicrobial susceptibility testing becomes more readily available for clinical use, past antimicrobial use will remain the simplest and most reliable means of assessing the risk for metronidazole- or clarithromycin-resistant *H. pylori*.

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Reference  

Use of Angiotensin-Converting Enzyme Inhibitors in Heart Failure and Renal Insufficiency

TO THE EDITOR: We agree with Shlipak (1) that it is difficult to determine the efficacy of angiotensin-converting enzyme (ACE) inhibitors in patients with heart failure and renal insufficiency on the basis of subgroup analysis of data from randomized, controlled trials of ACE inhibitors in heart failure. However, data from retrospective follow-up studies suggest that ACE inhibitors are equally or more beneficial in patients with heart failure and renal insufficiency (2-4). Our group has demonstrated that use of ACE inhibitors was associated with lower 1-year mortality rates in patients with heart failure and perceived contraindications to ACE inhibitors (adjusted hazard ratio, 0.34 [95% CI, 0.14 to 0.81]). Renal insufficiency (serum creatinine concentration ≥ 221 μmol/L [≥ 2.5 mg/dL]) was the most common condition perceived as a contraindication (56%). In patients with acute myocardial infarction and left ventricular systolic dysfunction who also had renal insufficiency (serum creatinine concentration ≥ 265 μmol/L [≥ 3 mg/dL]), use of ACE inhibitors was associated with lower 1-year mortality rates (adjusted hazard ratio, 0.63 [CI, 0.48 to 0.84]) (3). In another study, in patients with heart failure who were treated with ACE inhibitors, the odds for 6-month mortality were similar for those with normal renal function (adjusted odds ratio, 0.75 [CI, 0.50 to 1.13]) and those with renal insufficiency (serum creatinine concentration ≥ 177 μmol/L [≥ 2 mg/dL]) (adjusted odds ratio, 0.90 [CI, 0.43 to 1.82]) (4). These data are consistent with Shlipak’s conclusion (1) and with the American Col-

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Letters

College of Cardiology/American Heart Association guidelines regarding the use of ACE inhibitors in patients with heart failure and renal insufficiency (5).

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Grant Support: Dr. Ahmed is supported by a National Institute of Health Mentored Patient-Orientated Research Career Development Award (1-K23-AG19211-01).

References

IN RESPONSE: I appreciate Dr. Ahmed’s comments, and I agree that ACE inhibitors are likely to be beneficial in patients with systolic heart failure and renal insufficiency. The observational studies that demonstrate ACE inhibitor effectiveness in this setting are reassuring (1–3). However, subgroup analyses from randomized clinical trials of ACE inhibitors would add valuable and more definitive evidence to support the use of these agents in these patients.

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References

Patient Safety and Medical Malpractice

TO THE EDITOR: Brennan and Mello (1) presented a malpractice case that is all too typical of those occurring today. They were concerned that the need to prove negligence has been blurred and that juries are determining awards on the basis of injury severity rather than the presence of negligence.

A short section titled “A New Paradigm” mentioned a “no-fault” patient compensation program that would eliminate the prosecution of physicians and hospitals if a patient is injured while interfacing with the health care industry.

An entire issue should have been devoted to this subject. Most physicians are practicing defensive medicine and feel as if they live in a polarized world. This increases the cost of care and may subject patients to even more risk as practitioners perform more tests to be sure of their diagnoses.

The “new paradigm” described by Brennan and Mello would be evolutionary. It would create a mutual relationship among patients, hospitals, and physicians. We would no longer feel besieged by a system that seeks to prosecute us when no actual crime has been committed. We would have shown only that we cannot practice zero-defect medicine. We want to partner with our patients again, and the current highly charged polarized environment would no longer exist.

I feel that this type of change will occur only through a ballot initiative, with the physicians leading the charge. Our state and federal legislatures are top-heavy with attorneys who are easily influenced by the attorneys’ lobby, which wishes to protect the “sacred cow” of torts. Our law was developed in the Middle Ages. It has stopped serving us.

The American College of Physicians should develop an implementation plan that most states would accept and that would replace the current system. We should be leading the way. We know better than most how important such a plan would be for improved patient relationships and cost containment.

A superfund should be developed that would pay injured parties or their families immediately through a fixed and nonmodifiable multi-tiered structure. This fund could be administered through for-profit corporations. All parties who receive profits from the system, including medical insurance companies and patients, would pay into it. Drug companies would also have to pay a share for adverse drug reactions.

We would certainly need a central database that would allow us to assign responsibility to various parties. Also, data on individual physicians and institutions would have to be published, as would information on adverse outcomes, along with their causes, and remedies. Patients would still be able to confront their physician or institutional representative in a public forum.

Independent boards would be maintained in all counties. Board members would be called upon to advocate for patients. They would be appointed or elected and could include attorneys.

