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Research Note:
Relative Profitability of Acute Care Hospital Services (2d edition)

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I. Introduction

This research note categorizes acute care hospitals services as relatively profitable, relatively unprofitable, variably profitable, or uncertain. It updates "Research Note: Relative Profitability of Acute Hospital Services," an online exhibit to Horwitz, "Making Profits and Providing care: Comparing Nonprofit, For-Profit, and Government Hospitals," *Health Affairs* 24, no. 3 (2005): 790-801. Scholars in hundreds of studies have relied upon the previous work as an authoritative source of profitability designations (See, e.g. Barro et al., 2006, Bazzoli et al., 2012, Chang and Jacobson, 2017). Given the age of that note, it is time to provide an update.

Whether a service is likely to be profitable for any individual hospital depends on many circumstances, such as the patient population most likely to receive it, market conditions, insurer and government policies at the time the service is adopted and provided, the management priorities and skills of the hospital executives, and a host of other factors (Bai and Anderson, 2016). Consequently, the warning that appeared in the previous note remains valid: "Despite the rigorous nature of this service review, a note of caution is necessary. Categorizing services by profitability is difficult. Profitability is not an inherent attribute of medical services but depends on institutional-specific factors such as management skills or accounting conventions like cost allocation. Within a single hospital, costs and charges differ, and discounts vary by individual payer. Further, there are joint service costs that blur the profitability picture" (Horwitz, 2005b).

To that warning we add a caveat that we did not include previously but that applies to both research notes: Relative profitability designations do not mean that a service is, in fact, profitable for hospitals, even most of the time. This note offers a simple categorization of relative profitability, not absolute profitability. Consequently, this note attempts to suggest what services a typical administrator, faced with the decision of whether to adopt or discontinue a service, would reasonably consider to be relatively profitable or not.

The services reported in this document address the major service areas offered by full-service, acute care hospitals. They are all represented, in some form, in the American Hospital Association Annual Surveys. In addition to medical services, we newly include profitability designations for the community outreach services listed in the AHA surveys. Because these services are not medical services, we have listed them separately at the end of this Research Note.

II. Research Methods and Sources

The categorizations in this research note are based on many sources. First, they derive from a review of peer-reviewed public health, health policy, medical, business, finance, statistics, sociology, and public policy research relating to profitability of medical services. Second, we reviewed Medicare reimbursement policies as reported by the Medicare Payment Advisory Commission (MedPac) and Prospective Payment Assessment Commission (ProPAC). Third, the designations are supported by a review of trade publications, business magazines, and newspaper articles. Although this last set of sources does not always report scientifically rigorous information, they are helpful in demonstrating what an administrator is likely to understand about the

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profitability of potential services. Fourth, in some cases, an analysis of the socioeconomic or insurance statuses of patients likely to demand various services supports the case that a service was relatively profitable or relatively unprofitable.

This research took place over several years (2017-2021). Researchers, under the close supervision of and ongoing review by a law librarian (Lynn McClelland MPH, JD, MLIS, Reference Librarian) and Horwitz, performed initial searches on each service, made recommendations regarding profitability designation. Researchers included five UCLA law students with health law and policy expertise and research training, an experienced health lawyer and UCLA LLM graduate, and MPH students at Vanderbilt and the University of Minnesota. Horwitz and Nikpay reviewed the document multiple times, and Horwitz, Nichols, and Nikpay determined final decisions on coding by consensus after discussing the evidence.

III. Relatively Unprofitable Services

A. Alzheimer's Disease and Related Dementias

Although there is considerable evidence that private, residential facilities that care for patients in need of a group of services related to memory care—services often known as Alzheimer's Disease and Related Dementias (ADRD), charge high prices and are profitable for institutional providers, there is little evidence regarding the profitability of these services in the acute care hospital setting. Nonetheless, given the evidence available, the high treatment needs and costs of these patients as a result of their condition and high number of comorbidities, and the fact that the services do not involve surgery or other interventions that tend to be profitable, we categorize this group of services as relatively unprofitable.

In 2020, 5.8 million Americans were estimated to have Alzheimer's Disease, and that number is predicted to increase to 14 million by 2060 (Centers for Disease Control and Prevention, 2020b *citing* Matthews et al). People with Alzheimer's Disease and other conditions related to dementia are costly patients to treat. These patients are typically elderly (80% are 75-years or older [Hebert et al., 2013]) and are more likely to have comorbidities than are other patients (Alzheimer's Association, 2020, Zhao et al., 2008, Kuo et al., 2008). For example, mental health conditions, neurologic conditions, cerebrovascular disease, diabetes with acute complications, and injuries are more prevalent in people with Alzheimer's Disease than in a matched control group (Kuo et al., 2008). Among Medicare beneficiaries age 65 or older, 26% of beneficiaries with an Alzheimer's Disease or dementia diagnosis, compared to only 4% without such a diagnosis, report having at least five chronic conditions, including coronary artery disease (38%), diabetes (37%), chronic kidney disease (29%), and congestive heart failure (28%) (Alzheimer's Association, 2020). Severe dementia itself precipitates several age-related complications such as difficulty communicating, malnutrition, immobility, and swallowing disorders (Alzheimer's Association, 2020), all of which makes treating other conditions more costly. In general, people who have Alzheimer's Disease

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combined with other chronic conditions tend to have higher medical service use and higher costs of care (Alzheimer's Association, 2020; Wong, 2020).

In fact, the number of hospital stays per year for people with Alzheimer's Disease or other dementias is twice as high as for other elderly individuals (Alzheimer's Association, 2020). Their lengths of stay are longer, and the charges related to those stays are higher for hospitalized patients with Alzheimer's Disease than for other patients (Beydoun et al., 2017, Zhu et al., 2015). Under a capitated payment system, a longer length of stay can make a patient less profitable for a hospital. One study considered the medical costs of patients across the spectrum of cognitive impairment and concluded that both emergency department and hospital inpatient costs were proportionate to the severity of the cognitive decline (Leibson et al., 2015). Finally, in 2018, almost a quarter (22%) of hospital stays of Medicare patients with Alzheimer's Disease or other dementias are followed by readmission within 30 days (Centers for Medicare and Medicaid Services, 2021a). Since 2012, hospitals with higher than predicted readmission rates are subject to Medicare reimbursement rate cuts (Joynt and Jha, 2013).

Although reimbursements for Alzheimer's Disease care and memory-related services were traditionally low, or at times non-existent, they have increased somewhat over the past decade. In 2011, Centers for Medicare and Medicaid Services began reimbursing providers for an annual wellness visit during which an assessment for cognitive impairment is expected to take place (Centers for Medicare and Medicaid Services, 2011), meaning that patients may have a diagnosis before being treated at a hospital. In 2017, a new procedure code was initiated to reimburse providers for clinical visits for cognitive assessments and care planning services (Centers for Medicare and Medicaid Services, 2016a). However, these reimbursement codes are inadequate in that they are limited to the assessment and the development of a care plan and do not cover ongoing care management services (Boustani et al., 2019), and they exclude certain clinical services and providers (Borson et al., 2017). Requirements for chronic management services, such as the creation of a comprehensive plan of care covering all health issues of the patient or limiting payment to only one practitioner per month (Centers for Medicare and Medicaid Services, 2018b, Centers for Medicare and Medicaid Services Medicare Learning Network, 2019), are demanding, hindering, and time consuming (Boustani et al., 2019). Even in outpatient settings, reimbursements do not compensate for the costs of the Alzheimer care services (Boustani et al., 2019). Consequently, patients with these conditions may arrive at the hospital undiagnosed or treated and therefore in need of intensive services.

The small percentage of acute care hospitals that offers this set of services is likely to attract patients in great need, both for ADRD treatment and for other services. Such services include treatment for multiple co-morbidities, which in themselves are expensive to treat and are made even more so due to the challenges of treating patients with memory disorders. As a consequence, ADRD services are likely to be unprofitable for hospitals, although research relating to the profitability of this category of services is sparse.

B. Burn Care

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Burn care has long been regarded as one of the most unprofitable services that an acute care hospital offers (MedPAC, 2008, HealthLeaders Media Staff, 2009). Burn treatment requires specialized units that are expensive to operate; for that reason, there are typically only one or two burn centers in large cities (Hynes, 2019). These centers tend to be located in nonprofit, safety net hospitals (Galewitz, 2015), and many hospitals do not offer burn treatment services at all (MedPAC, 2008).

The costs of treating burns are very high (McDermott et al., 2016, Kearns et al., 2016, Schroeder, 2017), particularly because patients have long lengths of stay. Compared to all other inpatient hospital admissions, burn-related patient stays are about twice as costly and long (McDermott et al., 2016). Contributing to high costs of treatment, burn care usually involves at least 24 hours of hospitalization, during which time patients are closely monitored and their burn damage is evaluated before the necessary treatment course can be determined and administered (Hynes, 2019).

These high costs, coupled with low reimbursement, make burn care likely to be unprofitable. As with other unprofitable services, reimbursement rates have not kept pace with high costs (Schroeder, 2017, Anami et al., 2017). In part, this is because people with low socioeconomic status, who are at higher risk for burns (Park et al., 2009), are more likely to be uninsured or insured by public programs with lower reimbursement rates than privately insured patients. Although nonprofit hospitals may be able to cross-subsidize burn care from other, more profitable services, some choose not to do so. For example, for-profit hospitals, which are more sensitive to financial pressures than other forms of hospitals, tend not to offer burn care at all (Tillman, 2013, Horwitz and Nichols, 2011, Horwitz, 2005a).

On the other hand, telemedicine has shown some promise for lowering the costs of treating burns. Telemedicine increasingly allows hospital staff to monitor and treat less severe burn cases outside of expensive, inpatient units. In fact, telemedicine reimbursement rates are equivalent to those of in-person visits, and "the availability of telemedicine services allows access to specialty expertise in a large and sparsely populated region without imposing an undue financial burden." (Russell et al., 2015, pg. 1037). However, the use of telemedicine does not appear to reduce the probability that patients will eventually be transferred to a burn center to receive care (Mohr et al., 2017).

Nonetheless, overall high costs coupled with low reimbursement rates suggest that burn care remains a relatively unprofitable service. As one nonprofit hospital administrator explained, "burn care isn't an opportunity to make a profit; it's about providing life-saving care for the people who need us most" (Hynes, 2019).

C. HIV/AIDS

There have been dramatic changes in HIV/AIDS diagnosis, treatment, and insurance coverage since the last Research Note. Yet overall HIV/AIDS treatment remains relatively unprofitable for hospitals.

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Nonetheless, this section outlines several factors suggesting that HIV/AIDS-related services may have become somewhat less unprofitable than in the past. First, HIV testing is now broadly covered by public and private insurance without patient cost sharing (D'Aunno et al., 2014; Kaiser Family Foundation, 2019a; Kaiser Family Foundation, 2019b), allowing providers to be reimbursed for giving more rapid diagnoses, which allows for the implementation of steps to prevent further infection and enables rapid treatment. For example, in 2015, Centers for Medicare and Medicaid Services (CMS) announced Medicare coverage of annual HIV screening for all beneficiaries between the ages of 15 and 65 (Kaiser Family Foundation, 2019a). As a result of access to screening, more HIV patients receive medical care earlier, avoiding more severe illness and the substantially higher medical expenditures associated with patients who begin treatment at later stages (Fleishman et al., 2010).

Second, in states that expanded Medicaid eligibility and eliminated the abilities of insurance companies to deny coverage based on pre-existing conditions, the ACA made coverage more accessible to HIV/AIDS patients, which likely eases the financial burden on hospitals providing HIV/AIDS services (Ritchwood et al., 2017). Between 2012 and 2014, "the percentage of uninsured hospital stays among HIV patients fell from 13.7 percent to 5.5 percent in four Medicaid expansion states…" (Heslin and Elixhauser, 2016, pg. 2).

Third, providers may save or recoup costs through a number of federal programs. For example, low-income, underinsured HIV patients can access treatment coverage through the federal Ryan White AIDS Drug Assistance Program (ADAP),[1] regardless of whether they live in a Medicaid expansion state (Health Resources and Services Administration, 2020b). More significantly, under the federal 340B Program,[2] health care organizations participating in Medicaid or Medicare may generate revenue when reimbursement for covered outpatient drugs exceeds the discounted prices the entity paid for the drugs. (MedPAC, 2015b).

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[1] ADAP is a state and territory-administered program, authorized under the Ryan White HIV/AIDS Program, that provides FDA-approved medications to low-income people living with HIV who have limited or no health coverage from private insurance, Medicaid, or Medicare (Health Resources and Services Administration, 2020a). In FY2020, the federal government awarded over $2.4 billion through the Ryan White Program, funding state and local governments ($1.97 billion), community organizations and providers ($ 276.2 million), and clinical training programs ($71.7 million) (U.S. Department of Health and Human Services, 2020d, Kaiser Family Foundation, 2020). ADAP funding recipients provide medical care and treatment services to more than half of people living with HIV in the United States (Kaiser Family Foundation, 2020).

