In 2000, gallbladder disease in the United States resulted in more than $6 billion in direct costs and lost wages, making it the most expensive category of digestive disease [1]. Stones in the gallbladder become more common with advancing age. Eighty percent of gallstones are composed mainly of cholesterol, and the remainder are composed of oxidized polymers of bilirubin [2]. In principle, cholesterol stones form because the amount of cholesterol in bile exceeds the carrying capacity of the available bile salts and lecithin (phospholipid). Gallstone disease is discussed in several recent books and other reviews [3–6].

Approximately 1% to 2% of persons with asymptomatic gallstones found at screening develop symptoms each year of follow-up; symptoms develop at a higher rate in the earlier years of follow-up [7]. About 10% of patients presenting with symptoms of gallstones present with cholecystitis, and a smaller percentage present with acute pancreatitis or biliary obstruction from stones. The great majority of patients with symptomatic gallstones present with episodic pain. This article presents 2 case studies that illustrate approaches to the diagnosis and treatment of symptomatic gallstone disease.
GALLSTONE DISEASE

[8–13]. Many patients with gastroesophageal reflux or other gastrointestinal disorders have fat-induced abdominal pain. At best, symptoms cannot always reliably predict that a patient’s gallstones are the source of pain [14]. Evidence of gallbladder inflammation by computed tomography (CT) or ultrasonography or a nuclear biliary scan showing gallbladder nonfunction provides objective evidence that the gallbladder is the source of pain [15].

This patient’s somewhat irregular pain pattern is easily consistent with pain from gallstones. The upper gastrointestinal tract could also be the source. Gastroesophageal reflux typically causes burning pain in the chest, but some patients have pain in the epigastrium or occasionally pain referred to the right or left upper abdomen.

• What is the next step in evaluation?

Imaging Studies
Endoscopic evaluation of the upper gastrointestinal tract (esophagogastroduodenoscopy) could be helpful, especially if the pain occurred on a more regular basis or were closely related to food intake. A trial of a proton pump inhibitor also could be useful if the pain occurred on a regular basis. In this patient, the pain seems unlikely to be related to acid given its irregular pattern.

Conventional transabdominal ultrasonography is the primary imaging method used for diagnosis of gallbladder stones. Ultrasonography is more than 95% sensitive for identifying gallbladder stones and is highly specific for a stone when an acoustic shadow is seen. Ultrasonography often shows thickened bile with tiny nonshadowing echoes, termed “sludge” [16]. Sludge has most of the same implications as stones in terms of causing pancreatitis or gallbladder pain. Failure to identify stones in the gallbladder by ultrasonography is often related to the presence of sludge or to an erroneous diagnosis of a gallbladder polyp [17].

Tiny stones can be missed by transabdominal ultrasonography, especially in persons with large body size. The smallest stone that can be identified by ultrasonography is probably a few millimeters, depending on the physical characteristics of the stone as compared to the bile. Endoscopic ultrasonography is performed using special endoscopes with high-frequency ultrasound transducers that are used in close proximity to the gallbladder and other internal organs [18]. Endoscopic ultrasonography is coming into wider community use. Limited experience suggests that this procedure can identify gallbladder stones in persons with negative transabdominal ultrasonography findings [19,20]. The principal use of endoscopic ultrasonography in the biliary tree is to detect common bile duct stones, as discussed below.

Several other imaging modalities can identify gallbladder disease. CT is about 80% sensitive at detecting stones in the gallbladder but may miss noncalcified stones [21]. Magnetic resonance imaging is as sensitive as ultrasonography in identifying stones in the gallbladder, but it is more expensive, requires breath-holding, and has no advantage over ultrasonography [22].

Assessment of gallbladder nonfunction using nuclear biliary scintigraphy (hepato-iminodiacetic acid [HIDA] scan and similar scans) is predictive of gallbladder disease [15]. Anatomic information from nuclear scintigraphy is severely limited, however. Gallbladder ejection fraction can be measured following administration of intravenous cholecystokinin, such as 0.02 µg/kg over 30 to 60 minutes [15,23]. Excessively rapid infusion over 2 to 3 minutes can cause spasm of the gallbladder neck and a falsely low ejection fraction. This test should be done only in stable patients, not on ill inpatients, who may have decreased gallbladder contraction as a result of acute illness. Persons with upper abdominal pain suggestive of gallbladder disease, normal gallbladder by ultrasonography, and low gallbladder ejection fraction reportedly have relief of pain by cholecystectomy more than 50% to 70% of the time, and often have chronic cholecystitis [24,25]. However, these results have been achieved in patients who had careful evaluation to exclude other causes of abdominal pain.

