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The Healthcare Burden Imposed by Liver Disease in Aging Baby Boomers

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Abstract The Baby Boomer generation is composed of 78 million Americans who are just beginning to reach their retirement years. Most Boomers have at least one chronic health problem, and these significantly increase the expense of providing medical care. Liver disease is the 12th most common cause of death in the United States, representing a relatively small portion of overall healthcare costs compared with cardiovascular disease and malignancy. Nonetheless, hepatitis C and fatty liver disease are more common in the Boomers and may play a more dominant role as they age. As a consequence, primary liver cancer is likely to become more prevalent. As with most chronic illnesses, prevention rather than disease management is likely to have the greatest impact. For those already afflicted by chronic liver disease, recognition and treatment can reduce the incidence of late complications, as was clearly demonstrated with chronic hepatitis B and C. Perhaps obesity is the greatest threat to our future health, and fatty liver disease, although likely preventable, will probably become the disease that fills the waiting rooms of future hepatologists.

Keywords Hepatitis C · Fatty liver disease · Alcoholic liver disease · Hepatocellular carcinoma

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Introduction

The 78 million living Americans born between 1946 and 1964 are collectively known as the Baby Boomers. Throughout those years, medicine dealt with problems related to environment (infections and cancer) and trauma; life expectancy was about 68 years. Now, as the leading edge of this generation reaches retirement age, life expectancy is approaching 80 years. The number of Americans over age 65 years will double in the first 30 years of this century [1]. Medicine has changed dramatically as well and now deals increasingly with complications of chronic diseases that often result from lifestyle choices including coronary artery disease, chronic obstructive pulmonary disease, diabetes, degenerative arthritis, and asthma [2]. The care of these and other diseases will dominate healthcare during this generation's retirement years. Today, almost half of all Americans and 75% of elderly Americans have at least one chronic health problem [2–4]. About 70% of those with one chronic problem have at least two chronic illnesses [2, 3]. Chronic diseases account for 70% of all deaths and about 80% of US healthcare costs [3]. Chronic health problems are more common in the elderly and result in a significantly higher rate of hospitalization, emergency room visits, and outpatient visits [2]. These rates are expected to increase in the coming decades [5]. These demographics are our medical destiny.

Contribution of Liver Disease to the Healthcare Burden

Liver disease is the 12th leading cause of hospitalizations and death, and thus accounts for a relatively small proportion of total US healthcare expenditures; that is likely to remain the case. Today, chronic viral hepatitis,

alcoholic liver disease, and nonalcoholic fatty liver disease account for most US liver disease [6, 7]. Thus, our discussion focuses on these and a few emerging trends in liver disease that will impact the healthcare burden in the elderly in coming decades.

Alcoholic Liver Disease

Excessive alcohol consumption is the third leading preventable cause of death in the United States [8]. A strong correlation has always existed between national per capita alcohol consumption and mortality from cirrhosis [9]. Although this epidemiologic association falls short of establishing a direct causal link, alcohol nonetheless accounts for between 40% and 45% of US liver-related mortality [10]. However, this statistic may underestimate the true impact of alcohol because chronic alcohol consumption not only causes acute and chronic alcoholic liver disease, but also contributes to the progression, complication risk, and mortality of other causes of liver disease, particularly chronic hepatitis C [7].

Per capita alcohol consumption fell from a peak of almost 2.8 gallons of ethanol in 1980 to less than 2.2 gallons in 1999, but gradually increased again through 2005 mainly from increased per capita consumption of wine [11]. At the same time, the age-adjusted death rate from cirrhosis declined by 48% between 1970, the beginning of the peak in alcohol consumption, and 2005 compared with a decrease in all-cause mortality of 35% [10]. However, an alcohol-related diagnosis was listed in 1.7 million—about 4%—of all hospital discharges in 2006 and the proportion of these related to liver disease has steadily increased over the past 20 years [12]. Thus, we might expect that deaths from alcohol-related liver disease will rise again in coming years.

Intervention at the time of presentation with advanced liver disease does not significantly affect the impact of this disease on society, although it can be important for the individual, and outcomes after transplantation are excellent in selected persons. On the other hand, public policy and prevention can have a dramatic influence. Increased taxation of alcoholic beverages and raising the minimum drinking age reduce consumption and abuse during later adulthood [13, 14]. Furthermore, studies indicate that brief screening and counseling during medical visits are extremely cost-effective ($1755 per quality-adjusted life year saved) [15]. Clearly, these are changes that government and the healthcare industry must initiate.

Chronic Viral Hepatitis

Hepatitis C

In the United States, the high chronicity rate after acute hepatitis C virus (HCV) infection kept the prevalence of chronic hepatitis C infection relatively stable at about 3 to 4 million persons over the past decade, despite a marked fall in incidence since 1990 [16–18]. Importantly, however, the proportion of individuals chronically infected with HCV who have had their disease for longer than 20 years is increasing and will continue to do so for another two decades [16, 17]. Notably, although the overall prevalence of HCV is 1.6%, the prevalence after age 40 is up to threefold higher, and most individuals with HCV infection are thus now in their fourth to fifth decade of life [18]. Baby Boomers constitute about 66% of HCV-infected patients in the United States [18]. Outpatient and hospital visits for hepatitis C have increased steadily since the early 1990s [19•].