[2] Created in 1992 and expanded in 2010, the 340B Program is a federal program that requires drug manufacturers to sell outpatient drugs to eligible health care organizations and covered entities at discounted prices as a condition of participation of Medicaid and Medicare (Conti and Bach, 2013). Among the roughly 3,000 participating hospitals, about two-thirds are nonprofit and one-third are government owned (Government Accountability Office, 2018). Although there are stringent requirements for participation, there has been evidence that some nongovernmental hospitals participate despite not meeting those requirements (Government Accountability Office, 2019; Government Accountability Office, 2020). Under the program, a covered entity may generate revenue when reimbursement for the covered outpatient drugs exceeds the discounted prices the entity paid for the drugs. (MedPAC, 2015b). In general, covered entities may use these funds to "expand the number of patients served, increase the scope of services offered to low-income and other patients, invest in capital, cover administrative costs, or for any other purpose," although spending is not tracked (MedPAC, 2015b, pg. 8). Several scholars have shown that entities covered by the program earn substantial profits (Conti et al., 2019, Nikpay et al., 2018, Government Accountability Office, 2011, Wallack and Herzog, 2011).

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Despite these improvements, hospital-based treatment for HIV/AIDS is still overall likely quite unprofitable. This is largely because as the overall probability of HIV/AIDS patients being hospitalized declines, patients who are hospitalized are increasingly older and sicker (leading to longer and more costly hospital stays), and are more likely to be uninsured or underinsured. Furthermore, there are limits to the federal drug payment programs mentioned above, making them less profitable for hospitals than they may seem.

First, although there are fewer people with HIV/AIDS than in the past, the population of people with HIV/AIDS who become hospitalized has become both older and sicker. More specifically, "[t]he annual number of individuals receiving an HIV diagnosis declined by 16% during the past decade, from 44,716 in 2009 to 37,428 in 2018" (Sullivan et al., 2021, pg. 1098). And treatment advances, such as antiretroviral treatment, have driven down hospital stays and shifted care to outpatient settings (Heslin and Elixhauser, 2016), where patients obtain lab tests to monitor drug treatment (U.S. Department of Health and Human Services, 2020a). Between 2006-2013, hospital stays of patients with a principal HIV diagnosis decreased by 49% and aggregate inpatient costs for HIV-treatment declined by 12%, from $3.2 billion to $2.83 billion (Heslin and Elixhauser, 2016). A 2016 study showed that the probability of a person living with HIV being hospitalized during a year fell 64%, from 0.36 to 0.13 from 2000 to 2013, and the average monthly hospital cost per person living with HIV disease also decreased (74%) (Hellinger, 2016). These results are consistent with other research identifying sharp declines in admissions after the introduction of combination antiretroviral therapy (ART) in 1996 (Davy-Mendez et al., 2020, Hellinger, 2016, Yehia et al., 2010).

With declines in admissions, the characteristics of the population of patients who are hospitalized for HIV/AIDS treatment has changed. The now smaller population of hospitalized patients, consisting of those who cannot be treated in outpatient settings, has become more expensive to treat for several reasons. Inpatients are less likely to have had adequate access to outpatient care and therapy (Bachhuber, 2014). And, as treatment improves for those who can access it and patients increasingly survive with the disease, patients are older than they used to be. Effective antiretroviral therapy has increased the life expectancy of HIV-infected people to such an extent that their lifespans are converging on those of populations who are not infected with HIV (Brown and Guaraldi, 2017). Although there have been recent increases in HIV diagnoses among 25- to 34-year-olds (Sullivan et al., 2021), and the number of new HIV infections among people aged 50 and older is decreasing, in 2018, 17% of the new diagnoses in the US were 50 and older (Centers for Disease Control and Prevention, 2020a). In that same year, over half of people living with diagnosed HIV were aged 50 or older in the United States (Centers for Disease Control and Prevention, 2020a). Another sign of this aging is that the proportion of patients with HIV covered by Medicare "rose from 22% in 2000 to 33% in 2013, whereas the proportion of patients covered by Medicaid fell from 52% in 2000 to 44% in 2013" (Hellinger, 2016).

The aging of the population living with HIV has meant that patients increasingly have comorbidities typical of older patients in general; moreover, studies have demonstrated that the prevalence of such comorbidities (e.g., hypertension, chronic kidney disease, low bone mineral

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density, liver disease, and thyroid disease) in general is higher in the HIV-infected population than in uninfected patients (Mayer et al., 2018, Gallant et al., 2017, Onen et al., 2010, Nkhoma et al., 2010, Deeks, 2011). One study found that 83% of people aged 50 years or older who were living with HIV (and 63% of those aged 18 to 49) had at least one comorbidity compared to only 69% of people without HIV, matched for age and gender (and 42% of those aged 18 to 49) in the sample (Koram et al., 2013). Studies on European patient populations have also documented relatively high numbers of co-morbidities for people living with HIV (Brown and Guaraldi, 2017). Besides aging, studies in the U.S. and abroad demonstrate that lifestyle factors such as smoking, physical inactivity, or drug use, which are both more common and more consequential in the HIV-positive population, also contribute to relatively high morbidity among this population (Zingmond et al., 2017, Brown and Guaraldi, 2017).

These comorbidities are increasingly common among the current population with HIV/AIDS who are hospitalized, meaning costs are higher per person than they once were. For example, there has been "a sizeable increase in the average age of hospitalized persons with HIV (from 41 in 2000 to 49 in 2013) and a sizeable increase in the average number of diagnoses reported for each HIV inpatient (from 6.0 in 2000 to 12.4 in 2013)" (Hellinger, 2016). The percentage of those patients with HIV who are hospitalized "with a diagnosis of congestive heart failure increased from 3.6% to 7.9% between 2000 and 2013, whereas the percent with arrhythmia increased from 2.6% to 8.4%, and the percent with liver disease increased from 10.4% to 16.3%" (Hellinger, 2016).

Inpatients with HIV, particularly those with symptoms, have longer lengths of stay than other patients (Rowell-Cunsolo et al., 2018, Akgün et al., 2013), which also suggests that they are sicker than other patients. For example, one study showed hospital stays associated with a principal or secondary HIV diagnosis in 2006, 2010, and 2013 had respective lengths of stay of 6.8, 6.5, and 6.1 days (Heslin and Elixhauser, 2016); according to the National Inpatient Survey database, the average length of stay for each of the three years for all inpatients was 4.6 days (H-CUP, 2020). A 2014 review of research concluded that both the length of stay and average cost of hospitalizations among people with HIV were longer and higher than the national average; in this study, 9 days and $65,000 for inpatients with HIV, versus 4.6 days and $10,000 for the general population; moreover, the most common reasons for hospitalizations among the patients with HIV were "non-AIDS defining illnesses" (Price et al., 2016). For example, patients with HIV or AIDS show higher complication rates and lengths of stay than other patients with the same non-HIV/AIDS treatments such as appendectomies (Masoomi et al., 2011), trauma treatment (Morrison et al., 2010), and treatment for acute Myocardial Infarction (Pearce et al., 2012). Another study examining Medicare expenditures found that although comorbidities had little effect on pharmaceutical costs, the effect of comorbidities on hospital costs was dramatic: "nearly 2/3 (64%) of the study sample had at least one non-HIV related condition and 39% had two or more, [and] mean costs of care increased from $30,312 for those without an identified comorbidity to over $46,000 for those with 2 comorbidities, and up to $219,000 for people with 11 comorbidities or more" (Zingmond et al., 2017). In general, the number of comorbid conditions and inpatient

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medical procedures were significant predictors of HIV/AIDS-related hospital length of stay (Santella et al., 2010, as cited in Price et al., 2016).

Second, an additional factor contributing to the general unprofitability of HIV/AIDS treatment is the fact that people with HIV/AIDS are disproportionately underinsured or uninsured. People living with HIV are more likely than the general population to be insured by Medicaid (42% compared to 13%, respectively) (Kaiser Family Foundation, 2019b, Kates, 2011), and HIV prevalence is highest in areas that did not expand Medicaid under the ACA (Sullivan et al., 2021). Between 2012 and 2014, "the percentage of uninsured hospital stays among HIV patients increase[ed]… from 14.5 percent to 15.7 percent in two comparison states that did not expand Medicaid" (Heslin and Elixhauser, 2016, pg. 2). Furthermore, hospital-based HIV/AIDS treatment requires many laboratory services that are costly and may not be completely reimbursed by insurance (Eaton et al., 2017). And, as overall infection rates decline, people who are racial minorities, particularly Black and Latino Americans, are more likely than others to become infected (U.S. Department of Health and Human Services, 2020b, 2020c), and these patients are more likely than others to have inadequate insurance. As a result of these factors, many patients who end up in the hospital are still patients who are not profitable for hospitals from an insurance reimbursement perspective.

Finally, although the 340B program may be profitable for hospitals in many instances, that may not be the case for HIV/AIDS treatment. First, not all hospitals can participate in the program, and for hospitals outside the 340B program, drug manufacturers and pharmaceutical companies charge high prices. HIV treatment drugs are particularly expensive in the U.S. (Rosenberg, 2018a, Rosenberg 2018b). One study demonstrated a 34% increase in the cost of antiretroviral therapy (ART) in the United States between 2012 and 2018, 3.5 times more than inflation (McCann, 2020). In fact, HIV medicines are a top expenditure in Medicaid's drug budget, and Medicare Part D expenditures on HIV specialty drugs have been increasing quickly in recent years (Dawson and Dolan, 2020; Rosenberg, 2018a, MedPAC, 2020, MedPAC, 2017).

Second, 340B-discounts cannot be claimed for drugs administered to Medicaid patients. Yet, 42% of patients with HIV/AIDS are covered by the Medicaid program (Kaiser Family Foundation, 2019b). Third, given the high prevalence of outpatient drugs in HIV/AIDS care, recent attempts by drug manufacturers to limit 340B discounts on outpatient drugs administered through contract pharmacies could essentially eliminate discounts for eligible HIV/AIDS patients (Davis, 2020). Most HIV/AIDS treatments consist of oral therapies that are dispensed through pharmacies (U.S. Food and Drug Administration, 2020). Fourth, perhaps the most important limitation to financial opportunities provided by 340B is the expiration of patents for HIV/AIDS drugs (Ritchwood et al., 2017, Walensky et al., 2013). Because 340B discounts for branded drugs are larger than those for generic ones, costs for HIV/AIDS programs may increase after patents for antiretroviral drugs expire (Dickson et al., 2018).

Finally, 340B profits from HIV/AIDS therapies may subsidize otherwise uncompensated care for patients with HIV/AIDS and, therefore, be used for additional service provision and forestalling losses, rather than to generate profits. There is some evidence that this is the case in

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federally qualified health and other outpatient clinics (Kirby et al., 2018). Although we were not able to find any research that answers this question specifically in the HIV/AIDS and hospital context, studies have shown that 340B-disproportionate share hospitals provide significantly more care to low-income patients and higher levels of uncompensated care than non-340B hospitals (Nikpay et al., 2018, L&M Policy Research, 2018, Dobson Davanzo & Associates, 2016, 340B Health, 2017), so this may be the case for 340B hospitals with respect to HIV/AIDS services.

How all these trends affect profitability is hard to estimate. However, given the aging population and associated comorbidities, the high costs of treating patients with HIV compared to other patients for non-HIV related diagnosis, and the insurance profile of the sickest patients, HIV/AIDS treatment likely remains a relatively unprofitable service for hospitals.

D. Hospice

Hospice services were not included in Horwitz (2005b) and, therefore, are new to this edition of the Research Note. Medicare's hospice program, established in 1983, was designed to provide beneficiaries with no more than six-months of life expectancy an alternative to interventional, medical care (Centers for Medicare and Medicaid Services, 2021b). Hospice care is provided in various settings, including patients' homes, single-service hospice facilities, skilled-nursing facilities, and acute care hospitals. Hospitals offering hospice services may have a dedicated hospice unit and team of caregivers to provide intensive support to terminally ill patients. As the largest hospice payer, Medicare reimbursed more than 90% of all hospice patient days in 2017 (MedPAC, 2020). Hospice services have long been very unprofitable for hospitals to provide (MedPAC, 2020), though they are quite profitable for free-standing, single-service, for-profit hospices (Hallman and Forster, 2015, Stevenson et al., 2015).

The for-profit hospice industry, which is dominated by free-standing providers affiliated with regional and national hospice chains (Stevenson et al., 2015), has grown substantially over the past two decades. From 2000-2012, the number of Medicare hospice beneficiaries increased from 500,000 to 1.3 million patients, and expenditures increased by more than 400% from $2.9 billion to $15.1 billion (MedPAC, 2016). However, the majority of the growth was driven by for-profit hospice providers, and primarily in freestanding hospice facilities (MedPAC, 2016). From 2000-2014, the total number of hospice providers nearly doubled, from 2,255 to 4,092 providers (MedPAC, 2016). In 2019 alone, hospice providers overall increased by 4.3%, largely because for-profit hospice growth grew by 6.3% (MedPAC, 2020).