Diagnosis
Abdominal ultrasonography is performed and shows multiple small stones in the gallbladder floating on a layer of thickened bile. The gallbladder wall and bile ducts are normal size. The physician makes a diagnosis of chronic cholecystitis. The patient is curious about what causes gallstones to develop and asks what he could have done to prevent them.

• What factors are associated with the formation of gallstones?

Risk Factors
A number of factors correlate with the prevalence of gallstones or cholecystectomy (Table 1). Gallstones become more common with advancing age and are related to number of pregnancies in women [26]. Until older age (60 years), they are approximately twice as common in women as in men. Cholesterol excretion into bile is partly genetically determined. In the United States, gallstones are more common in some ethnic groups such as Native Americans and Mexican-American women [27]. Other important risk factors are obesity and repeated fluctuations in body weight. Rapid weight loss greater than 1.5 kg per week causes a high
incidence of new symptomatic gallstones [28]. Moderate exercise correlates with lower rate of cholecystectomy among nonobese women but not obese women [29]. No consistent relationship has been established between dietary fat intake and gallstones when obesity is taken into account. In some studies, lower serum cholesterol and higher serum triglyceride levels correlate with gallstone risk [30]. The development of gallstones is correlated with constipation, probably related to changes in bile salt metabolism and recycling [31,32]. Coffee consumption and moderate alcohol intake correlate inversely with the rate of cholecystectomy [33]. Crohn’s disease or resection of the terminal ileum increases the risk of gallstones by increasing the enterohepatic circulation of bilirubin, and perhaps by reducing the bile salt pool [34]. High-dose estrogens, cholestyramine, and fibrates increase the risk of gallstones and/or cholecystectomy [35]. The case patient’s major risk factors for gallstone formation include obesity, elevated triglycerides, and probably his use of a fibrate for hyperlipidemia.

**What therapy is recommended for symptomatic gallstone disease?**

**Cholecystectomy**

Cholecystectomy is recommended. Most cholecystectomies are performed for episodic pain from gallstones. Up to 30% of persons with an episode of gallstone pain have no further recurrences, and risk-benefit analysis suggests that a policy of watchful waiting is associated with a loss in life expectancy of only a few months [36]. In a placebo-controlled trial, patients who received diclofenac for attacks of gallstone pain had reduced pain and less progression to acute cholecystitis [37]. Other nonsteroidal anti-inflammatory drugs presumably would work similarly. For patients with gallstones and no symptoms, prophylactic cholecystectomy is not recommended [38].

In the late 1980s, laparoscopic cholecystectomy seemed radical, and the idea of outpatient laparoscopic cholecystectomy sounded outrageous to many. Yet this procedure has become the usual treatment for many low-risk patients [39-42]. Cost-benefit studies vary in favoring laparoscopic or open cholecystectomy [42-45]. Laparoscopic cholecystectomy and alternative treatments for gallstone disease were the subject of an National Institutes of Health Consensus conference in 1992 [46]. Laparoscopic cholecystectomy uses more expensive disposable equipment and longer operating room time but fewer hospital days than open cholecystectomy. From the standpoint of total societal cost, laparoscopic cholecystectomy causes fewer days lost from employment and fewer days of significant postoperative pain. Most patients return to work within a week, compared to nearly 6 weeks with open cholecystectomy. Total mortality is slightly lower with laparoscopic cholecystectomy, but the incidence of serious bile duct injuries is higher, up to 0.5% [47,48]. Laparoscopic surgery is sometimes not feasible in the presence of extensive scarring around the gallbladder, and a 5% conversion rate from laparoscopic to open cholecystectomy is typical.

**Treatment Recommendation**

The physician recommends that the patient undergo cholecystectomy. However, the patient is reluctant to have surgery and asks what nonsurgical options are available.