Again, all providers and institutions would be exempt from prosecution if a patient outcome should be associated with injury.

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Reference
IN RESPONSE: Dr. Gale’s proposal for an injured patient superfund is an interesting concept and one that deserves further exploration.

The College is aggressively pushing for changes to the U.S. medical tort system. We are examining options such as a no-fault system, alternative dispute resolution, and enterprise liability.

Currently, we are primarily concerned with reforming the tort system by capping noneconomic damage awards (that is, awards for pain and suffering) at $250 000. Such a cap has already been successfully tested in California. A recent study by economist Kenneth Thorpe titled “The Medical Malpractice ‘Crisis’: Recent Trends and the Impact of State Tort Reforms,” which was published in Health Affairs (1), clearly demonstrated this fact. Mr. Thorpe’s sweeping examination of past state tort reform efforts showed that the $250 000 cap is the most effective way to reduce rates of professional liability insurance premiums.

Given the multitude of financial pressures faced by physicians, and the need for immediate relief from high professional liability insurance premiums, we believe pursuing the $250 000 cap offers the best path to follow for the College.

Munsey S. Wheby, MD
Immediate Past President, American College of Physicians

Practice Guidelines for Chronic Kidney Disease

TO THE EDITOR: Screening for microalbuminuria is clearly recommended, especially for diabetes, by the American Diabetes Association, the new guidelines from the Seventh Joint National Commission on Health Care, and the European Society of Hypertension (1). Levey and colleagues (2) reported the National Kidney Foundation guidelines for chronic kidney disease. The problem with these guidelines regarding microalbuminuria is the initial step where an albumin-specific stick is proposed; this may be ill-defined. We propose the following, which is very much in line with the guidelines from the European Society of Hypertension and from the American Diabetes Association (Figure). Clinicians should start with a more specific test for measuring albumin–creatinine ratio, preferably in the early-morning urine. Several laboratory tests are available, as is the DCA 2000, which is quite reliable in clinical practice (3). With the presence of microalbuminuria, shown by an albumin–creatinine ratio between 30 and 300 mg/g, clinicians should take further steps toward diagnosis, particularly confirming the abnormal test result and offering the patient explanation and intervention.

Follow-up and confirmation are clearly important because there may be other reasons for increased albumin–creatinine ratio, especially urinary tract infection and other infections. Heavy physical exercise and vaginal discharge can also increase albumin–creatinine ratio, but such cases are rather rare. Patients should be informed about renal disease in diabetes. Better glycemic control is certainly indicated and may reverse microalbuminuria, as shown in recent studies (3).

I also propose, besides better metabolic control, that the renin–angiotensin system should be blocked with appropriate doses (not too low) of angiotensin-converting enzyme inhibitors and angiotensin-receptor blockers. For example, it has been shown that 1.25 mg of ramipril is not effective (type 2 DIAbetes, Hypertension, Cardiovascular Events and Ramipril [DIABHYCAR] Study) in contrast to 10 mg (Heart Outcomes Prevention Evaluation [HOPE] Study) (3). In addition, blood pressure control is clearly indicated, as suggested in all guidelines, in diabetic patients whose blood pressure is below 130/80 mm Hg. A decrease in or normalization of albumin–creatinine ratio can indicate that an intervention has been effective (4, 5). With these strategies, there is evidence that progression to more advanced renal disease can be at least partially prevented.

The strategy I describe here should generally receive more emphasis, especially in diabetic patients, to reduce the huge number of U.S. patients who have end-stage renal disease and require dialysis.

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References
4. Yuyun MF, Dinneen SF, Edwards OM, Wood E, Wareham NJ. Absolute level and rate of change of albuminuria over 1 year independently predict mortality and cardio-

Figure. Search strategy to detect patients with early renal disease, especially early diabetic nephropathy.
TO THE EDITOR: The clinical guidelines published by the Kidney Disease Outcomes Quality Initiatives Work Group on Chronic Kidney Disease (1) allow physicians to assess their patients’ risk for chronic kidney disease. In particular, prediction equations for glomerular filtration rate (GFR) are easy to use and extremely helpful for disease stratification. Beyond these equations, however, the Work Group recommends the use of 24-hour urine collections for the estimation of GFR only under special clinical circumstances. That and the A rating given in Table 1 to avoiding 24-hour creatinine clearances to estimate GFR seem to imply that the routine use of timed urine collections does not constitute sound clinical practice. This is misleading.

For example, the average of 24-hour urinary creatinine and urea nitrogen clearances appears to equal the Modification of Diet in Renal Disease Study’s equation in accuracy (2). It has been used in many studies, including one appearing in the same issue of *Annals* (3) as the National Kidney Foundation guidelines (3). Obtaining a 24-hour urine sample does not only allow secondary confirmation of GFR; urea nitrogen clearances also provide important additional information regarding daily dietary protein intake, given that malnutrition frequently accompanies chronic kidney disease.