As a consequence of the increasing prevalence of freestanding providers, the share of hospital-based hospice providers has declined over the past twenty years. In 2018, for-profit hospices (including free-standing and hospital-based) comprised 70% of all hospices (MedPAC, 2020). Hospice care has been extremely profitable for freestanding providers in terms of Medicare profit margins, which produced a low of 11.6% in 2014 and a high of 15.3% in 2017 (MedPAC, 2020, Table 11-14). MedPAC has urged Congress every year since 2008 to enact significant reforms to Medicare's hospice payment structures, cautioning policymakers that Medicare's overpayments and subsequent overutilization of hospice care do not lead to better quality care

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(MedPAC, 2008, MedPAC, 2009, MedPAC, 2010, MedPAC, 2011, MedPAC, 2012, MedPAC, 2013a, MedPAC, 2014, MedPAC, 2015a, MedPAC, 2016, MedPAC, 2017, MedPAC, 2018, MedPAC, 2019, MedPAC, 2020).

Hospital-based hospice care, which in 2018 made up only 10% of all hospices (MedPAC, 2020), has had an entirely different experience. For more than 20 years, hospital-based providers have exhibited significant financial losses related to hospice care, with profit margins from Medicare reimbursement ranging from -10% to -24% annually (MedPAC, 2008-2020). From 2014-2018, annual Medicare margins had a low of -23.8% (2015) and a high of -13.8% (2017) (MedPAC, 2020, Table 11-14).

Hospital-based hospice is also more costly for the provider than is free-standing hospice. First, because "[w]hen beneficiaries elect to enroll in the Medicare hospice benefit, they agree to forgo Medicare coverage for conventional treatment of their terminal illness and related conditions." (MedPAC, 2020, pg. 309). This condition means that providing hospice care deprives a hospital of reimbursement for treatment that it might have otherwise provided whereas a free-standing hospice earns revenue entirely from hospital treatment.

A second reason hospital-based hospice care is unprofitable is that Medicare's per diem reimbursement system, in place until 2016, meant that payments were correlated with length of stay (O'Neill et al., 2008), and patients in hospitals-based hospice stay for much shorter periods than those in free-standing hospices. Overall, average length of stay per hospice patient increased from 54-86 days between 2000-2010 (MedPAC, 2012). In 2018, the average lengths of stay by hospice ownership were 110 days for for-profit compared to 68 days for nonprofits, and 92 days for free-standing, 70 days for home-health based, and 57 days for hospital-based hospice providers (MedPAC, 2020). Nonprofit providers are more likely than for-profit centers to serve higher cost patients who live for shorter periods of time and consequently have shorter lengths of stay, such as those with late-stage cancer diagnoses (Hallman and Forster, 2015).

Attempts to reform Medicare's payment system have had modest results (Bazell et al., 2019, MedPAC, 2020). Despite the 2016 implementation of the first significant reform since 1983— hospice providers are now reimbursed at a higher per diem rate for the first 60 days of stay and a lower rate thereafter—average lengths of stay have remained roughly stable and profit margins have largely only increased for for-profit hospice providers (up by approximately 6% since 2016) (MedPAC, 2020). And for-profit providers have driven all of the growth in the total number of hospice providers since 2016 (Parker, 2019). However, the new reimbursement system has led to a reduction in losses for hospitals: margins related to Medicare reimbursement for hospital-based hospice went from -22.9% in 2015 and -13.8% in 2017 (MedPAC, 2020).

Thus, hospice care is and is likely to remain relatively unprofitable for hospitals.

E. Mental Health/Substance Use Treatment

Despite attempts by the federal government to expand mental health coverage and access—notably with the passage of the Mental Health Parity and Addiction Equity Act of 2008 and the Affordable Care Act (ACA)—mental health remains relatively unprofitable for acute care

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hospitals due to several factors, including that the services have high staffing costs and patients often require complex treatment while lacking adequate or any insurance coverage. The financial strain on hospitals has forced many to close their mental health facilities over the last 50 years, resulting in a substantial decline and shortage in the number of psychiatric beds in the U.S. (Shields et al., 2018). According to the National Institute of Mental Health, "nearly 60 percent of people with mental health conditions and 90 percent of those with substance abuse problems don't get the treatment they need" (Editorial Board, 2013).

Recent trends indicate a rise in the number of for-profit psychiatric hospitals as well as a shift towards providing mental health and substance use treatment in outpatient settings and (Kowalczyk, 2017b). As a result, acute care hospitals may face increased financial burden, often in their emergency rooms, for providing care to underinsured, high need, and high-cost patients.

This section addresses five types of mental health services found in the American Hospital Association surveys: 1) inpatient mental health, alcohol, and substance use, 2) outpatient mental health, alcohol, and substance use, 3) child/adolescent psychiatric care, and 4) psychiatric emergency care.

i. Inpatient mental health, alcohol, and substance use treatment

Inpatient mental health and substance use treatment in acute care hospitals have long been unprofitable, in large part due to high overhead costs coupled with a relatively poorly insured and sick patient population. A large cost for psychiatric care in hospitals is for medical and nursing staff, as federal and state regulations require psychiatric hospitals and psychiatric units to provide a minimum number of hours of direct care from nurses and mental health workers (Kowalczyk, 2017a). In addition, federal safety and quality standards, including a CMS requirement in 2019 that all inpatient facilities be ligature-free, have led psychiatric units to close in Wyoming, California, Ohio, and Missouri, referring to the requirement as "high-cost solutions with low value" (Kudelska, 2019).

In addition to high costs, the historically low reimbursement rates and lack of adequate insurance coverage for patients seeking inpatient mental health services place financial burden on hospitals. People with mental illnesses are more likely to have public insurance and less likely to have private insurance, compared with those without mental health issues (Rowan et al., 2013). Although the ACA expanded private insurance coverage, Medicaid, which has low reimbursement rates, remains the largest payer for mental illness. In 2015, Medicaid covered "21% of adults with mental illness, 26% of adults with serious mental illness, and 17% of adults with substance use disorder" (Zur et al., 2017, Greene, 2019). Further straining hospitals, mental and behavioral disorders accounted for the largest share of Medicaid hospital readmissions in 2010, totaling 19.4% of readmissions (Trudnak et al., 2014).

The financial burden of high costs and low reimbursement rates for psychiatric services led to the closure of many inpatient psychiatric facilities in recent years. From 1998-2013, the number of psychiatric beds in the U.S. fell by over 30% (Kudelska, 2019,). Even still, considerable

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evidence suggests that acute care hospitals are disproportionately at risk of financial losses from mental health services, compared with for-profit, freestanding psychiatric hospitals.

Despite the overall decline of inpatient psychiatric beds, the number of for-profit beds (including freestanding psychiatric hospitals and acute care, general hospitals) increased by 48% from 2010 to 2016 (Shields et al., 2018). For-profits tend to specialize in the single-service psychiatric hospital business. For example, 43.5 percent of psychiatric hospitals were for-profit in 2014 compared to 16.4 percent nonprofit and 40.1 percent government-owned (Horwitz, 2020). Freestanding, for-profit psychiatric hospitals are better suited than acute care hospitals to earn profits as they are an example of specialty hospitals, which are generally well-positioned to drive down costs and select for well-insured patients (Sachdev, 2016) and have shown high profits (Kowalczyk, 2017b). Such hospitals have regulatory advantages that allow them to pursue profits more than general hospitals. For example, because freestanding psychiatric hospitals are typically exempt from EMTALA, they do not need to stabilize all patients who come to them (Schmalz and Sawyer, 2020). Not being full-service hospitals, they are also able to select for patients insured by commercial payers, which pay much higher rates than Medicaid and Medicare. For example, in the state of Michigan, Blue Cross Blue Shield paid one hospital $250 for a psychiatric evaluation, compared with Medicaid's $40 reimbursement rate (Greene, 2019). As an example of overall profitability, Universal Health Services Inc., the largest psychiatric hospital system in the country, earned $702 million in profits in 2016, an average profit margin of 23.3% (Kowalczyk, 2017b, Sachdev, 2016). These approaches are not available to general acute care hospitals, hospitals that typically receive psychiatric patients through the ED.

Another method for-profit, freestanding hospitals seem to use to cut costs for psychiatric care is providing low standards of care (Schlesinger and Gray, 2006). News and media sources have highlighted numerous cases of for-profit mental health facilities across the country that do not meet staffing requirements or sanitary standards. In 2017, 24 of Universal Health Services' 188 mental health hospitals were under federal regulation for potential fraud, and the company settled to pay the Department of Justice $127 million in 2019 to resolve the charges (Truong, 2019, Kowalcyzk, 2017b). As part of a general acute care hospital, it would be difficult to provide lower standards of care in one unit than for a single-service hospital to do so.

Ultimately, although some for-profit, freestanding providers can generate high profits from inpatient psychiatric facilities, acute care hospitals continue to face financial losses from inpatient mental health services. High overhead costs leave hospitals financially burdened to provide mental health treatment to patients who are often underinsured and turn to emergency departments for care (Elejalde-Ruiz, 2018, Greene, 2019).

ii. Outpatient mental health, alcohol, and substance use treatment

National trends indicate that more mental health services are being provided in outpatient settings, which operate at lower costs (Han et al., 2017). According to the 2018 National Mental Health Services Survey, 40% of all mental health treatment facilities in the US were outpatient facilities (Substance Abuse and Mental Health Services Administration, 2018). From 2010-2015,

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the number of outpatient behavioral health locations grew 2.9% and many privately owned outpatient facilities generated reliable profits (The Advisory Board, 2015a; Diment, 2016). The expansion of private insurance and Medicaid with the implementation of the ACA increased coverage for mental health and substance use treatments, driving growth in the outpatient sector. However, it is difficult to determine the profitability of outpatient mental health services for hospitals and there is limited research available, likely because privately owned, freestanding facilities dominate the outpatient mental health industry (Han et al., 2017).

iii. Child/adolescent psychiatric care

Although some single service child psychiatric hospitals, which are largely for-profit, are able to generate profits, child and adolescent psychiatric services are likely even less profitable than adult services. As a result, there is a national shortage of hospitals that provide youth psychiatric care. For example, one study found that only 12% of counties have a hospital-based mental health treatment facility that serves children and adolescents, while one-fourth of counties have any type of hospital-based mental health facility (Cummings et al., 2016).

Youth psychiatric services have typically been unprofitable because they are complex and expensive to provide (Lindrooth et al., 2018). The minimum number of hours of direct care from nurses and mental health workers required for child psychiatric services is greater than for adults (Kowalczyk, 2017b). In addition to high costs, child psychiatric services are often not well reimbursed; Medicaid and CHIP covered more than 57% of children in 2018 (Takkunen and Zlevor, 2018).

As the role of publicly owned hospitals in providing youth psychiatric services has declined over the past two decades, freestanding privately owned for-profit and nonprofit mental health facilities have expanded their investment in child psychiatric care (Cummings et al., 2016). The implementation of the Mental Health Parity and Addiction Equity Act of 2008 helped make child and adult psychiatric services more lucrative for freestanding mental health facilities by requiring mental health and substance use services essential for acceptable insurance coverage (Mechanic, 2017). As a result, freestanding mental health facilities are able to capture more favorable reimbursement rates than before, particularly for children covered by private insurance. Since public hospitals are more likely than privately-owned facilities to provide care to underinsured psychiatric patients, many public hospitals are left to provide care to the highest cost, highest need patients (Rowan et al., 2013). Thus, acute care hospitals treat patients that specialty hospitals may not wish to treat and overall, this service is likely relatively unprofitable.

iv. Psychiatric emergency care

Psychiatric emergency services have long been regarded as unprofitable because they occur in the emergency room, which often attracts a poorly insured, sick population. Mentally ill patients rely more on emergency rooms for care than physically ill patients, and there is some evidence that emergency room utilization for mental health services is rising (Luthra, 2016). In 2010, there were 6.4 million national visits to emergency departments by patients whose primary diagnosis

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were for mental illnesses, an increase of 28% from four years prior (Creswell, 2013). Hospital administrators and emergency department (ED) physicians have noted that psychiatric emergency patients often require more costly staff resources than other ED patients, such as one-to-one nurse supervision (Sanborn, 2016*).* The cost burden of psychiatric emergency patients is particularly high for hospitals without a psychiatric or behavioral department, as ED physicians may lack access to instant care resources like a psychiatrist or social worker (Sanborn, 2016). As a result, patients face lengthier wait times in the ED with worsening mental health conditions (Sanborn, 2016). On the other hand, hospitals with behavioral health units are likely better equipped to minimize costs or break even by having a faster triage process to connect patients with care resources and by requiring fewer staff members who are trained to work with psychiatric patients (Sanborn, 2016).