**What nonsurgical therapeutic approaches have been used to treat gallstone disease?**

**Oral Dissolution Therapy**

The principal nonsurgical treatment options are oral dissolution therapy and extracorporeal lithotripsy. Oral dissolution therapy is carried out using oral ursodiol (ursodeoxycholic acid), a salt [14]. Ursodiol normally constitutes about 3% of the bile acid in human bile, but when given orally at a dose of 8 to 10 mg/kg/day, it constitutes about half of the bile salt pool. Ursodiol dissolves cholesterol stones at a rate of about 1 mm diameter per month [49]. Ursodiol is not suitable as principal treatment in patients with complicated gallstone disease, such as acute cholecystitis or cholangitis. Side
effects other than occasional diarrhea are rare. A patient weighing 80 kg would take approximately 900 mg of ursodiol daily, at a cost of approximately $12 per day, for 6 months or more if the stones are small. Thus, a course of treatment would cost at least several thousand dollars.

For the case patient, the fact that the stones are floating on a layer of thick bile indicates that they have a high cholesterol content. The composition of stones can often be inferred from clinical data and imaging studies [50,51]. Homogenously calcified stones seen on plain abdominal radiograph or CT are usually pure pigment stones, which do not dissolve with ursodiol. Ring calcification occurs in a cholesterol stone with a layer of calcium salts, which inhibit dissolution. CT may be helpful when deciding whether to proceed with ursodiol therapy [51]. Ursodiol works poorly in patients with nonfunctioning gallbladders. Gallbladder function can be assessed using nuclear cholecintigraphy, oral cholecystogram, or ultrasonography, as discussed.

The patient could be a candidate for ursodiol therapy, given that he has small cholesterol stones. Assuming the stones are approximately 5 mm diameter, they could be dissolved within 6 months. Symptoms often disappear before the stones are completely dissolved. Oral dissolution therapy and/or lithotripsy are associated with a high rate of recurrent, symptomatic gallstones, with 5-year recurrence rates ranging from 20% to 50% [52]. Thus, ursodiol therapy makes a great deal of sense for persons who are very elderly or at high surgical risk but does not make good sense in the case patient, who is only 42 years old and in good health. Cost-benefit analysis suggested that ursodiol treatment has clinical and cost benefits over surgery for some older groups of patients [53]. Oral dissolution is applicable to about 15% to 30% of patients.

Gallstones have also been treated by contact dissolution, using solvents such as methyl tertiary-butyl ether (MTBE) instilled through a percutaneous catheter placed through the liver into the gallbladder [14]. Cholesterol gallstones can be dissolved, but pigment stones and heavily calcified cholesterol stones cannot. MTBE has occasional toxicity, and other agents such as ethyl propionate have been used [54,55]. Contact dissolution requires careful monitoring in a hospital. Enthusiasm for this technique has been limited by a 5-year gallstone recurrence rate of 50% to 70% [56]. In the United States, contact dissolution is not widely available, if at all.

**Lithotripsy**

Both dissolution therapies and lithotripsy were popular in the late 1980s, until the use of laparoscopic cholecystectomy became widespread [57–59]. Lithotripsy can break up stones of any composition, but calcified stones can present a challenge. An adequate candidate for lithotripsy can have a lucent solitary stone with a diameter less than 30 mm, or up to 3 stones with a similar total volume. Only 10% to 20% of patients meet these liberal criteria.

As generally practiced, extracorporeal lithotripsy breaks stones into fragments measuring at least several millimeters, which then pass through the common bile duct. Surprisingly, passage of these fragments causes only occasional pain and pancreatitis. Intensified lithotripsy has recently been used to pulverize stones rather than merely fragment them. Fatty meals are given between sessions to aid gallbladder emptying. Unfortunately, even this more radical treatment does not result in a much higher rate of complete clearance of stones from the gallbladder [60]. However, pain relief often occurs without complete clearance of stones.

Lithotripsy machines were not officially approved by the U.S. Food and Drug Administration (FDA) for treating gallstones until 2000. The capital cost of equipment was high, multiple sessions were required, and ursodiol was used to enhance stone elimination, but at significantly higher cost. Stone recurrence is common after lithotripsy, up to 69% at 6 years [61]. Therefore, the cost-effectiveness of gallstone lithotripsy has been unfavorable compared to surgery, and the availability of such services has been limited in the United States. In 2000, the FDA specifically approved the Medstone STS Lithotripter for gallstone lithotripsy in conjunction with ursodiol. With an FDA-approved lithotriptor, more effective lithotripsy protocols, lower cost equipment, and less reliance on adjuvant ursodiol, lithotripsy may undergo a renaissance for use in selected patients.