Although early prospective studies suggested that fewer than 20% of patients with chronic hepatitis C infection would progress to cirrhosis after 15 to 25 years, these studies involved small numbers of patients. Subsequent studies that included large groups of patients followed prospectively over many years painted a bleaker picture, with up to half developing cirrhosis given sufficient time [20, 21]. Fibrosis progression appears to be particularly dependent on patient age and the duration of infection [22–24]. Because fibrosis occurs more slowly in those infected at a younger age, most untreated patients develop cirrhosis after age 60 years, regardless of when their infection occurred [23]. Among patients with cirrhosis, the annual risk of hepatic decompensation is more than 3% and the risk of hepatocellular carcinoma (HCC) is 1–7% [25, 26]. Cirrhosis caused by chronic hepatitis C accounts for about 40% of deaths from liver disease and is the leading indication for liver transplantation in the United States; in 2006, HCV infection was associated with nearly 40% of all liver transplants performed [19•]. HCV infection is also the most common cause of HCC, the leading cause of death among those with HCV-related cirrhosis [27–29]. The risk of HCC appears to increase with age and the duration of infection [30]. HCV explains the rapid increase in HCC in the United States in recent years, whereas rates for hepatitis B virus (HBV)-related and alcohol-related HCC have decreased or remained stable [27, 31•]. Mathematical models estimate that hepatic decompensation and HCC are expected to double by 2020, whereas liver-related deaths will almost triple [17]. These morbid and often mortal events will occur primarily in persons in their sixth, seventh, and eighth decades of life.

Treatment of chronic hepatitis C with interferon-based regimens successfully eradicates the virus in about half of patients [32]. Ongoing studies with direct-acting antiviral drugs suggest that eradication may be possible in about 70% of cases [33]. Sustained viral clearance reduces or even reverses liver fibrosis [34]. In successfully treated patients with cirrhosis, the risk of liver failure is essentially eliminated

and the risk of HCC is reduced by about two thirds [35, 36•]. Thus, antiviral treatment might significantly reduce the societal impact of HCV infection. However, most infected patients remain undiagnosed in this country and patients and physicians have been slow to accept therapy. Thus, the future impact of antiviral treatment on what could potentially be a tsunami of liver failure and HCC is unknown. The contribution of hepatitis C to our future healthcare costs over the next few decades remains a wild card.

Hepatitis B

Although widespread application of the hepatitis B vaccine in children and young adults has dramatically reduced the number of cases of acute HBV infection in the United States, between 800,000 and 1.4 million persons remain with chronic infection [37]. The overall prevalence of chronic infection is less than 1%, but there are communities with high proportions of native Alaskans or Asians where 5–15% may be infected [38]. Thus, hepatitis B is now an uncommon infection in most medical clinics, representing only about 3% of the liver disease diagnosed [7]. Globally, however, about 350 million persons are chronically infected, usually via perinatal transmission [37].

About 40% of individuals with childhood onset of infection will develop a complication of the disease, either liver failure or HCC [38]. Indeed, HCC is the third most common cause of cancer-related deaths worldwide [39], and an estimated 620,000 persons worldwide die from HBV-related liver disease each year [37]. In the United States, however, most of the disease morbidity and mortality is among immigrants, mostly Asian, and first-generation Asian Americans who often acquired their infection before the widespread use of the HBV vaccine. Indeed, 74% of HCC in Asians is from HBV [40], and 80% of Asians with HCC are new immigrants [31•]. Finally, liver failure caused by HBV, as reflected in the number of liver transplants done annually, appears to be declining [41]. Whether this trend reflects changes in population demographics or use of antiviral therapy is speculative.

Several potent antiviral agents are available [42]. Although it is clear that these agents reduce the risk of hepatic failure and HCC, and may even reverse liver failure, guidelines for their use remain controversial and somewhat arbitrary. The majority of infected patients are not currently receiving antiviral therapy, even in the United States.

As vaccination becomes more widely applied in the United States and elsewhere in the world, the incidence of new infection will continue to fall. However, even universal vaccination will not eliminate chronic infection from the population for at least a generation. Thus, complications of HBV infection will continue to be seen, albeit at an ever-decreasing rate, over the next several decades.

Hepatocellular Carcinoma

HCC is the third leading cause of cancer mortality worldwide [31•]. Most cases occur in patients with advanced liver fibrosis or cirrhosis. Age-adjusted HCC incidence rates tripled in the United States between 1975 and 2005 [27, 31•]. Incidence rates increased in each 10-year birth cohort from 1900 through the 1950s, and the risk appears to increase progressively with age. Thus, this complication primarily affects the elderly. The rate has increased most dramatically in whites, blacks, and Hispanics, particularly in males, from hepatitis C. In contrast, Asians/Pacific Islanders, although having a higher incidence of HCC, represent a relatively small proportion of the total number of cases and the rate has remained steady or gradually fallen in recent years [31•]. Mathematical models estimate that the high prevalence of chronic hepatitis C will cause the number of cases of HCC to continue increasing through at least the year 2020 [17]. Furthermore, such models project the highest risk, at least in HCV-infected persons, will occur between the ages of 70 and 85.