F. Obstetrics

This service category includes a few obstetric-related services that are identified separately in the American Hospital Association Annual Surveys, including obstetrics (listed both as a service line and by bed count) and birthing rooms. Although responsible for over four million hospitalizations per year and more than $50 billion in revenue (Russell, 2019), obstetric services are relatively unprofitable for hospitals. They are likely to be unprofitable because there is decreasing demand (particularly in rural areas), high overhead costs, and low Medicaid reimbursement rates. Despite the unprofitability of the services, hospitals are likely to have obstetrics units both because they tend to be loss leaders—patients who deliver in a hospital is likely to seek care for her family in the future (Luthra, 2018)—and because an obstetric unit is important for providing full-service care.

Obstetric units are a source of substantial losses for many hospitals, which has resulted in the closure of obstetric units across the country, especially in rural areas and other areas with high concentrations of Medicaid enrollees (Hung et al., 2017). Between 2004 and 2014, 9% of rural hospitals closed their obstetric units, bringing the total proportion of rural hospitals offering obstetric services to less than half (Kozhimannil et al., 2018, Mara, 2018,). For rural areas, a sharp decline in demand due to a flat to declining birth rate makes it harder for a hospital to maintain the service, as some have estimated that a typical obstetric unit would need at least 800 births per year to cover the fixed costs (Hung et al., 2017, Mamula, 2018). Urban areas may have greater volume, but they are also likely to have higher fixed costs, especially for facilities, personnel, and liability coverage (Lorch et al., 2014).

As rural obstetric units have closed, more volume has been directed towards suburban hospitals (Bruce, 2013, Luthra, 2018). Suburban hospitals are more likely to have a higher proportion of patients covered by commercial payers, which reimburse at higher rates—perhaps more than twice as much—than Medicaid (Haskell, 2017,). Even so, obstetric units are not viewed by hospitals as profit centers; rather, obstetric units are often seen as a way to drive "downstream activity" for the patient and her family towards more profitable services, including future medical care or neonatal ICU stays. Since women are often the primary health care decision makers for

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their families, hospitals may keep obstetric units open as a way to encourage women who had positive birthing experiences to seek future care services for their family (Haskell, 2017, Luthra, 2018, Mamula, 2018, Russell, 2019).

In light of decreasing demand and increasing fixed costs, more hospitals—especially in rural areas—have begun experimenting with telehealth solutions, where ultrasounds are conducted and followed by video conferences with a remotely located obstetrician (McKay, 2017). Though still an emerging technology, there is promise that this can enable more rural patients, especially those who are high-risk, to remain local for pre-birth obstetric services (McKay, 2017), and it may make the service more profitable in the future.

Finally, there has also been a marked increase in surgical deliveries (Datz and O'Neil, 2017). Nearly one in three births in obstetric unit are delivered by C-section, even though some estimate that nearly half of these are avoidable (Datz and O'Neil, 2017, Kozhimannil et al., 2013). C-section deliveries are reimbursed at higher rates than vaginal deliveries and are more likely to occur at hospitals with relatively high costs (Andrews, 2015, Rosenthal, 2013a). Some observers hypothesize that the high rate of surgical deliveries is motivated by financial rather than medical concerns (Andrews, 2015, Kozhimannil et al., 2013). Similarly, there has also been an increasing trend of early deliveries, which in turn resulted in longer, more profitable hospital stays and neonatal ICU admissions, although this has reversed in recent years as hospitals have put "hard-stop" policies against early deliveries without a medical reason (Terhune, 2014). Nonetheless, even with the increase in surgical deliveries and the use of obstetrics as a loss-leader, the service itself is relatively unprofitable.

G. Palliative Care

Palliative care has dramatically expanded over the last decades, evolving from a philosophy of care to an interdisciplinary specialty that focuses on improving the quality of life of seriously ill patients. Unlike hospice, palliative care is provided at any stage of the illness along with life-prolonging medications and curative medical treatments (Centers for Medicare and Medicaid Services, 2015a). Most inpatient palliative care is delivered by palliative care consultation (PCC) teams, and some hospitals have a dedicated, acute palliative care unit (APCU) (Reddy et al., 2014). In 2019, 72% of hospitals with 50 or more beds reported a palliative care team, an increase from 67% in 2015 and only 7% in 2001 (Center to Advance Palliative Care, 2019a). Although studies have demonstrated that providing palliative care can result in considerable cost savings (May, 2019), the need for dedicated staff as well as low or nonexistent reimbursement rates suggests that the service overall is relatively unprofitable.

Palliative care can generate overall savings per admission. For example, inpatient palliative care consultation (PCC) has been associated with a reduction in laboratory and radiology testing, pharmacy costs, intensive care unit admissions, and invasive procedures (Penrod et al., 2006, 2010, Morrison et al., 2008, 2011, Gade et al., 2008). Some studies have further reported a shortened length of stay when PCCs were requested (Wu et al., 2013, Ciemins et al., 2007). Economic analyses have confirmed the beneficial effect of PCC on costs (May et al., 2016, May

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et al., 2014, McCarthy et al., 2015, Smith et al., 2014, Morrison et al., 2011). A recent meta-analysis examining the data from six previous studies (accounting for a total of over 130,000 patients) found that PCC combined with medical treatment within three days of admission resulted in an average cost savings for the hospital of $3,237 per admission, and there were higher savings for cancer patients ($4,251 per admission) and for patients with four or more comorbidities ($4,865) (May et al., 2018).

Inpatient palliative care units (PCU) have likewise shown an association with cost savings (Nathaniel et al., 2015, Albanese et al., 2013, Eti et al., 2014, Smith et al., 2003). One study estimated that $848,556 in spending was avoided by transfers to a hospital's PCU from various other units (including general medical units, more than half of which was attributable to transfers from the intensive care units) (Albanese et al., 2013). Another analysis of direct cost savings at a particular PCU found that in its first two years of operation, the PCU saved $687 per patient relative to spending that would have happened in other acute care units (Nathaniel et al., 2015). Furthermore, after patients were transferred to the PCU, the average daily direct costs of patients who died in the hospital were $240 less than costs of patients receiving palliative care through PCC, demonstrating thereby that although both PCC and PCU are associated with cost savings for hospitals, these cost savings are even greater when patients are transferred to the PCU (Nathaniel et al., 2015). A study of the PCC and PCUs showed that over 13 months, Johns Hopkins Medical Institutions saved almost $3.5 million (Isenberg et al., 2017). In addition, studies have shown that cost savings further increase when the palliative care intervention takes place early in the hospital admission (Macmillan et al., 2020, Fitzpatrick et al., 2018, May et al., 2018, May et al., 2015).

Providing palliative care also appears to reduce readmission rates and future health care utilization. Studies have shown a decreased 30-day readmission rate when patients received palliative care (Bharadwaj et al., 2016, O'Connor et al., 2015). A randomized trial of 517 patients analyzed the cost of care for six months after hospital discharge and reported a net health care cost savings of $4,855 per patient who had had palliative care during their admission (Gade et al., 2008). Finally, another study of 41,363 patients demonstrated that patients who had received palliative care had considerably lower future acute care utilization and costs, as well as a lower number of future intensive care unit days (O'Connor et al., 2018).

Despite these cost savings, palliative care services are poorly reimbursed or, in many cases, not reimbursed at all. There is currently no specific CPT code or other defined method of reimbursement for hospital-based palliative care services (Sullender and Selenich, 2016). Medicare Part A does not cover palliative care unless it is delivered in a hospice setting, meaning that reimbursement is only available when palliative care is delivered to terminally ill patients who are no longer receiving curative medical treatments (HealthCompare, Inc., n.d., Centers for Medicaid and Medicare Services, 2021b). PCC, however, are covered by Medicare when they fall under Medicare Part B fee-for-service benefits (HealthCompare, Inc., n.d.). In 2015, Centers for Medicare and Medicaid Services (CMS) introduced two new time-based billing codes for end-of-life discussions, covering face-to-face conversations between patients and health care professionals about prognosis, treatment plan, goals, quality of life, and wishes regarding future

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medical treatment (Centers for Medicare and Medicaid Services, 2015b, Kim et al., 2019). However, no rate has been set by CMS, leaving reimbursement decisions to Medicare administrative contractors, who are generally private health insurers (Lowes, 2015, Sullender and Selenich, 2016).

Furthermore, the lack of a billing code means that bills are likely to be rejected. Since palliative care is provided concurrently with other curative medical treatments, there is a risk of duplication of services if different medical providers treat a patient on the same day and bill their services for the same diagnosis (Jones et al., 2015). Finally, given the time-consuming and multidisciplinary nature of palliative care, the revenue collected through reimbursements do not match the actual costs of the program (Center to Advance Palliative Care, 2019a). Low reimbursement results in a heavy toll on hospitals as reimbursement covers less than 50% of costs (Center to Advance Palliative Care, 2019b).

Finally, billing codes neither reflect the holistic nature of palliative care nor cover the range of providers and services needed, such as the services of chaplains, social workers, registered nurses and bereavement counseling (Fitzpatrick et al., 2018, Sullender and Selenich, 2016). In April 2019, the Center for Medicare and Medicaid Innovation announced five new alternative payment models, including Primary Care First, which aims to reduce Medicare spending by preventing unnecessary inpatient hospital admissions while improving quality of care and access to care. The program, a voluntary five-year alternative payment model for eligible practitioners (including palliative medicine practitioners), supports the delivery of advanced primary care to patients with complex, chronic needs, and seriously ill populations (Centers for Medicare and Medicaid Services, 2021c). The first cohort of the program began in January 2021 and might lead to better reimbursement for this type of care.

H. Transplant: Bone Marrow, Liver, and Lung

The most common types of organ transplants are kidney, liver, heart, and lung (Milliman Research Report, 2020, Centers for Disease Control and Prevention, n.d.). This section addresses three types of transplants—bone marrow, liver, and lung transplants—that are relatively unprofitable. Due to high reimbursement rates and relatively well-insured patient populations, renal and heart transplants are typically regarded as relatively profitable services for hospitals (Houston, 2019) and are discussed in detail in a later section.

The number of organ transplants performed in the U.S. has more than doubled over the past two decades, and the waitlist for transplants has grown by a factor of five. In 2018, 36,527 organ transplants and more than one million tissue transplants were performed (Health Resources and Services Administration, n.d.-a). Transplants are one of the costliest services a hospital can provide. The profitability of transplants depends on the type of transplant, the volume of transplants performed at a hospital, costs associated with any treatment complications, and patient insurance status. Minimum volume requirements to meet CMS and private insurance standards for reimbursement have driven competition among transplant centers, causing liver and lung transplants to be relatively unprofitable for hospitals with lower market share (Knap, 2006,

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Klesney-Tait et al., 2015). Bone marrow transplants, one of the most common types of tissue transplants, are also relatively unprofitable for hospitals.

i. Bone marrow transplants

Bone marrow transplants are one of the most common types of tissue transplants, with more than 22,000 procedures performed annually (Milliman Research Report, 2020). Overall, hematopoietic cell transplantations (HCT) are relatively unprofitable services for hospitals due to high costs and, often, inadequate Medicare reimbursements. HCT is the umbrella term under which bone marrow transplantation sits—the cells used in HCT may come from bone marrow, umbilical cord blood, peripheral blood, or other sources. HCT can either be autologous (transplantation of stem cells from the patient's own body) or allogenic (transplantation of cells from another individual, either related or unrelated) (Foreman and Nakamura, 2015). Both types of HCT—allogenic and autologous—are generally unprofitable for hospitals, though autologous HCT is typically less unprofitable than is allogenic HCT (Preussler et al., 2012). During the late 1990s and early 2000s, the very high costs of HCT with high-dose regimens (HDCT) were particularly well-known (Saito et al., 2008).

HCT has become increasingly available because it is generally a cost-efficient and clinically effective method of treating bone, bone marrow, or blood related diseases, but the procedure remains expensive (Majhail et al., 2013). From 2004 to 2007, HCT was found to be among the "top ten procedures with the highest increase in hospital costs," with total national costs for HCT hospitalization increasing from $694 million to $1.3 billion (Majail et al., 2013). Yet it is a very high-cost service (Majhail et al., 2009). Despite efforts to cover costs with reimbursements, hospitals often have shortfalls amounting to tens of thousands of dollars per patient, although there is considerable variation depending on the method of treatment, source of cells, patient's illness and patient characteristics (see e.g., Maziarz and Driscoll, 2011; Khera et al., 2012).

In the 1980s, there was high variation in costs for both among inpatient and outpatient high-dose chemotherapy and autologous stem cell collection as well as between them; similarly, although mean total charges to insurers covered costs, the range of charges both among inpatient and outpatient patients and between them was high. (Meisenberg et al., 1998, Table 4). More recently, Medicare reimbursement for some procedures related to autologous HCT have gone down significantly; for example, the reimbursement rate for harvesting autologous HCT has decreased from over $850 to just over $80 per collection (Shah et al., 2015; Bennett et al., 1999). As reimbursement rates have declined, costs have increased from an average of $99,450 in 2002 to an average of $144,199 in 2014; this increase has outpaced the increase in overall costs for inpatient stays (Abbasi, et al., 2020).