**Surgery Referral and Further Course**

The physician explains to the patient that he is a candidate for treatment with ursodiol, but he is not a candidate for lithotripsy because multiple gallstones are present. He still advises the patient to have surgery. The patient agrees, and the physician refers him to a surgeon.

Before his appointment with the surgeon, the patient develops mild epigastric pain with slight jaundice, dark urine, and pruritus. The day after onset of this pain, the patient’s alkaline phosphatase level is 130 U/L (normal < 120), aspartate aminotransferase is 120 U/L, alanine aminotransferase is 90 U/L (normal < 50), and bilirubin is 3.8 mg/dL.

**What is the likely cause of this patient’s pain?**

**How should he be evaluated?**

**Biliary Obstruction**

The symptoms and blood test results suggest biliary obstruction. The alkaline phosphatase level often takes several days to increase in acute bile duct obstruction. The aminotransferases
can briefly increase to 500 U/L or more in the first day or two after acute bile duct obstruction, sometimes leading to the mistaken diagnosis of acute hepatitis. Given the clinical findings, the next appropriate study is endoscopic retrograde cholangiopancreatography (ERCP). ERCP within several days is adequate in a stable, nonfebrile patient. Inpatient observation is usually not required after ERCP and stone removal.

In contrast, a patient with signs of cholangitis, biliary obstruction, and fever needs immediate attention [62]. Cholangitis is treated with antibiotics covering gram-negative enteric organisms and possibly anaerobes [63]. Some recommended antibiotic regimens include ampicillin-sulbactam, piperacillin-tazobactam, ticarcillin-clavulanate, or a third-generation cephalosporin plus anaerobic coverage. A randomized trial established the superiority of ERCP over surgery as the means of establishing biliary drainage, especially in patients with signs of sepsis [64]. In patients with persistent cholangitis after several days of antibiotic treatment, delay in ERCP is associated with increased complications [65]. ERCP is often required emergently in the septic patient with cholangitis. Cholangitis has conventionally been treated with an antibiotic regimen of 7 to 10 days [63]. However, clinical experience and a retrospective study support the concept that only brief antibiotic treatment is needed following successful drainage of the biliary tree [66]. A community-based retrospective study of patients hospitalized with acute cholangitis showed that early ERCP was associated with reduced length of stay [67].

### Endoscopic Procedure

Two days later the patient undergoes an outpatient ERCP procedure. Radiographs from this study show a gallstone impacted near the papilla of the bile duct. A papillotome is inserted into the bile duct, and a 7-mm cut is made to widen the bile duct. A balloon-tipped catheter is inserted and used to pull the stone from the duct. The patient is sent home.

- **When should an ERCP procedure be done to evaluate for stones in the common bile duct?**

### ERCP for Common Bile Duct Stones

ERCP is not routinely indicated in all patients before cholecystectomy, given that the average patient with cholelithiasis has a low risk of having gallstones in the common bile duct (CBD). Laboratory criteria predictive of finding stones in the common bile duct include elevated bilirubin, alkaline phosphatase, and aminotransferase levels. Ultrasonography and abdominal CT can suggest the presence of CBD stones based on the presence of dilated bile ducts and sometimes by imaging stones in the ducts [68]. A meta-analysis and a consensus conference on the diagnosis of CBD stones indicated that none of these imaging or laboratory indicators is highly sensitive by itself [69,70]. A variety of formulas and algorithms have been suggested for predicting the likelihood of CBD stones being present [71,72] (Table 2). An NIH Consensus Conference in 2002 addressed the role of ERCP in detecting and treating CBD stones [73].

Patients in whom there is a high suspicion of CBD stones generally undergo ERCP before cholecystectomy. Patients with lower risk can undergo intraoperative cholangiography at the time of cholecystectomy. When stones are found intraoperatively, they are ideally removed by laparoscopic CBD exploration, if the surgeon is capable of performing this procedure [74]. However, this procedure requires advanced surgical training. Open surgical CBD exploration has become less common. If laparoscopic CBD exploration cannot be done, the patient should undergo ERCP soon after surgery. If a patient develops jaundice soon after surgery due to a retained CBD stone, ERCP should be done without delay because high pressure in the bile ducts can cause clips to come off the cystic duct.