Supplementary to GFR prediction equations, 24-hour urine creatinine and urea nitrogen collections give the practitioner added tools in the evaluation and management of chronic kidney disease.

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References

IN RESPONSE: Many of the points raised by Drs. Mogensen and Korosi are discussed in the full version of the guidelines (1). Page numbers cited below refer to pages in that publication.

Dr. Mogensen agrees with the recommendation to test patients at increased risk for chronic kidney disease for “microalbuminuria” in a spot urine sample. However, he suggests measuring the albumin-to-creatinine ratio rather than an albumin-specific dipstick, as depicted in Figure 2 of our article in *Annals*. We agree that that testing could begin with measurement of albumin-to-creatinine ratio (page S215), as discussed in a more recent consensus conference sponsored by the National Kidney Foundation and the National Institute of Diabetes and Digestive and Kidney Diseases (2). The gold standard method for detection of microalbuminuria is based on immunoassay in a timed urine collection. Sensitivity of detection of microalbuminuria using an albumin-specific dipstick or an albumin-to-creatinine ratio in spot urine samples is 80% to 90% (pages S97–S98). The guidelines also recommend periodic reevaluation of patients with negative test results using either method.

Currently available methods are sensitive enough to detect urine albumin concentrations just above the normal range (Table 3). Ultimately, many factors, including cost, influence the decision about whether testing should begin with a dipstick in the physician’s office or with a laboratory test. Clinicians must also be attentive to common causes of false-positive and false-negative results (page S99). A recent report demonstrated limited sensitivity of an immunoassay compared with high-performance liquid chromatography (4). More studies are needed to determine the appropriate reference range and clinical importance of albuminuria detected by high-performance liquid chromatography.

Dr. Korosi agrees with the recommendation to estimate GFR

Table. Methods for the Detection of Microalbuminuria

<table>
<thead>
<tr>
<th>Method (Manufacturer)</th>
<th>Type of Analysis</th>
<th>Detection Limit, mg/L</th>
<th>Principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multistix PRO test strips (Bayer Corp.)</td>
<td>Semi-quantitative; reagent strip test</td>
<td>80–150</td>
<td>Dye binding; at a constant pH, albumin causes a sulphonephthalein dye impregnated in the pad to change color</td>
</tr>
<tr>
<td>CLINITEK microalbumin test strips (Bayer Corp.)</td>
<td>Semi-quantitative; reagent strip test; requires CLINITEK instrument</td>
<td>20–40</td>
<td>Same principle as Multistix PRO Test Strips; however, detection limit differs</td>
</tr>
<tr>
<td>Micral test strips (Roche Diagnostics)</td>
<td>Semi-quantitative; reagent strip test</td>
<td>15–20</td>
<td>Immunochemical; albumin binds with gold-labeled monoclonal antibody; albumin–antibody complexes migrate to dye-impregnated detection pad; intensity of color increases with albumin concentration</td>
</tr>
<tr>
<td>ImmunoDip (Diagnostic Chemicals Ltd.)</td>
<td>Semi-quantitative; modified reagent strip</td>
<td>12–18</td>
<td>Immunochemical; complexed with antibody (albumin–antibody) migrates to top band; intensity of top band increases with albumin concentration</td>
</tr>
<tr>
<td>Immunoturbidimetry</td>
<td>Quantitative</td>
<td>5–8</td>
<td>Immunochemical; albumin–antibody complex decreases light transmission through sample</td>
</tr>
<tr>
<td>Nephelometry</td>
<td>Quantitative</td>
<td>0.5–1.0</td>
<td>Immunochemical; antibody–antibody complexes scatter light</td>
</tr>
<tr>
<td>Radioimmunoassay</td>
<td>Quantitative</td>
<td>0.1–0.3</td>
<td>Immunochemical; radionabeled albumin competes with sample albumin for a limited amount of antibody</td>
</tr>
<tr>
<td>Radial immunodiffusion</td>
<td>Quantitative</td>
<td>~6</td>
<td>Immunochemical; antibody present in the medium forms precipitin rings with albumin from the sample; diameter of ring is proportional to the albumin concentration</td>
</tr>
</tbody>
</table>
from serum creatinine measurements using prediction equations but also advocates collection of 24-hour urine samples for confirmation of GFR and estimation of dietary protein intake. Estimating GFR from the mean of the 24-hour urea and creatinine clearance has been validated only in individuals with GFRs less than approximately 15 mL/min per 1.73 m² (5). Studies in patients with higher GFRs show that 24-hour creatinine clearance does not provide a more accurate estimate of GFR than the Modification of Diet in Renal Disease Study prediction equation. Thus, the guidelines do not recommend routine collection of a 24-hour urine sample to confirm the estimate of GFR in routine practice. In subspecialty practice, a 24-hour urine sample can be useful to confirm GFR estimates lower than 15 mL/min per 1.73 m² and to estimate dietary protein intake (pages S89–S90). Other indications for clearance measurements to estimate GFR (S90) and recommended filtration markers (S77) are discussed in the guidelines.