Reimbursement is also limited for allogenic HCT and bone marrow transplants; reimbursement codes for HCT have not kept pace with costs or medical practice. For example, hospitals generally have to absorb $30,000-50,000 when patients receive dual umbilical cord stem cell transplants (Maziaraz and Driscoll, 2011). Medicare will only cover the costs of allogenic HCT for myelodysplastic diseases if a beneficiary is participating in an approved clinical trial that

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meets certain criteria (Centers for Medicare and Medicaid Services, 2010). Importantly, allogenic transplantations require an allocation of costs for finding the donor, on top of the same types of costs associated with autologous transplantation (Gajewski et al., 2004, Gajewski, 2015). The average cost of an initial hospitalization for allogenic HCT has been estimated at $200,000, compared to an average range of $36,000-88,000 for autologous HCT (Shah et al., 2018).

Large transplant centers typically have contractual arrangements with large private insurers and, as with Medicare, hospitals receive a fixed amount of money for each transplant, regardless of actual cost (Bennett et al., 1999; see also Clemmons and Anderegg, 2017). These fixed reimbursement rates are often substantially less than the costs the hospital incurs by providing the services. Harvesting costs are not substantially recouped by Medicare reimbursement, and the hospital is not particularly likely to successfully cover its costs through charges to private insurance. In the very best cases, these costs are covered by insurance and the hospital does not have to absorb any losses. In addition, without payments from private insurance to the hospital, the labor hours of physicians contribute substantially to the unprofitable nature of bone marrow transplantation and HCT (Bennett et al., 1999), because these labor hours increase overall costs.

ii. Liver transplants

Liver transplants are used to treat severe types of liver failure primarily caused by alcoholic liver disease, hepatocellular carcinoma, and hepatitis C virus. More than 8,000 liver transplants are performed annually (Habka et al., 2015, Milliman Research Report, 2020). Although liver transplants may be profitable for hospitals that are able to perform high transplant volumes, competition among transplant centers and the burden of extremely high costs have caused many hospitals to view the service as relatively unprofitable (Knap, 2006).

The average billed charge for a liver transplant is approximately $870,000 (Milliman Research Report, 2020). More than half of these costs result from the transplant procedure itself, which includes hospital lengths of stay of an average of 21 days, ancillary services, nursing care, drugs, supplies, and facility-based service. In addition, liver transplants are associated with relatively high costs during the 180 days post-transplant discharge, which may result from hospital readmissions, regular outpatient visits, and treatment of complications (Milliman Research Report, 2020). For hospitals looking to start a liver transplant program, the costs can be up to $3 million (Knap, 2006).

Similar to other types of organ transplants, some hospitals are able to earn profits despite high costs because the majority of liver transplant recipients are covered by private insurance, which pays favorable reimbursement rates to hospitals (Milliman Research Report, 2020). Privately insured patients have been found to have higher transplant rates and lower waitlist dropout rates, compared with patients covered by Medicare or Medicaid (Stepanova et al., 2020). Hospitals that are able to capture high proportions of well-insured patients may also view transplant centers as a way to build prestige and drive downstream revenue (Knap, 2006).

However, profitability is closely linked with liver transplant volume. As competition among new transplant centers has increased, some hospitals have struggled to perform enough

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liver transplants to generate profits. In light of research demonstrating that better patient outcomes are associated with higher volume transplant facilities, CMS requires a minimum of 12 transplants per year in order for a facility to be certified for Medicare compensation (Stepanova et al., 2020, Knap, 2006). Private insurers often look to partner with transplant centers that perform more than 50 liver transplants annually. As a result, liver transplants have become concentrated in fewer hospitals better suited to earn profits, while some hospitals unable to capture enough market share find that they need to provide liver transplants to as many as six uninsured patients to meet CMS certification requirements (Knap, 2006).

iii. Lung transplants

Lung transplants are used to treat restrictive lung disease, obstructive lung disease, and cystic fibrosis. Over 2,500 lung transplants are performed per year in the U.S. and the average billed charge for a lung transplant is over $1,000,000 (United Network for Organ Sharing, n.d., Milliman Research Report, 2020). The costs of the procedure itself, combined with an average patient length of stay in the hospital of 31.4 days post-transplant, account for a majority of these expenses (Milliman Research Report, 2020). Faced with very high costs, high competition, and pressure to increase transplant volume, more than 40% of lung transplant centers that opened in the U.S. since 1988 have closed their lung transplant programs (Klesney-Tait et al., 2015).

However, as with liver transplants, lung transplants may prove relatively profitable for a small number of hospitals that perform the procedure in high volumes (Klesney-Tait et al., 2015). Financial solvency necessitates high volumes, as transplant centers must meet a minimum number of volume requirements in order to become eligible for Medicare reimbursements and private insurance coverage (Klesney-Tait et al., 2015). Since approximately two-thirds of lung transplant recipients are privately insured, hospitals that meet these volume requirements may capture favorable reimbursements (Lehr et al., 2017).

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IV. Relatively Profitable Services

A. Bariatric Surgery

Bariatric surgery is a relatively profitable service. In the last 20 years, there has been a dramatic increase in the number of performed procedures (Nguyen et al., 2016, American Society for Metabolic and Bariatric Surgery, 2021). Several factors have meant that the service is quite profitable, including advances in bariatric surgery procedures and subsequent improved outcomes, expanded insurance coverage, and continued expansion of robotic surgery, implementation of Enhanced Recovery After Surgery (ERAS) guidelines, and an increasing prevalence of obesity. Profit margins were estimated to be 14.7% in 2020 (Le, 2020).

Over time, developments in surgical techniques have improved outcomes and reduced costs. Until the 2000s, most bariatric surgeries were open procedures (Livingston, 2005), although bariatric surgery was one of the early types of surgery to benefit from robotics (Pugin, 2011). With the introduction of laparoscopic surgical procedures, which led to a large increase in the number of bariatric operations (Lee and Almalki, 2017, Nguyen et al., 2016, Broderick et al., 2015, Lo Menzo et al., 2015, Nguyen et al., 2005), there were improvements in surgical complexity, in postoperative recovery such as decrease postoperative pain, and in shorter lengths of stay (Khorgami et al., 2017a, Cooney et al., 2003, Scerbo et al., 2020, Jung et al., 2017, Lee and Pryor, 2011). Over the past decade there have been significant changes in the types of laparoscopic bariatric procedures performed; laparoscopic sleeve gastrectomy (LSG) surpassed the laparoscopic Roux-en-Y gastric bypass as the leading bariatric procedure in the U.S. (Wirth et al., 2021, Mocanu et al., 2020, Kizy et al., 2017, Ponce et al., 2016), a transition that has led to further decrease in complications and length of stay (Sheetz et al., 2019, Khan et al., 2016) and lower readmissions (Sheetz et al., 2019, Abraham et al., 2016).

These improvements have greatly decreased costs, largely due to decreasing length of hospital stays, without reducing quality. For example, hospital costs related to LSG have been found to increase linearly with the length of hospital stay, almost doubling after 7 days (Khorgami et al., 2017a). And next-day discharge after bariatric surgery did not result in worse rates of 30-day adverse events compared to discharges on the second postoperative day (Balla et al., 2017, citing Elnahas et al., 2015 and Khorgami et al., 2017b). A study of a regional collaborative improvement program showed a drop from 8% to 5% in the rates of thirty-day emergency department visits after bariatric surgery from 2007 and 2009 with an associated savings up to $1 million annually (Share et al., 2011). Finally, LSG provides a reduced operative time (Khan et al., 2016), allowing significantly more cases to be performed daily (Mocanu et al., 2020).

Insurance coverage for bariatric surgeries has also increased over the last decade (Gebran et al., 2020, Chhabra et al., 2020). A billing code for LSG was introduced in 2011 (Nguyen et al., 2016), prior to which reimbursements were based on a per diem amount that did not cover costs (Livingston, 2005). In 2012, the Centers for Medicare and Medicaid Services announced coverage for LSG as a surgical procedure for obesity (Centers for Medicare and Medicaid Services, 2012). Between 2009 and 2017, the proportion of state employee programs covering bariatric surgery

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increased by 23% while that of Medicaid programs increased by 9% (Jannah et al., 2018). By 2018, Medicare, 49 state Medicaid programs, 43 state employee programs, individual and small-group insurance markets in 23 states, and the majority of commercial insurers offered coverage for at least one bariatric procedure (Gasoyan et al., 2020, Gebran et al., 2020, Scott, 2019, American Society for Metabolic & Bariatric Surgery, 2018). These developments made the surgery more accessible, as coverage is a major factor in a patient's decision to seek bariatric surgery (Gould et al., 2019, Gasoyan et al., 2019, Sadhasivam et al., 2007) and insurance denials are a deterrent (Love et al., 2017, Sadhasivam et al., 2007). Although expanded Medicaid coverage under the Affordable Care Act increased the utilization rates of bariatric surgery in vulnerable populations and successfully decreased the gap in bariatric surgery rates by insurance status and income (Gould et al., 2019), the majority of patients who undergo bariatric surgery continue to be privately insured (Gasoyan et al., 2019), suggesting that reimbursement rates for this service remain high.

Several factors suggest that profitability may increase. For example, developments in robotic surgery over the last decade, including for bariatric surgery procedures (Scerbo et al., 2020), demonstrate many advantages (Scerbo et al., 2020, Shah et al., 2014) including better outcomes such as a shorter length of stay (King et al., 2021, Scerbo et al., 2020). Despite some costs of robotic surgery such as capital expense, maintenance costs, and the potential for increased operative time in some cases (Veilleux et al., 2020, Scerbo et al., 2020), studies have overall found that robotic surgery leads to sharp decreases in the length of operations with experience using the technology (Oviedo et al., 2021, El Chaar et al., 2019, Lyn-Sue et al., 2016). With the expiration of patents related to the Intuitive robotic device in 2019, costs associated with this service should decline (Rassweiler et al., 2018, Brodie and Vasdev, 2018, Veilleux et al., 2020).

The implementation of enhanced recovery after surgery (ERAS) protocols lead to shorter lengths of stay and morbidity, including with respect to bariatric surgery (Taylor et al., 2020, Gondal et al., 2019, Malczak et al., 2017, Singh et al., 2017). An early study of ERAS identified a decrease in 30-day readmissions as well as in length of stay—from 2.77 days before the implementation to 1.77 days—with total annual costs savings greater than $800,000 (Taylor et al., 2020).

Finally, demand for bariatric surgery is likely to increase. The prevalence of obesity in the United States rose by 42.4% between 2017 and 2018 (Centers for Medicare and Medicaid Services, 2020), and it is expected to increase further (Ward et al., 2019). Bariatric surgery is safe and is currently the most effective long-term therapy for weight loss (Mocanu et al., 2020, Veilleux et al., 2020). However, it seems to be underutilized, with fewer than 1% of patients who clinically qualify for bariatric surgery undergoing a procedure (Gazoyan, 2020, Gould et al., 2019, Ponce et al., 2015).

Overall, bariatric surgery is relatively profitable for hospitals, and the profitability of the service seems poised to grow.

B. Cardiac Services

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This section discusses several individual cardiac services listed in the American Hospital Association Annual Surveys: open-heart surgery, cardiac catheterization labs, and pacemakers/defibrillators. We characterize adult cardiac rehabilitation and pediatric cardiac services as of uncertain profitability and, therefore, discuss them in a later section of this Research Note. Cardiac services have traditionally been one of the most reliable hospital profit centers and that continues to be true today (Beason, 2015, Boulton, 2014) and hospitals that lose cardiology practitioners face large declines in revenue (Olsen, 2017), although attempts to constrain reimbursement rates and increased competition may lower profits somewhat in the future.

According to the American Heart Association, heart conditions lead direct health expenditures in the U.S. In 2012, health care providers received $98.7 billion in payments for cardiac services, with hospitals receiving $60.5 billion of those payments for inpatient and emergency cardiac services (Benjamin et al., 2017). Despite the high costs of providing cardiac care, the services remain profitable because cardiac patients are unusually well-insured, with private insurers willing to pay relatively high reimbursement rates for specialty care (Boulton, 2014). Moreover, the average age of a first heart attack is 65.3 for men and 71.8 for women, which means that a large portion of heart patients have access to Medicare coverage and are, therefore, likely to be insured (Benjamin et al., 2017). Medicare reimburses above the hospital's cost for many heart procedures, ensuring that the hospital makes a profit on these services. For example, Medicare reimburses $6,000-$12,000 above the projected cost hospitals incur for a cardiac bypass, guaranteeing that hospitals make a profit (Stensland and Winter, 2006).