Risks of ERCP and papillotomy include acute pancreatitis, infection, bleeding, or perforation of the intestine [75]. In most instances, the papilla of Vater can be enlarged by papillotomy, and stones can then be pulled from the duct. Larger stones can be broken using a mechanical basket lithotriptor. Stones larger than 1 cm can present a challenge. Stones can be broken using a laser beam directed through glass fibers at the time of ERCP, but these laser lithotripsy systems use expensive, fragile glass fibers and require frequent maintenance, limiting their current availability [76,77]. Extracorporeal shock-wave lithotripsy can be used to fragment CBD stones.
Sometimes stones cannot be removed during an ERCP procedure, often due to a diverticulum of the duodenum near the papilla. Percutaneous transhepatic cholangiography is the major alternative method for establishing drainage of an obstructed biliary system and potentially allowing removal of stones. In the difficult case, transhepatic cholangiography can be used to place a flexible guidewire through the skin, into the biliary tree, and into the duodenum to serve as a guide for cannulation during ERCP [78]. CBD stones can be removed nonsurgically by one means or another in the vast majority of patients. For a patient with difficult-to-remove common duct stones, high operative risk, and limited life expectancy, a biliary stent can be left in place to allow biliary drainage. Although the stent becomes occluded within a few months, the stent acts to tent the bile duct around the stone and can successfully drain the bile duct for years [79].

Two new imaging methods are gradually becoming more common in community practice in the United States: endoscopic ultrasonography (EUS) [18] and magnetic resonance cholangiopancreatography (MRCP) [80]. Comparative trials of EUS versus ERCP suggest that EUS has a sensitivity for CBD stones similar to that of ERCP (about 90%) [71,81,82]. In the future, EUS may be used to exclude the presence of CBD stones in persons with a fairly low probability, thus avoiding the risks of ERCP. MRCP uses a reconstructed image of the bile ducts from magnetic resonance imaging. Sensitivity for detecting stones in the CBD is high [71]. MRCP is an alternative for patients with a low probability of CBD stones, especially if there is increased risk of sedation.

**Cholecystectomy Procedure**

The patient undergoes laparoscopic cholecystectomy as an outpatient 3 days later and is sent home. He is seen in the office a week later and is doing well.

**CASE STUDY 2**

**Presentation**

A 61-year-old woman with long-standing type 2 diabetes presents to the emergency department with a 12-hour history of nausea, vomiting, mild epigastric discomfort, and temperature to 101°F. Ultrasonography performed 2 years ago to evaluate mildly elevated aminotransferase levels showed an echogenic liver and a large stone in the gallbladder. She had no pain at that time. On physical examination, she has mild tenderness in the right upper quadrant and epigastrium. Her complete blood count is notable for a white blood cell count of 17,000/mm³ with left shift. A liver test panel shows a bilirubin level of 1.6 mg/dL, aspartate aminotransferase of 80 U/L, alanine aminotransferase of 100 U/L, and alkaline phosphatase of 90 U/L. Urinalysis is normal.

**Evaluation and Treatment of Patient**

Ultrasonography shows a large stone impacted in the neck of the gallbladder, marked thickening of the gallbladder wall, and a small amount of fluid around the gallbladder. The patient undergoes urgent cholecystectomy. The procedure is converted from laparoscopic to open cholecystectomy because of marked inflammation around the gallbladder. The intraoperative cholangiogram is normal. The patient recovers uneventfully.

**Acute Cholecystitis**

This patient has known gallstones, and her clinical presentation is consistent with acute cholecystitis. The clinical presentation can be deceptively mild in patients with diabetes and severe acute cholecystitis. The incidence of perioperative morbidity and mortality is greater in patients with diabetes and acute cholecystitis as compared to the general population [83,84]. In the past, prophylactic cholecystectomy was recommended for patients with diabetes and asymptomatic gallstones. This policy was abandoned because the risk of elective surgery is increased in diabetic patients, canceling out the benefit of prophylactic surgery [85].