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References

Table. Success Rate and Mean Discomfort for Blood Collection with the Butterfly Device and the Conventional Needle

<table>
<thead>
<tr>
<th>Variable</th>
<th>Venipunctures, n</th>
<th>Success Rate (95% CI), %*</th>
<th>P Value†</th>
<th>Mean Score for Discomfort on the Visual Analogue Scale (95% CI)‡</th>
<th>P Value§</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood collection device</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butterfly</td>
<td>539</td>
<td>98.3 (96.7–99.2)</td>
<td>0.01</td>
<td>1.3 (1.2–1.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Needle</td>
<td>564</td>
<td>96.8 (94.2–98.3)</td>
<td></td>
<td>1.9 (1.7–2.0)</td>
<td></td>
</tr>
<tr>
<td>Location of venipuncture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radial wrist</td>
<td>18</td>
<td>94.6 (81.1–98.6)</td>
<td>&gt;0.2</td>
<td>2.5 (1.9–3.2)</td>
<td>0.004</td>
</tr>
<tr>
<td>Forearm</td>
<td>100</td>
<td>98.4 (95.8–99.4)</td>
<td></td>
<td>1.7 (1.4–2.0)</td>
<td></td>
</tr>
<tr>
<td>Back of the hand</td>
<td>99</td>
<td>98.3 (95.8–99.3)</td>
<td></td>
<td>2.0 (1.7–2.3)</td>
<td></td>
</tr>
<tr>
<td>Antecubital fossa</td>
<td>886</td>
<td>98.2 (96.8–99.0)</td>
<td></td>
<td>1.5 (1.4–1.6)</td>
<td></td>
</tr>
<tr>
<td>Subjective evaluation of veins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>396</td>
<td>99.5 (98.7–99.8)</td>
<td>&lt;0.001</td>
<td>1.3 (1.2–1.5)</td>
<td>0.001</td>
</tr>
<tr>
<td>Intermediate</td>
<td>466</td>
<td>97.1 (95.0–98.3)</td>
<td></td>
<td>1.6 (1.5–1.7)</td>
<td></td>
</tr>
<tr>
<td>Bad</td>
<td>241</td>
<td>84.8 (76.7–90.5)</td>
<td></td>
<td>2.0 (1.8–2.1)</td>
<td></td>
</tr>
<tr>
<td>Blood tubes collected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 tube</td>
<td>447</td>
<td>97.8 (95.4–98.9)</td>
<td>&gt;0.2</td>
<td>1.5 (1.4–1.7)</td>
<td>&gt;0.2</td>
</tr>
<tr>
<td>&gt;1 tube</td>
<td>656</td>
<td>97.7 (95.7–98.8)</td>
<td></td>
<td>1.6 (1.5–1.8)</td>
<td></td>
</tr>
</tbody>
</table>

* Estimated probabilities from logistic regression model with terms for blood collection device, location of venipuncture, subjective evaluation, number of blood tubes collected, and phlebotomist.
† From logistic regression.
‡ Least-squares means from a general linear mixed model with terms for blood collection device, location of venipuncture, subjective evaluation, number of blood tubes collected, and phlebotomist.
§ From a general linear mixed model.

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mist (1 indicated “good,” that is, thick and robust veins; 2 indicated “intermediate”; and 3 indicated “bad,” that is, thin and fragile veins). The conventional needles and butteflies used in our study were 21-gauge (Multi-Drawing Needle and Blood Collection Set plus Luer Adapter, respectively, Greiner Bio-One, Kremsmuenster, Austria).

The study was performed at the Department of Obstetrics and Gynecology, Medical University Vienna, Vienna, Austria, from May to October 2003. Institutional review board approval was obtained. At admission, patients were informed of the study and consented to blood drawing. Because of the nature of blood drawing, neither the investigators nor the patients were blinded in any way.

Patients were randomly assigned by using a random-number sequence with a permuted block size of 20. Randomization was stratified by phlebotomist. All patients who were randomly assigned underwent venipuncture attempts. Multiple conditional logistic regression analysis was used to assess the effect of blood collection device on success rate, adjusted for the following confounders: blood tubes restoration analysis was used to assess the effect of blood collection device on success rate, adjusted for the following confounders: blood tubes to be drawn (1 vs. >1), location of venipuncture (categorical), and subjective evaluation of patients’ veins by phlebotomist (continuous). The logistic regression analysis was stratified by phlebotomist. Results are given as estimated probabilities from the logistic regression models.