The shift of treatment from freestanding physician offices towards hospital outpatient services also contributes to the profitability of these services for hospitals. According to a 2013 MedPac report, financial incentives have driven a significant increase in cardiac evaluation and testing services provided in hospital outpatient departments; for example, Medicare payment rates for evaluation and management visits are 80% higher and echocardiogram rates are over 70% higher when billed as hospital outpatient services rather than at freestanding physician offices. MedPAC estimates that if Medicare rates were equivalent for outpatient services and physician offices, Medicare would have saved $1.5 billion in 2011 (MedPAC, 2013a). Thus, the increase of cardiac care services provided as hospital outpatient services may signal that cardiac services are particularly lucrative.

Whether a cardiac service is profitable for a particular hospital depends on many factors, including ownership form and location. For example, the cost of heart failure hospitalization has been shown to be higher in nonprofit hospitals than in for-profit hospitals, and the average charge-to-cost ratio for hospitalization is 3.5:1 for nonprofit hospitals and 5.9:1 for for-profit hospitals (Akintoye et al., 2017). In rural areas where cardiac services may only be offered at one facility, hospitals exercise monopoly power to charge private insurers even higher reimbursement rates (Wohlforth, 2016).

However, there are signs that cardiac services may not continue to be as consistently profitable as they have been. First, although the long-term growth cardiac specialty hospitals signals that cardiac care is a profitable service (DeMaria, 2004), specialty hospitals tend to focus

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on cardiac services typically serve high proportions of privately insured patients, leaving a less profitable patient pool to be treated at general hospitals (Robinson, 2015, Wilson et al., 2007). Although Congress passed a moratorium on specialty hospitals in 2003, the moratorium ended in 2006 (Terry, 2011). Between 2000 and 2010, the number of specialty hospitals nearly doubled (499 to 956), mainly including cardiovascular and orthopedic hospitals (Moses et al., 2013). Second, value-based reimbursements may disproportionately reduce cardiac reimbursements since the patients tend to be older, and Medicare reimbursement rates may have a significant effect on the profitability of cardiac care services for hospitals (Cohn, 2013, Greene, 2018b). Similarly, bundled payment models, which aim to reimburse for the value of care rather than volume, may generate lower reimbursement rates overall for cardiac care providers (Greene, 2018b). Third, as hospitals continue to invest in cardiac services, thereby increasing competition, prices and margins may fall (Boulton, 2016, Cohn, 2013, Greene, 2018b). However, cardiac adoption patterns suggest that there exists a medical arms race (Horwitz et al., 2018), which may be supported by supplier-induced demand. In fact, hospitals have found ways to promote their services (Klein et al., 2011), such as directly marketing heart scans to patients, and even providing gift certificates for the service (Williams, 2017). The Cleveland Clinic informed local patients that it would send a helicopter to transport them to their catheterization lab faster than competing hospitals in the area (Carrier et al., 2012). Other hospitals market themselves as doing cutting-edge research to attract patients (Fratt, 2008).

Overall, it is unclear whether and how treatment advances have affected profitability. On the one hand, the annual rate of hospitalizations among Medicare beneficiaries for heart attacks have fallen over time (e.g., 1485 per 100,000 in 2002 to 1122 per 100,000 in 2011) (Benjamin et al., 2017). On the other hand, hospitals have expanded profitable outpatient treatments that cost less than inpatient treatments (Solnik, 2015), particularly in areas with high proportions of privately insured consumers (Robinson, 2015).

i. Open-heart surgery

Open-heart surgery is an important profit center for many hospitals. One of the most common open-heart surgeries in the United States is coronary artery bypass graft (CABG) surgery, in which the surgeon grafts a functioning artery or vein from the leg to bypass a blocked artery in the heart. In the United States, 400,000 CABG surgeries are performed annually, and CABG is known as a consistently profitable procedure with fixed costs that do not vary greatly by patient volume (Alexander and Smith, 2016). A study published in the Journal of American Medicine in 2013 finds that the average profit per CABG surgery is $17,700 for both Medicare and private insurance. Further, if the patient suffered any complications after the surgery, like an infection, stroke, sepsis, or pneumonia, the profit margin increased to $29,600 (Eappen et al., 2013). According to a 2006 study, cardiac surgery at most hospitals yielded profit margins of 14.1%, whereas hospitals on average have an overall operating profit margin of around 4.3% (Jacobs et al., 2006). However, CABGs have increasingly been replaced by less-invasive alternatives

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(Alexander and Smith, 2016), despite some evidence that they are more effective than placebo and the use of stents (Farina et al., 2020).

Another common type of open-heart procedure is aortic valve repair or replacement, which involves replacing the original valve with a new mechanical valve or with a valve made from animal tissue or taken from a donated heart (Texas Heart Institute, n.d.). Though cardiac valve surgery is expensive to perform, costing the hospital about $34,500, high reimbursement rates lead hospitals to generate an average profit of $29,000 on a single valve surgery (Brown et al., 2016). For privately insured patients, hospitals can make an average profit of $44,000. For patients insured by Medicare alone, the average profit drops to $11,000 (Robinson, 2011b).

Heart transplant surgery, though much rarer, is another procedure that generates profits for hospitals (*see below for detail regarding the profitability of heart transplants).*

ii. Cardiac catheterization labs and related services

Cardiac catheterization labs (cath labs) perform diagnostic tests as well as interventions such as angioplasty. There are approximately one million cardiac catheterizations performed annually (Benjamin et al., 2017). According to a survey of cath lab industry professionals in 2012, cath labs brought in revenue ranging from $5 million to $200 million depending on the hospital. These professionals also indicated that they perceive cath labs to be financially stable even in times of economic instability (Springboard Healthcare, 2012). One hospital in Sterling, Illinois draws millions of Medicare dollars annually from their cath lab, driving the hospital to become the region's primary source of economic development (Williams, 2017).

The largest percentage of this revenue (37.7%) comes from diagnostic health catheterization, with percutaneous coronary intervention (PCI) being the next closest at 19.4% (Springboard Healthcare, 2012, Fig. 3). According to one source, although angioplasty (a procedure to widen clogged arteries) is not as profitable as cardiac surgeries, angioplasty procedures are done at a higher rate than cardiac surgeries and profits from angioplasties are considered to be responsible for keeping many hospitals afloat (Editorial Staff Writer, 2015). Profit margins for angioplasty at most hospitals are about 9.5%, much higher than the average profitability of 4.3% for general hospitals (Jacobs et al., 2006). In 2008, among a sample of hospitals participating in the value-based purchasing initiative of the Integrated Healthcare Association, an angioplasty procedure would on average profit the hospital $3,000 for a Medicare patient and $14,500 for a privately insured patient (Robinson, 2011a). Patients that require more advanced PCI care bring increased profits to hospitals. According to one trade magazine, performing two staged or repeat PCI procedures, which approximately 5.7% of PCI patients receive, can bring in an average profit of $22,000 (Tierney, 2017). Patients that require a "protected PCI," which involves placing the patient on a heart pump to give the patient's heart extra support during the procedure, bring in a profit of $55,000 (Tierney, 2017). However, recent research findings that PCI treatments are no more effective than placebo treatments for patients with stable angina may predict a serious decline in the frequency and/or reimbursements for these procedures in the future (Al-Lamee et al., 2018).

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Although cath labs are profitable, they require significant financial investments to remain that way, as high-cost technology in the cath lab evolves quicker than in most other areas in a hospital (Klein et al., 2011). Some technological advances have added to the profit margins; for example, some hospitals are building hybrid cath lab/operating rooms (Fornell, 2009). These new hybrid cath labs allow cath lab procedures and cardiac surgeries to be performed simultaneously, increasing efficiency and improving patient outcomes. The advanced technology also attracts patients, which is essential in the increasingly competitive cardiac services industry (Fornell, 2012). In addition, the advancements of new technologies used in cath labs can enable hospitals to maximize profit margins because Medicare often uses cost surveys that are a few years old, with reimbursement rates that represent prior costs before advancements reduced them (Ginsburg and Grossman, 2005). According to a 2020 MedPAC report, costs for cardiac catheterization continue to grow faster than overall cost growth within healthcare, likely indicating that profits persist as technology advances (MedPAC, 2020).

New procedures have also developed that are better for patients but reduce overall profit for hospitals. For example, Transcatheter Aortic Valve Replacement (TAVR), a new minimally invasive valve replacement procedure, requires more expensive products compared to standard valve replacement surgery (Brown et al., 2016). A standard surgical valve costs hospitals about $5,000, whereas a TAVR valve costs over $30,000 (Reynolds et al., 2016). In addition, patients who undergo a TAVR procedure recover more quickly and spend less time in the hospital and the ICU than patients who undergo standard surgical valve replacement (McCarthy et al., 2017). Thus, although TAVR is a procedural advancement beneficial to patients, the new procedure brings in a much lower profit than the standard surgical replacement. The mean profit for surgical aortic bypass in 2016 was $29,000, but mean profit for TAVR was only $14,000 (Brown et al., 2016). The profitability of TAVR also varies greatly between hospitals, at least when it comes to profit from Medicare. Hospitals that perform more than 50 TAVR operations annually tend to receive higher Medicare payments and thus have higher profits. Hospitals that perform fewer than 50 TAVR operations on average lose money from the operation as their Medicare reimbursements are lower than the cost of the operations (McCarthy et al., 2017).

iii. Pacemakers and defibrillators

Insertions of pacemakers and implantable cardioverter-defibrillators (ICDs) are another source of profitability for hospitals. Essential for many heart patients, pacemakers are used to normalize a patient's heart rhythms, most commonly to treat a heart rhythm that is too slow. As physicians are able to keep patients alive longer with other cardiac services, the need for pacemakers to keep the heart beating regularly has been steadily increasing. The number of pacemaker insertions per year rose from 121,000 in 1993 to 189,000 in 2009 (Norton, 2012). Hospitals earn reliable profits from pacemakers; a sample of hospitals participating in the value-based purchasing initiative of the Integrated Healthcare Association averaged about $3,000 in profits from Medicare reimbursement and $13,000 from private insurers (Robinson, 2011a). Implantable cardioverter-defibrillators (ICDs) operate similarly to pacemakers but have the ability

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to shock the heart during cardiac arrest to bring it back into a normal rhythm (University of Iowa, 2016). The ICD device is more expensive, causing profits from Medicare patients to be relatively low because most of the reimbursement goes to the high cost of the device (Stensland and Winter, 2006). Medicare profits for an ICD insertion among a sample of hospitals participating in the value-based purchasing initiative of the Integrated Healthcare Association averaged about $2,000, whereas profits from private insurance average a much higher $21,500 (Robinson, 2011a).

C. Diagnostic Imaging

This section includes Computed Tomography Scanning (CT), Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET), Single Emission Computed Tomography (SPECT), ultrasound, and diagnostic radioisotope facilities. Mammograms are addressed below in the section regarding women's health.

Diagnostic imaging is regarded as one of the most significant areas for hospital revenue and profit (Boodman, 2016, Becker's Hospital Review, 2015, ADVANCE Staff, 2019). Although various reimbursement reforms that were introduced to contain rapid growth and rising costs during the first decade of the 2000s seem to have had some effect and, therefore, made the services somewhat less profitable than they had been, diagnostic imaging services remain a central component of many patient's treatment courses and a key generator of revenue and profits for hospitals, especially in outpatient services (Levin et al., 2017, Seltzer and Lee, 2014).

Imaging is a central component of many patients' experience with health services, as nearly three in four patients will need some type of imaging service (ADVANCE Staff, 2019). As a result, imaging is the largest source of profits for many hospitals (ADVANCE Staff, 2019). In the late 1990s and early 2000s, the use of imaging increased substantially, and fee-for-service reimbursement resulted in a sizable profit of more than $24 billion for hospitals (Boodman, 2016, ADVANCE Staff, 2019, Seltzer and Lee, 2014). Beginning in the early 2000s, the rapid growth in volume of imaging put a spotlight on the significant mispricing of the relative value units (RVUs) associated with imaging services, which incentivized an increased volume of services (MedPac, 2009). As few episodes of care occur without some type of imaging, hospitals were finding that at least one portion of a patient's treatment would result in reliable revenue and profit (Rubin, 2017). Although the price of an MRI or CT machine can exceed $1 million, CT has one of the highest cost-to-charge ratios of any service line, and a scanner pays for its own purchase cost relatively quickly (Sferrella, 2015).

However, over the last decade, the use and growth of imaging services decreased (Cutler and Sahni, 2013, Levin et al., 2017), suggesting that imaging's place as a significant profit center could be changing (Seltzer and Lee, 2014). Although the rapid growth in the volume of imaging from 2000-2009 totaled 85%, cumulative growth from 2009-2014 decreased by 7% (MedPAC, 2014). The decline in use is related to both private and public payor interventions, including pre-authorization requirements, value-based reimbursement models (e.g., ACOs), and lower reimbursements generally (Levin et al., 2017, Seltzer and Lee, 2014, MedPAC, 2014). Relatedly, there has been more research on and physician attention to the potential harms of radiation

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exposure from imaging (Levin et al., 2017), especially when imaging may not even be medically necessary (Becker's Hospital Review, 2015).