The next step in evaluation of this patient could be either nuclear hepatobiliary imaging or repeat abdominal ultrasonography. Visualization of the gallbladder by nuclear scan would almost rule out cholecystitis [15]. Conversely, a nonfunctioning gallbladder in this setting would make acute cholecystitis extremely likely, and could be sufficient justification to proceed to urgent cholecystectomy. Ultrasonography with Doppler could support a diagnosis of acute cholecystitis by showing thickening or increased vascularity of the gallbladder wall or fluid around the gallbladder [86]. Thickening of the gallbladder wall is not specific for cholecystitis and can also be seen in acute hepatitis and in persons with portal hypertension and low albumin [87]. Ultrasonography can also assess for CBD stones. Depending on the clinical scenario, abdominal CT scanning might be helpful in confirming cholecystitis and excluding alternative diagnoses [88].

**Questions**

- What is the likely diagnosis in this patient?
- What are the next steps in evaluation and management?
possibly nonsteroidal anti-inflammatory drugs [89]. Some surgeons prefer to treat conservatively and perform cholecystectomy electively after resolution of acute cholecystitis. However, studies suggest that early surgery is as safe as delayed surgery [90,91]. Delay of surgery for more than 4 days is associated with a higher rate of conversion from laparoscopic to open cholecystectomy and longer hospital stay [92]. When surgery is delayed for 3 days or more, it may be preferable to do it electively at a later time, if possible. A randomized trial found laparoscopic cholecystectomy to be as safe as open cholecystectomy in patients with acute cholecystitis [93].

Percutaneous drainage of the gallbladder by a radiologist (cholecystostomy) is an alternative treatment for acute cholecystitis in persons who are poor candidates for surgery [94]. However, a randomized study in high-risk patients with acute cholecystitis did not find much benefit for cholecystostomy as compared to conservative treatment [95]. Cholecystostomy might best be reserved for patients who are doing poorly after several days of conservative treatment [96]. Percutaneous puncture of the gallbladder is occasionally valuable as a diagnostic procedure when the diagnosis of cholecystitis is in doubt.

Summary
Most gallstones cause no symptoms. Recurrent pain in the epigastrium or right upper abdomen is the most common symptom. Gallstones in the gallbladder are usually identified by ultrasonography. It is often difficult to be sure that pain is caused by stones. Laparoscopic cholecystectomy has become the standard treatment for symptomatic gallstones. Oral dissolution therapy and lithotripsy are used occasionally. CBD stones can be removed by endoscopic means in the great majority of cases.

Corresponding author: David E. Johnston, MD, Gastroenterology, The Everett Clinic, 3901 Hoyt Avenue, Everett, WA 98201, djohnston@everettclinic.com.

Financial disclosures: None.

References
GALLSTONE DISEASE


Copyright 2002 by Turner White Communications Inc., Wayne, PA. All rights reserved.
To receive 1 hour of AMA PRA Category 1 CME credit, read the article named above and mark your responses on this form. You must complete all parts to receive credit. Then return this form using the fax number or address appearing at the bottom of this page. A certificate awarding 1 hour of category 1 CME credit will be sent to you by fax or mail. This CME Evaluation Form must be fax marked or postmarked within 1 year of this JCOM issue date. Please allow up to 4 weeks for your certificate to arrive.

**Part 1.** Please respond to each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was provided with new information pertinent to my practice.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I reaffirmed a specific skill or knowledge.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>This article will help with clinical decision making.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Relevant clinical outcomes are addressed.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>The case is communicated in a manner that kept my interest.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>The case presentation is realistic and effective.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I could easily interpret the tables and figures.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>My attitude about this topic changed in some way.</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Additional comments: ______________________________________________________________________________________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>__________________________________________________________________________________________________________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Part 2.** Please complete the following sentence.

As a result of reading this case study, I . . .

- see no need to change my practice.
- will seek more information before modifying my practice.
- intend to change the following aspect(s) of my practice: (Briefly describe)

________________________________________________________________________________________________________
________________________________________________________________________________________________________

**Part 3.** Statement of completion: I attest to having completed the CME activity.

Signature: ___________________________ Date: ___________________________

**Part 4.** Identifying information: Please PRINT legibly or type the following:

Name: __________________________________ Fax number __________________
Address: __________________________________ Telephone number __________________
______________________________________________________________ Social Security number: __________________
(Required and confidential)

Medical specialty: ____________________________________________

Wayne State University School of Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.
Wayne State University School of Medicine designates this CME activity for a maximum of 1 hour of category 1 credit toward the Physician’s Recognition Award of the American Medical Association. Physicians should claim only those hours of credit actually spent in the educational activity.