Similarly, a general linear mixed model was used to evaluate the effect of blood collection device on patients’ discomfort, adjusted for the confounders listed earlier (all of which were estimated as fixed effects) and including phlebotomist as a random effect. To evaluate pairwise interactions of blood collection device and confounding variables, the corresponding interaction terms were added to both logistic and linear models and tested for statistical significance. A $P$ value less than 0.05 was considered statistically significant.

Twelve phlebotomists performed 1154 venipunctures; success rates varied between 89.5% and 100%. We evaluated 7 variables per venipuncture, which meant that 8078 values were theoretically available for statistical analysis. Complete data on 1103 venipunctures were analyzed. Of the 55 missing values, 41 related to the number of blood tubes drawn, 6 related to visual analogue scale values, and 8 related to location of blood collection. Missing values were equally distributed among phlebotomists and were considered to be nonsystematic.

In a multivariable logistic model considering all investigated variables as covariates, success of venipuncture was associated with type of blood collection device (98.3% for butterfly vs. 96.8% for conventional needle) (Table). Although the overall difference seems marginal, the difference in estimated success rates was considerably more impressive (79.9% for conventional needle vs. 88.7% for butterfly) in patients with a higher baseline risk for failure, for example, those with thin and fragile veins. As expected, quality of veins was correlated with success rate, while location of venipuncture and number of blood tubes to be collected were not. In the multivariable model, no significant interactions were ascertained between investigated variables.

The butterfly device significantly reduced patients’ discomfort by an average score difference of 0.6 on the visual analogue scale (Table). Venipuncture at the antecubital fossa was associated with the least discomfort, followed by the forearm, the back of the hand, and the radial wrist (Table). Patients with good veins reported significantly less discomfort than patients with intermediate and bad veins, and the number of blood tubes to be collected did not alter patients’ discomfort (Table). Again, no significant interactions were ascertained.

Conclusion: To our knowledge, this is the first observation to date reporting on a common clinical problem encountered by millions of nurses, medical students, and physicians. We conclude that the butterfly device seems to increase the success rate of venipuncture and reduce patients’ discomfort, especially when drawing blood is difficult.

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Acknowledgments: The authors thank Georg Heinze, PhD, Department of Medical Computer Sciences, Medical University Vienna, for expert statistical analysis.

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References

Editor’s Note: The lead author of the following Clinical Observation was one of a dozen Associates of the American College of Physicians selected to present a clinical vignette at the 2002 Annual Session in Philadelphia. We are proud to present this case report through a special arrangement with the Council of Associates of the College.

A Novel Diagnostic Method for Acute Pulmonary Embolism: Technetium-99m Apcitide Scintigraphy

TO THE EDITOR: Background: Pulmonary embolism is one of the leading causes of morbidity and death in the United States, with a purported 500 000 to 600 000 cases and an estimated 50 000 to 200 000 deaths occurring per year (1). The currently accepted diagnostic algorithm is integrated and includes a methodical history and physical examination supplemented by selective laboratory and radiologic testing with chest radiography; ventilation-perfusion scanning; helical computed tomography (CT); and the current gold stan-
standard, pulmonary angiography (2). Unlike these anatomic imaging methods, technetium-99m apcitide is a new physiologic imaging tool that highlights areas of acute platelet aggregation on scintigraphic images by competitively binding to the glycoprotein Ibβ/Ila receptors on activated platelets. We present one of the first documented cases of the use of this technology to assist in diagnosing pulmonary embolism.

Case Report: A 59-year-old man with a history of the antiphospholipid syndrome and 1 recent episode of pulmonary embolism presented to our institution with a 4-day history of intermittent subjective fever, fatigue, and neck pain. He reported no chest pain, shortness of breath, hemoptysis, or leg pain. He was allergic to iodinated contrast dye. On physical examination, he was nontressed and normotensive, with a heart rate of 110 beats/min and an oxygen saturation level of 88% on room air. His temperature was 38.3 °C. Lung examination was notable for bilateral basilar crackles, but the remainder of the physical examination yielded normal results. Results of laboratory examination were normal except for a PaO2 of 67 mm Hg on 4 L of oxygen and an international normalized ratio of 1.3. An electrocardiogram showed sinus tachycardia without evidence of right-heart strain or ischemic changes. Chest radiography on admission showed a new wedge-shaped, pleural-based opacity in the left midlung zone. Empirical therapy was started with low-molecular-weight heparin for suspected pulmonary embolism and antibiotics for possible community-acquired pneumonia.