There has also been increasing attention paid to inappropriate usage of imaging, its profitability, and its high utilization. In MedPAC's 2020 annual report, the Commission recommended that closer scrutiny be placed on practitioners who order substantially more imaging services than their peers through the creation of a prior authorization program (MedPAC, 2020). Thus, with greater focus on value, providers may not be able to profit to as high of an extent as they could under fee-for-service reimbursement for imaging (Hewett, 2014), especially since imaging requires significant capital investment and continuing operational and maintenance expenses (Lipschultz, 2013). And, as patients are faced with higher-deductible insurance products that delineate out-of-pocket expenses based on whether something is diagnostic or preventative, there may also be greater patient interest in seeking out lower-cost options (e.g., reference pricing) (Robinson et al., 2017) or pushback against potentially unnecessary imaging services (Hewett, 2014).

Nonetheless, all of these interventions to constrain use and limit spending have been implemented because there is high use and spending. Imaging may not hold the opportunity to profit that it once did, but it remains a profitable set of services for hospitals.

D. Extracorporeal Shock Wave Lithotripsy

Approved by the Food and Drug Administration in 1985, the extracorporeal shock wave lithotripter (ESWL), which uses shock waves to shatter kidney stones into fragments, largely replaced surgical treatments in the 1990s and remains the only non-invasive treatment for kidney stones. Although it has long been a profitable service for hospitals, and likely remains so, reductions in reimbursement rates as well as the rise of ureteroscopy as a competing, albeit invasive, treatment may undercut the role of ESWL as a profit generator for hospitals.

Over the last two decades, the prevalence of kidney stones has increased, yet the use of ESWL has fallen by 14.5% while the use of ureteroscopy (URS) increased by more than 250% (Geraghty et al., 2017, Scales et al., 2012). Some research finds that technological equipment improvements have led URS to be a more cost-effective treatment than ESWL, as ESWL requires high acquisition costs of the machine, considerable maintenance costs, and a relatively big space to maintain the equipment (Vicentini, 2015). Another reason URS utilization has increased is that the treatment has been shown to result in better outcomes for patients than ESWL, demonstrated by higher average stone free rates post treatment (Geraghty et al., 2018).

In addition, growing reimbursement rates have made URS a more favorable treatment than ESWL (Vicentini, 2015, Gatty, 2019). In 2019, CMS implemented a final rule change to the agency's Hospital Outpatient Prospective Payment System, which reduced the base payment for performing ESWL in Ambulatory Surgery Centers (ASCs) by 21% (Gatty, 2019, American Association of Clinical Urologists, 2019). Although the effects of this recent reimbursement change are unclear, the American Association of Clinical Urologists predicts that the reductions "will result in migration to higher cost hospital outpatient department (HOPD) sites of service,"

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where reimbursements for ESWL are 54% higher than when performed in ASCs (American Association of Clinical Urologists, 2019).

Despite decreasing reimbursement rates and a decline in usage, ESWL is likely to remain relatively profitable for hospitals, and the global ESWL market is projected to continue to grow as the incidence rate of kidney stones increases (MedGadget, 2019).

E. Fitness Centers

Fitness centers have long been regarded as a relatively profitable service for hospitals, and their role in healthcare may become more important in light of trends towards population health and value-based reimbursements. Since the early 1990s, hospitals have invested in building fitness and wellness centers to attract and retain new patients to their hospital system (Calechman, 2019). The Medical Fitness Association (MFA) reports that the number of medical fitness center facilities grew from 79 in 1985 to 1,284 in 2014, with a total of over four million members (Smock and Alemagno, 2017). The MFA has also reported that wellness centers generate hospitals returns on investment between 6% and 10%, depending on the hospital's operational decisions (The Advisory Board, 2015b). By attracting patients who are well-insured or willing to pay out-of-pocket for memberships, fitness centers serve to contribute positively to a hospital's bottom line (Sloane, 2015).

In addition, as value-based reimbursement becomes more widespread, fitness centers are increasingly viewed as a potential tool to help promote population health, focus on preventative medicine rather than a "sick care" model, and reduce costs (Ullman, 2015, The Advisory Board, 2015b, Smock and Alemagno, 2017). For example, by offering a broader range of services and by staffing exercise physiologists at local wellness centers, hospitals are better able to attain a medically integrated model of care (Ullman, 2015). Since improving and maintaining overall health will likely keep patients out of long-term hospital stays, hospitals view fitness centers as a potential way to lower overall capital expenditures in the long-term (Ullman, 2015).

Hospitals may also use wellness facilities as a tool to advertise healthcare services and protect market share. By becoming known as "community hubs," fitness centers are viewed by some hospitals and health systems as a branding strategy to capture and retain patients for the whole continuum of care (Wood, 2010, Sloane, 2015).

Nonprofit hospitals, however, may operate fitness centers to break even, as wellness services can help nonprofit hospitals meet their community-benefit requirements to maintain their tax-exempt statuses (Wood, 2010, Calechman, 2019).

Business projections from hospital and fitness industry analysts suggest that, overall, there is a strong case for hospitals to continue investing in fitness centers (The Advisory Board, 2012, Stromgren, 2016).

F. Neonatal Intensive Care

Neonatal intensive care units (NICUs), units for newborns with serious medical conditions, are a relatively profitable service. Historically, these services have not been subject to intensive

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case management or cost-containment interventions (Schulman, 2003). Moreover, like adult and pediatric intensive care units, NICUs have high fixed costs related to staffing and technology. NICUs are different from Pediatric Intensive Care Units and adult units because the patients admitted to NICUs in general acute care hospitals are typically already in the hospital; they are moved from obstetrics directly into a NICU. Therefore, although the most medically severe neonatal patients may be transferred from a general hospital to a children's hospital, NICUs in general hospitals do not face the same levels of competition from children's hospitals as do PICUs or from other general hospitals as do adult intensive care units.

There has been some attention paid to whether NICUs are overused, perhaps driven by profit motive (Ramshaw, 2011), suggesting that hospitals view NICUs as profitable. Moreover, a recent Dartmouth study found that NICU services are often misused as a method of increasing hospital profits (Goodman et al., 2019, Johnson, 2019). In addition, discretionary NICU utilization increases based on the availability of NICU beds (Freedman, 2016), a finding that is consistent with the sense that NICUs require sufficient volume to be profitable because of NICUs' high overhead costs (Huang, 2019, McCluskey, 2018). This finding also suggests that hospitals are able to fill beds to achieve sufficient volume. Market analyses suggest that demand for NICU services is likely to grow because of an increase in preterm births (Fortune Business Insights, 2020). Overall, these services tend to be relatively profitable.

G. ***Oncology Services***[3]

Oncology services provide a significant source of revenue and profit for hospitals. As more oncology practices have consolidated with hospitals and medical systems, and as opportunities to profit on chemotherapy agents continue to grow, the services are likely to remain profitable. However, bundled payment models for oncology services and other reforms may well change the relative profitability of these services in the future.

Cancer drug prices have long been regarded as a significant source of profit for hospitals, and the discrepancy between Medicare payment rates and hospital acquisition costs was identified as early as 1997 (Jacobson et al., 2010). To address the rapid growth of expenditures on cancer drugs, the Medicare Prescription Drug, Improvement, and Modernization Act was enacted in 2003, marking a significant change in cancer drug reimbursement. As a result, starting in January 2005, Medicare substantially reduced payment rates for chemotherapy drugs administered in outpatient settings. However, contrary to the intended effects of the payment cuts, Jacobson et al. (2010) found that chemotherapy treatment rates among patients increased as payments were cut. Furthermore, the type of chemotherapy drugs administered changed, as physicians were more likely to dispense high-margin drugs, rather than those subject to substantial profitability cuts from the legislation (Jacobson et al., 2010). Despite the reimbursement changes, total U.S. spending on

[3] The AHA does not have a single measure of whether a hospital provides radiation oncology. Instead, it lists several different radiation treatment modalities, and we do not know whether those individual modalities are profitable. Therefore, although we suspect that radiation oncology is very likely to be profitable overall, we do not address the group of services in this study.

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cancer drugs has continued to rise, growing from $26.8 billion in 2011 to $42.1 billion in 2016 (Mulcahy, 2018).

Another significant way in which hospitals capture profits from cancer drugs is through the federal 340B program, discussed in detail in the section on HIV/AIDS services, and in which slightly over 3,000 hospitals participate (Health Resources and Services Administration, n.d.-b). The program allows hospitals to acquire cancer drugs at discounted prices while receiving Medicare reimbursements based on the average sale price, regardless of whether the drug was purchased at a discounted price (Doyle, 2018, Robinson, 2013, Vandervelde and Blalock, 2017). Thus, even as these hospitals receive significant discounts, averaging one-third of the cost of the drug and sometimes higher, they still receive non-discounted reimbursement rates from Medicare, as well as other payors (Doyle, 2018). And the discount applies to all drugs purchased, not just those administered to Medicare patients (Robinson, 2013).

The 340B program is thought to be very profitable for hospitals administering cancer drugs, which are among the highest cost outpatient drug therapies (Kantarjian et al., 2014). Unlike HIV/AIDS drugs, which are dispensed through pharmacies, many oncology drugs are administered by physicians in hospital outpatient clinics. As a result, recent challenges to 340B discounts for drugs administered at contract pharmacies do not apply. Although the amount of profit hospitals generate from administering 340B-discounted chemotherapy is unknown, a recent analysis found that the median hospital brought in an estimated $1.6M in profits in 2016 from the Medicare-covered chemotherapy services (Conti et al., 2019) Moreover, since there is no requirement that 340B hospitals pass along their discounted prices to underinsured and uninsured patients, hospitals can choose to sell all of their 340B drugs to fully insured patients (Nikpay et al., 2020) and may disproportionally locate clinics in higher-income communities in order to maximize profits (Conti and Bach, 2014). Finally, numerous reports find that 340B hospitals tend to administer higher volumes of chemotherapeutic agents than similar, non-340B hospitals, potentially to maximize profits (Desai and McWilliams, 2018, Government Accountability Office, 2015).

Although MedPAC's 2020 report demonstrates increases in drug prices due to 340B, the report notes that these effects are significantly smaller than the overall increasing trend of oncology spending. Thus, it seems unlikely that the 340B program will be the focus of any significant changes in the near future (MedPAC, 2020).

As private oncologists face a system which provides significant pricing discounts to hospitals, some have opted to simply affiliate with a hospital (Kolata, 2014). Even if the hospital does not have 340B designation, a hospital is likely better situated to use contracting leverage than an oncology practice to negotiate for lower drug prices (Newcomer, 2014). And, for oncologists that remain unaffiliated, they are faced not only with the competitive disadvantage of higher drug pricing, but also with hospitals that are increasingly opening more facilities to compete with the outpatient settings of private practices (Brill, 2013).

In addition to chemotherapy, another important type of oncology service is radiation, which is used for approximately two-thirds of all cancer patients (U.S. Department of Health and Human Services, 2017). Radiology services are likely profitable for hospitals for several reasons. First,

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like many services that can be provided in either an independent clinic or hospital-based clinic, Medicare reimbursement is higher when provided in a hospital because of a billing system known as "provider-based billing." Under provider-based billing, total reimbursement is higher because the hospital-based physician receives both a facility-based physician reimbursement for the procedure, as well as a separate payment to reimburse the hospital for overhead costs (American College of Physicians, 2013). This results in higher reimbursements for equivalent radiology services provided in the hospital than in freestanding radiology centers. For example, Intensity Modulated Radiation Therapy reimbursement is $108 in a hospital-based clinic and $58 when provided by a non-hospital-based radiologist (Centers for Medicare and Medicaid Services, n.d.-b). Importantly, more than half of all radiation oncologists are directly employed by hospitals and, therefore, increased physician reimbursement is captured by hospitals (American Society of Radiation Oncologists, 2019)

Second, the amount Medicare pays physicians for radiology services (i.e., physician relative value units known as RVUs) has increased substantially in recent years (Shen et al., 2014; Vu et al., 2018). Although RVUs only apply to Medicare reimbursement, private reimbursement closely follows Medicare's RVU scale (Clemens and Gottlieb, 2017).