Because most cases occur in patients with chronic liver disease, regular surveillance with imaging (eg, ultrasonography) can often identify tumors when they are localized and potentially amenable to locoregional ablation or transplantation [31•]. Although surveillance strategies are far from universally used in those at risk, the proportion of patients with HCC identified while still localized has steadily increased, which has led to improved survival [31•]. Between 1992 and 2004, 2- to 4-year HCC survival rates doubled, which was particularly evident for patients who underwent some type of tumor-specific treatment [31•]. However, the 1-year survival rate remains less than 50%. Liver transplantation is the most definite treatment for HCC, and the recurrence risk is low (about 5%) when the tumor is localized at the time of the operation. The number of cases undergoing liver transplantation for HCC in the United States has increased steadily over the past decade, and one of every five patients transplanted with hepatitis C has HCC [43].

The costs of tumor surveillance and treatment are not negligible. However, highly effective ablation techniques are available and therefore early identification of HCC can offer a real chance of cure. Wider application of surveillance should result in even more tumors being identified when they are amenable to locoregional therapies rather than transplantation. Tumor surveillance is particularly important among older patients who may be poor candidates for transplantation because of age and comorbid conditions.

Nonalcoholic Fatty Liver Disease

Although increasingly common, nonalcoholic fatty liver disease (NAFLD) currently accounts for few of the health-

care dollars presently used to care for patients with liver disease [7]. However, this situation is likely to change, perhaps dramatically. The prevalence of obesity has more than doubled in the United States over the past 30 years, and obesity is now present in 34% of the population [44, 45]. Obesity shortens life expectancy, and increases the likelihood of disability and comorbid conditions (eg, diabetes, hypertension, and pulmonary disease) [46, 47, 48•, 49]. Diabetes is now thought to be present in 1 of 10 adults, double the prevalence in 1970 [44]. Metabolic syndrome, defined by the presence of abdominal obesity, hypertension, and insulin resistance, affects 50 million Americans [49]. Obesity accounts for nearly 10% of US healthcare expenditures, and an estimated 300,000 die each year of weight-related disease [45]. Just as smoking killed more than 1 billion persons during the 20th century, complications of the current obesity epidemic, if left unchecked, could result in the loss of three to four times that many lives during the next 100 years.

NAFLD and nonalcoholic steatohepatitis (NASH) are commonly associated with obesity, insulin resistance or type 2 diabetes, and the metabolic syndrome [48•, 49]. The prevalence of NAFLD and NASH, currently estimated at 65% and 20% of obese adults, respectively, has increased in parallel with the obesity epidemic in this country [50]. Steatosis is present in almost all morbidly obese persons [50]. This trend has resulted in an almost fivefold increase in hospitalizations for NAFLD over the past 20 years, even among children and young adults [51]. Survival is reduced in patients with NAFLD and liver failure accounts for 10% of deaths in these patients, after malignancy and cardiovascular disease [48•]. The hazard risk for death from cirrhosis is 2.2 in those with central obesity.

If the current trend in obesity and diabetes in the United States continues, it is quite possible that NAFLD will become the most common cause of advanced liver disease and liver failure in the 21st century. Currently, no specific treatment of this disorder is available other than lifestyle and dietary change. Bariatric surgery, although not widely used, can significantly impact obesity and its complications, and the few long-term studies available suggest that these procedures can reduce overall 10-year mortality by 20–40% [52].

Although the future healthcare costs of obesity unquestionably will be overwhelming, it is less clear what proportion of the increased utilization and expense will be attributable to NAFLD. We suspect it is more likely that the competing risks of other complications of obesity (eg, diabetes, cardiovascular disease, malignancy, sleep apnea, and even Alzheimer's disease) will monopolize resources.

Conclusions

Currently, our healthcare system is challenged by the high prevalence of chronic disease and the overwhelming needs of providing ongoing care. The challenge lies in balancing the needs of these patients with the impending shortage of healthcare providers and dollars. Access to and provision of quality care to an aging population will be a difficult challenge. It will require development of overall goals, clear focus, and efficient utilization of our healthcare dollars to best optimize outcomes. In the long term, prevention rather than disease management is likely to have the greatest impact, but that transition will be highly contentious and perhaps politically untenable. However, on a more positive note, these goals may be more easily achievable in hepatology. Vaccination and other prevention strategies have reduced the incidence and mortality of acute viral hepatitis, and antiviral medications have reduced late sequelae of chronic HBV and HCV infection. HCC, a late consequence of chronic viral hepatitis, can often be managed by locoregional ablation and may become less common as the prevalence of chronic hepatitis declines after 2020. Alcoholic liver disease has become less common, although this phenomenon may be transient. However, increased taxation and raising the legal drinking age have proven effective at reducing alcohol consumption and abuse later in life. Finally, NAFLD, although common, may not impact long-term resource utilization for the reasons previously discussed. Thus, the primary focus in hepatology in the coming years must be on prevention and early detection of disease.

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