To confirm the suspicion of acute pulmonary embolism, further imaging was performed. Given the patient’s recent pulmonary embolism and abnormal chest radiograph on admission, a ventilation-perfusion scan was not likely to confirm a diagnosis, and helical CT was avoided because of the patient’s allergy to contrast dye. Therefore, on the second day of hospitalization, the patient underwent chest imaging with technetium-99m apcitide single-photon emission computed tomography (SPECT), which showed an abnormal level of increased radiolabeled peptide accumulation within the superior portion of the left lower lobe of the lung as well as the popliteal vein of the left leg. These findings were consistent with acute pulmonary embolism in the left lung and acute deep venous thrombosis (DVT) in the left popliteal vein. We also performed SPECT perfusion scintigraphy with technetium-99m macroaggregated albumin of the lungs on the same camera system, with similar patient positioning for anatomic localization. This demonstrated pleural-based, wedge-shaped superior and lateral basal segmental perfusion defects in the left lower lobe (Figure 1). Ventilation scintigraphy was not performed. The SPECT apcitide and macroaggregated albumin data sets were combined by using commercially available computer software, which displayed each data set individually and in a combined, color-coded fusion image. The fusion images demonstrated accumulation of technetium-99m apcitide in the perfusion defects on the macroaggregated albumin scintigraphic images, consistent with new, acute pulmonary embolism (Figure 2).

After diagnosis, therapy with low-molecular-weight heparin was continued, and the patient’s warfarin dose was adjusted to achieve a target international normalized ratio of 3.0 to 3.5. The patient was discharged in stable condition with close follow-up in our warfarin clinic and has done well.

Discussion: According to the simplified scoring model proposed by Wells and colleagues (3, 4), our patient presented with high pretest likelihood of pulmonary embolism, and we did not feel that community-acquired pneumonia was as likely a diagnosis. Choosing the appropriate imaging study in this patient was not straightforward. Because of his allergy, premedication would have been required before contrast administration and would have limited the immediate utility of helical CT. The patient’s recent pulmonary embolism limited the utility of ventilation-perfusion scintigraphy, since previous pulmonary embolism is one of the most common causes of false-positive “high-probability” ventilation-perfusion scans (5). In addition, it may have been difficult to differentiate a new pulmonary embolism from changes attributable to the patient’s recent previous event.

As described in the case history, the patient underwent technetium-99m apcitide SPECT imaging of the lung and lower extremities. Similar to CT, the SPECT acquisition protocol performs imaging in a 360-degree sequence and then reconstructs the data to display a 3-dimensional image. To localize the accumulation of technetium-99m apcitide, SPECT perfusion scintigraphy was performed and fused with the technetium-99m apcitide images. The fused images showed radiotracer accumulation within 2 perfusion defects in the left lower lobe. The first, a new defect compared with previous planar imaging, was within the lateral basal segment, while the second, an old defect, was within the superior segment. Whether the lateral basal segment defect was new is debatable; SPECT increases spatial resolution, and therefore the small defect in the lateral basal segment may have been missed on previous planar scintigraphy. If the patient had undergone planar perfusion imaging during this admission, his scan would probably have been unchanged and therefore considered negative for evidence of acute pulmonary embolism. In this particular case, technetium-99m apcitide imaging not only diagnosed DVT within the popliteal venous system of the left leg but also showed radiotracer uptake within the defects noted on perfusion imaging.

Figure 1. Transaxial, sagittal, and coronal perfusion images on single-photon emission computed tomography of lungs showing a marked perfusion defect within the superior segment and lateral basal segment of the left lower lobe.
scintigraphy. This confirmed that the patient probably formed acute thrombus within regions of chronic thrombus.

Figure 2. Fusion images (third row) demonstrate 2 large perfusion defects within the superior and lateral basal segments of the left lower lung lobe (lack of blue) with accumulation (shown in red) of technetium-99m apcitide within these noted perfusion defects.

Historically, angiography and ventilation–perfusion scintigraphy were the 2 primary radiologic tests available to accurately detect pulmonary embolism, although the diagnostic value of ventilation–perfusion scanning was controversial. In 1990, the Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED) solidified the scan’s utility as a valid and reliable method for diagnostic imaging (6). Soon thereafter, helical CT was added to the diagnostic algorithm. Recent literature has confirmed its accuracy and suggests that it excludes clinically significant pulmonary embolism, although it may miss small, isolated, subsegmental clots (7). Of importance, helical CT also often provides an alternative diagnosis when venous thromboembolism is not seen (7). Although helical CT is less invasive than angiography, the potential risk from contrast allergy still limits its use in certain populations. Also, it is an anatomically based imaging protocol and therefore may not be able to distinguish acute thrombus from chronic thrombus.

Apcitide is a synthetic peptide, chemically labeled to technetium, that binds to glycoprotein Ib/IIa receptors on activated platelets. Glycoprotein receptors are all cross-linked by platelets in chronic thrombus and are unavailable for binding; therefore, technetium-99m apcitide will not highlight chronic emboli. This method was originally designed to target and detect DVT in the lower extremities. One major multicenter clinical trial, enrolling 280 patients, directly compared technetium-99m apcitide scintigraphy with contrast venography in 39 patients and found that when technetium-99m apcitide scintigraphic images captured at 10, 60, and 120 minutes after injection were analyzed, the test had a sensitivity of 86.4%, a specificity of 88.3%, a positive likelihood ratio of 7.38, and a negative likelihood ratio of 0.154. The researchers concluded that combining early (approximately 10 to 20 minutes) and delayed (3 hours) imaging provided the best results (8).

Although technetium-99m apcitide has been shown to be a relatively accurate imaging method for DVT, no studies have examined its use for diagnosis of pulmonary embolism. In fact, to our knowledge, this is the first case in which it assisted in the evaluation of suspected pulmonary embolism. This new technology has 2 principal advantages. First, it highlights only acute emboli, and second, it does not have the nephrotoxic or allergic risks of intravenous contrast dye. It would probably fit into the diagnostic algorithm for pulmonary embolism in the following clinical situations. First, in patients with recurrent pulmonary embolism, it would enable clinicians to distinguish acute emboli from chronic emboli. Second, it would offer an alternative method of rapid diagnosis in patients with acute renal failure or contrast allergies who have intermediate to high pretest probabilities of pulmonary embolism and abnormal results on chest radiography. In this context, we believe that technetium-99m apcitide deserves further prospective evaluation.

References
7. van Strijen MJ, de Monye W, Schierock J, Kieft GJ, Prins MH, Huisman MV, et al. Single-detector helical computed tomography as the primary diagnostic test in sus-

**CORRECTION**

**Correction: Update in Infectious Diseases**

The Update in Infectious Diseases by Sande and Ronald (1) stated that “95% of SARS [severe acute respiratory syndrome] cases in Taiwan occurred among health care workers.” According to the summary published on the World Health Organization Web site (2), the correct figure is 20%.

**References**

Successful Treatment of Sarcoidosis

TO THE EDITOR: Ocular inflammation is a prominent manifestation of several autoimmune diseases. Although anti–tumor necrosis factor (TNF) therapy has been successfully used to treat uveitis associated with the HLA-B27 gene, the Behçet syndrome (1), and refractory idiopathic uveitis (2), its effect in sarcoid uveitis is unknown. We describe successful treatment using intravenous infliximab, a human-murine chimeric monoclonal antibody directed against TNF in a patient with sarcoid-related uveitis.

The patient presented with anterior uveitis, Bell palsy, and low-grade fever. Sarcoidosis was diagnosed on the basis of stage I bilateral hilar lymphadenopathy and an elevated angiotensin-converting enzyme level. Ocular examination revealed 2+ cells, 3+ flare with keratic precipitates and early posterior synechiae. His vision declined from normal to 20/50. Vision loss persisted despite weekly treatment with methotrexate and prednisone for 3 months. Because of the intolerable side effects of corticosteroids, the patient was given infliximab, 5 mg/kg of body weight, as a steroid-sparing agent. Within 2 weeks, the patient’s vision had improved dramatically to 20/25, and ocular inflammatory infiltrate had resolved. The patient continues to receive infliximab every 2 months and remains symptom-free with 20/20 vision at 6 months. His oral methotrexate dose has been reduced to 15 mg weekly, and his treatment with oral corticosteroids has been discontinued.

Infliximab was an attractive therapeutic option for several reasons. First, intravenous infusion provides high levels of bioavailable drug in the context of vision loss. Second, it has been successfully used in other granulomatous diseases, such as Crohn colitis. Third, previous beneficial use in patients with systemic sarcoidosis (3) has been documented. Nevertheless, the therapeutic benefit of inhibiting TNF may not be a class effect. A recent study (4) demonstrated excessive treatment failures in patients with stage 2 or 3 pulmonary sarcoidosis who were given soluble TNF receptor antagonist (etanercept). Experimental autoimmune uveitis models in animals have suggested a role for TNF-α in the pathogenesis of uveitis. Neutralization of this molecule has been shown to suppress the induction of experimental autoimmune uveitis, possibly by inhibiting antigen priming (5). Our patient’s remarkable response to this drug also suggests that TNF may be important in the pathogenesis of ocular sarcoidosis.

We believe that the successful treatment of sarcoid-related uveitis with infliximab is an important observation. This drug should be considered in patients who do not respond to traditional anti-inflammatory medications.

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References

Clinical Implications of Genetic Polymorphism of CYP2D6 in Mexican Americans

TO THE EDITOR: Background: Mexican Americans make up 66% of U.S. Hispanics, the country’s largest ethnic minority group (1). Few studies report antidepressant treatment in this population, and they have conflicting results (Table).

Objective: To perform an 8-week, prospective, double-blind trial investigating the pharmacogenetics of antidepressant response to desipramine or fluoxetine.

Results: We describe 2 Mexican-American women homozygous for CYP2D6*4 with resultant toxic levels of desipramine and severe adverse drug reactions at minimal doses.

Case Reports: JR and IA are Mexican-American women age 59 and 31 years who received a diagnosis of recurrent major depression. IA had a history of severe adverse drug reactions after paroxetine treatment. They began blinded treatment with desipramine, 50 mg/d. Both patients had orthostatic hypotension, which is a transient and common adverse drug reaction to desipramine. The dose was increased to 100 mg/d after 1 week, according to protocol.

IA returned the following week with worsened anxiety and physical symptoms including palpitations, hyperventilation, and myalgias. Electrocardiogram confirmed sinus tachycardia. Her desipramine level was 544.33 nmol/L (therapeutic range, 375.4 to 938.5 nmol/L). Medication frequency was decreased to every other day.

One week later, she had a desipramine level of 1358.9 nmol/L and persistent tachycardia requiring discontinuation of therapy with the medication. She reported improved sleep and decreased somatic symptoms. The following week, she continued to have tachycardia (desipramine level, 345.37 nmol/L).

JR’s depression improved after initial treatment, but adverse drug reactions (including blurry vision) continued to worsen. Drug level after 2-week treatment (100 mg/d) was 2545.14 nmol/L. Therapy with the medication was discontinued, and cardiac function normalized. After a week without the drug, desipramine levels were undetectable. Severity and frequency of somatic and depressive symptoms increased, and desipramine was restarted at 10 mg/d. The dosage was titrated to 25 mg/d over 1 month to result in a serum level of 397.91 nmol/L. JR’s mood and adverse drug reactions greatly improved.

Discussion: CYP2D6 metabolizes 50% of the 100 best-selling drugs, including antidepressants such as fluoxetine and desipramine. The CYP2D6 gene has been shown to have at least 70 alleles, with more than 20 of these changing the metabolism of its substrates (http://medicine.iupui.edu/flockhart/). This is reflected in divergent rates of drug metabolism among individuals and ethnic groups.
Five percent to 10% of white persons and 1% of Asians are poor CYP2D6 (5) metabolizers. Mendoza and colleagues (6) found that 4 of 349 Mexican-American persons (1%) were homozygous for the CYP2D6*4 allele responsible for poor drug metabolism.

An estimated 30,000 to 100,000 patients have died in hospitals from adverse reactions to properly administered, U.S. Food and Drug Administration–approved medications (7). Medical care of persons with atypical CYP2D6 metabolism is thought to cost an average of $5000 more per year compared to normal CYP2D6 metabolizers, presumably because of increased rates of adverse drug reactions (8). Our patients had been receiving small doses of the medication for 2 weeks in the context of a highly structured clinical research program when they developed severe adverse drug reactions. This allowed us to stop treatment immediately and rapidly individualize it, interventions that would have been unlikely to have happened in a general outpatient clinic where patients are seldom seen weekly. A key point to consider is the importance of carefully assessing patients for adverse drug reactions. In Hispanic women, depressive symptoms frequently present as somatic symptoms (9). These symptoms may include fatigue, headaches, backaches, insomnia, and loss of appetite. Therefore, a detailed history and physical examination and close follow-up visits, especially when therapy with a new medication is started, are essential.

Conclusions: Adverse drug reactions in Hispanics may be misattributed to cultural factors, when they may be due to genetic background. CYP2D6 genotyping can be done rapidly and reliably and is of considerable public health relevance because it can reduce the rate and severity of adverse drug reactions. Such genotyping should be performed routinely because genotyping costs offset medical costs related to atypical gene variants that affect pharmacokinetic pathways.

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References

Table. Studies on U.S. Hispanics with Antidepressants Metabolized by CYP2D6*

<table>
<thead>
<tr>
<th>Study, Year (Reference)</th>
<th>Hispanic Subtype</th>
<th>Participants, n</th>
<th>Medication Used</th>
<th>Method of Study</th>
<th>Conclusion</th>
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<tr>
<td>Marcos and Cancro, 1982 (2)</td>
<td>MDD Puerto Rican Female</td>
<td>41</td>
<td>Tricyclics</td>
<td>Retrospective review of medical records; no drug levels</td>
<td>Puerto Rican women require half the tricyclic dose compared to white persons for full recovery</td>
</tr>
<tr>
<td>Gaviria et al., 1986 (3)</td>
<td>Nondepressed Mexican American Male</td>
<td>10</td>
<td>Nortriptyline</td>
<td>Single dose of medication; drug levels and pharmacokinetic data collected</td>
<td>No major differences in pharmacokinetics of Hispanics vs. white persons</td>
</tr>
<tr>
<td>Alonso et al., 1997 (4) [Letter]</td>
<td>MDD Mexican American Female</td>
<td>13</td>
<td>Paroxetine or fluoxetine</td>
<td>Prospective, open-label treatment; no drug levels</td>
<td>No difference in treatment response or side effects between Hispanics and white persons</td>
</tr>
</tbody>
</table>

* MDD = major depressive disorder.