Third, the CMS has recently identified radiation services as "misvalued" (U.S. Department of Health and Human Services, 2017, American College of Radiology, 2019), a designation applied to codes for which reimbursement seems to be too high (Centers for Medicare and Medicaid Services, 2014a). Once the codes are identified as misvalued, specialty societies, such as the American Society of Radiation Oncologists, agree to review them and work towards voluntary, acceptable payment reductions (American Medical Association, 2018). In addition to reducing expenditures, CMS planned to apply an episode-based payment model to radiation (American Society of Radiation Oncologists, 2020), paying a single prospective payment to oncologists and to hospitals rather than separate fee-for-service payments (U.S. Department of Health and Human Services, 2017). Although the model's five-year performance period was scheduled to begin on January 1, 2021, the Consolidated Appropriations Act of 2021 effectively delayed the start date (American Society of Radiation Oncologists, 2020). Whether this model, which would affect both physician and hospital payment for radiology services, will be applied is unclear given opposition by radiation oncologists; according to the American Society for Radiation Oncology, "We remain seriously concerned with excessive payment cuts in the model that will cause significant financial strain on practices and risk patient access to radiation treatments" (American Society of Radiation Oncologists, 2020).

H. Orthopedic Services

Orthopedic services—including knee, hip, and shoulder replacements—have traditionally been seen as some of the most reliably profitable in the hospital. However, reimbursement model changes have put pressure on orthopedic surgeons to reduce costs by using new technology and care settings to remove orthopedic surgeries from hospitals altogether. Together, these changes

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may have reduced the relative profitability of orthopedic services for hospitals. Nonetheless, they are likely to continue being a relatively profitable service area.

Traditionally, orthopedic services have been one of the largest and most profitable hospital service lines, and orthopedic surgeons top the list of physician groups that bring in the most revenue (Ellison, 2019). Moreover, orthopedics' primary service—total joint replacements (Rovinsky et al., 2018)—is likely to see higher demand as the population continues to age, becomes more obese, and needs replacement parts from previous joint surgeries (Anderson, 2013). And, because many patients are Medicare-eligible, it is also a service that is rarely uncompensated by insurance (Navathe et al., 2018). Together, these factors have led to hospitals offering orthopedic services as a method to improve profitability (Boulton, 2013, Boulton, 2014, Brubaker, 2016, Ho, 2018).

However, changes in Medicare reimbursement policies, particularly those focused on providing bundled payments for orthopedic care, including joint replacements, could have a significant effect on the amount a hospital can bill for a given episode of care (Navathe et al., 2018). The bundled payment programs are meant to target the high variability in joint replacement costs and force hospitals and doctors to become more price sensitive when pursuing a treatment course (Anderson, 2013, Evans, 2018, Navathe et al., 2018, Okike et al., 2014). Currently, many orthopedic surgeons lack incentives to become knowledgeable about the cost-effectiveness of the devices they implant (Okike et al., 2014), focusing more on relationships with specific suppliers and the technology of the device itself. Yet, as reimbursement regimes are changing and putting downward pressure on revenue, more hospitals and doctors have tried to better understand the relative costs of different orthopedic procedures (Evans, 2018).

Improved technology that allows for less-invasive procedures may also reduce profitability for hospitals (Coutre, 2018, Rovinsky et al., 2018) because these services allow for more treatments in free-standing surgical centers. Although hospitals have historically provided orthopedic procedures, new care settings—most notably ambulatory surgery centers (ASC)—provide lower-cost options for orthopedic surgeries (Kelly, 2015, Rovinsky et al., 2018). ASCs offer orthopedic surgeons a site to earn high profits by avoiding hospital costs and offering more surgeries in an outpatient setting (Rovinsky et al., 2018). Notably, when Medicare started covering joint replacements in outpatient settings in 2018, subsequent declines in inpatient surgical stays for the procedures were observed between 2017 and 2018, which were "more than offset by 69,000 joint replacements in the outpatient hospital setting" (MedPAC, 2020).

Orthopedic physicians may have several incentives to perform surgeries in ASCs. Orthopedists who invest in ASCs may increase their revenue by receiving a share of ASC facility payments. In addition, ASCs are not subject to Stark Law, which likely incentivizes physicians to perform more surgeries from self-referrals (MedPAC, 2020). In fact, the number of ASCs specializing in orthopedics has increased over time (MedPAC, 2020). If hospitals lose orthopedic patients to non-hospital-affiliated outpatient settings, they will lose out on profits too. Thus, as technology improves and more outpatient, non-hospital settings become feasible for orthopedic surgeries, hospitals may lose orthopedic patients, surgeons, and profits.

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In addition, the patients who may be treated in ASCs tend to be healthier (Munnich and Parente, 2015) and, therefore, are likely to be those with the most complicated needs, leaving high-cost patients to be treated in hospitals and low-cost patients to be treated in ASCs. In fact, one study has found that higher-profit surgeries are more likely to be performed at ASCs than in hospital outpatient sites (Plotzke and Courtemanche, 2011). This suggests that even higher-cost patients would be treated as inpatients, limiting the opportunity for hospitals to cross-subsidize high-cost patients from profits made on lower-cost patients. However, hospital outpatient departments tended to earn higher reimbursement rates for the same procedures than did ASCs from 2007 to 2012 (Carey, 2015).

Although orthopedic services may be less profitable than they once were, they are still likely to be relatively profitable for hospitals.

I. Sports Medicine

Sports medicine is regarded as a profitable service, mainly driven by a profitable patient mix, relatively low-cost treatment provided primarily in outpatient settings, and the potential for downstream revenue (Glenn, 2012, The Advisory Board, 2016).

First, sports medicine tends to attract a profitable patient mix, which is reflective of the fact that patients in need of these services tend to be younger and therefore healthier than other patients, and that they are more likely to be privately insured than patients seeking other services (Glenn, 2012, The Advisory Board, 2016). Moreover, by offering sports medicine as part of a package of fitness and wellness related services such as exercise classes, gyms, pools, and playing fields, hospitals attract active patients who are likely to be relatively healthy and will one day need other health interventions, such as orthopedic surgery (Glenn, 2012, The Advisory Board, 2016).

Second, unlike many orthopedic interventions that require costly inpatient settings, sports medicine is more likely to involve the kinds of orthopedic services typically provided in outpatient settings followed by additional post-op rehabilitation services, both of which tend to be profitable (Glenn, 2012, The Advisory Board, 2016). In recent years, hospitals have been expanding their sports medicine capacities, primarily through outpatient construction projects (Glenn, 2012, Kadifa, 2015). In 2014, hospital outpatient sports medicine departments provided care for 1.4 million of the 2.3 million total sports medicine cases in the US, and 2024 projections expect the volume of hospital outpatient sports medicine cases to continue to increase (The Advisory Board, 2016).

J. Transplants: Renal and Heart

This section addresses two types of transplants—renal and heart—that are relatively profitable for hospitals. Other transplants that are relatively unprofitable—bone marrow, liver, and lung transplants—are covered in an earlier section.

As previously noted, the number of organ transplants performed in the U.S. has more than doubled over the past two decades, and the waitlist for transplants has grown by a factor of five. The profitability of transplants varies by transplant type, volume of transplants performed at a

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hospital, costs associated with any treatment complications, and patient insurance status. Due to high reimbursement rates and relatively well-insured patient populations, renal and heart transplants are typically regarded as relatively profitable services for hospitals (Houston, 2019).

i. Renal transplants

More than half of all organ transplants performed each year are renal transplants, totaling 23,401 transplants in 2019 (Health Resources and Services Administration, n.d.-a). Kidney transplants are considered the best treatment option for patients with end-stage renal disease (ESRD), and transplants are regarded as a more cost-effective treatment compared to long-term dialysis (Englesbe et al., 2009). Despite the high costs associated with kidney transplants, Medicare's guaranteed coverage of transplants for all ESRD patients under 65, combined with high reimbursement rates from private insurance payers, enables hospitals to profit from kidney transplants.

Kidney transplants cost more than $8 billion per year in the U.S., and the average billed charge for a kidney transplant is more than $440,000 (Houston, 2019, Milliman Research Report, 2020). The most significant expenses for kidney transplants come from procurement of the organ, the transplant procedure itself, and hospital stays for the transplant, which is 6.7 days on average (Milliman Research Report, 2020). Although the costs of kidney care incurred by hospitals are high, more than 85% of kidney transplants are covered by Medicare and private insurance, guaranteeing a stable source of revenue for hospitals (Keith et al., 2008). Medicare provides coverage for a wide range of kidney transplant services, including all inpatient services provided by the hospital, CMS approved lab tests, organ procurement costs, physician services, and immunosuppressive drugs for the 36 months post-transplant (Centers for Medicare and Medicaid Services, n.d.-d). Private insurance reimbursement rates are particularly lucrative for hospitals. In fact, privately insured patients are significantly more likely than Medicare recipients to have shorter duration rates of dialysis before being placed on a transplant waitlist (Keith et al., 2008). Medicaid expansion has also led to more coverage for kidney transplants (Lagasse, 2019).

Over the past few years, CMS has emphasized the need to reform Medicare reimbursements for kidney care, including introducing policies to increase the number of transplants. New payment models may make transplant profits higher as part of a plan to combat some of the well-documented and perverse financial incentives that have fueled a highly profitable dialysis industry. For example, for-profit outpatient dialysis chains currently dominate the industry and have been found significantly less likely than nonprofit centers to place patients on transplant waitlists (Monaco, 2019, Preidt, 2019). By implementing value-based reimbursements that encourage greater use of home dialysis and kidney transplants, CMS aims to decrease total spending on kidney care and to improve patient outcomes. As these revised payment models are implemented, it will be important to examine their effects. They are likely to decrease spending on outpatient dialysis centers and to increase kidney transplant utilization, which may drive hospital profitability of kidney transplants (Centers for Medicare and Medicaid Services, 2019).

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ii. Heart transplants

Heart transplants are one of the most expensive services a hospital can offer, but well-insured patient populations and high reimbursement rates help to make the service relatively profitable. Nearly 3,500 heart transplants are performed in the U.S. annually, with average billed charges of over $1.6 million per transplant (Milliman Research Report, 2020). The transplant procedure itself, combined with the average length of stay of 48.6 days post surgery, accounts for more than $1,000,000 of these costs (Bentley and Phillips, 2017, Milliman Research Report, 2020).

Despite high costs, there are 140 certified heart transplant centers, and these centers can bring in an average profit of $47,800 from the transplant and a year of subsequent care (Gregory et al., 2005). Moreover, using data from the United Network for Organ Sharing Registry, 44% of patients between the ages of 18 and 64 were continuously covered by private insurance (Pagani, 2016). To be placed on the United Network for Organ Sharing national heart transplant registry, patients must verify that they can pay for bills that total more than $1.3 million (Aleccia, 2018). Presumably the vast majority of transplant patients over age 64 are covered by Medicare.

K. Women's Health and Related Services

The AHA lists obstetrical services and the general category of "women's health services" separately. For example, the 2019 survey defined "women's health center/services" as "an area set aside for coordinated education and treatment services specifically for and promoted to women as provided by this special unit. Services may or may not include obstetrics but include a range of services other than OB" (American Hospital Association, 2019). Non-obstetrical services—such as gynecological surgery and gynecologic oncology—are not listed separately and are generally provided in a surgical or oncology department, both profitable service areas overall. In addition, there is little research on the profitability of non-obstetric women's health services. Nonetheless, with the exception of mammography, which appears in the section of this Research Note where we discuss services categorized as having uncertain profitability, we characterize non-obstetric women's health services as relatively profitable for several reasons.

First, even if the specific services provided are relatively unprofitable themselves, women's health services can be used as loss leaders. Hospitals have invested in women's health centers to drive downstream revenue, as women are believed to be the primary health care decision makers for their families (Luthra, 2018).

Second, although there have been some short-term reductions in reimbursements and some increases in the costs of providing inpatient gynecologic surgery, both the longer-term reductions in cost and the shift of care to outpatient settings suggest that gynecological surgery remains relatively profitable. In 2015, CMS decreased the Relative Value Units that it assigned to some gynecologic surgical interventions, reducing reimbursement for these services (Uppal et al., 2017). For example, the codes related to laparoscopic hysterectomy lost between 12% and 23% in their assigned Relative Value Unit (18% for the surgical laparoscopy with total hysterectomy), and the laparoscopic lymph node dissections codes lost between 5.5% and 16.3% of their Relative Value Unit (Uppal et al., 2017).

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Despite these reimbursement reductions, there have been several trends that have already reduced, or should reduce, costs associated with gynecological surgery services. For example, the implementation of Enhanced Recovery After Surgery (ERAS) pathways, recommended by the American College of Obstetricians and Gynecologists in 2018 to standardize perioperative care (The American College of Obstetricians and Gynecologists, 2018) has led to reductions in length of hospital stays and costs (Trowbridge et al., 2018, Kalogera and Dowdy, 2016, Modesitt et al., 2016).

In addition, changes in the provision of hysterectomies, a very commonly performed gynecologic procedure in the U.S. (H-CUP, 2015), suggest that costs associated with the service have gone down; however, it is unclear whether this has resulted in increased profitability in light of corresponding reimbursement decreases and the rise of robotically assisted hysterectomies. Over the last two decades, hysterectomies increasingly have been performed in outpatient or same-day settings (Ilizaliturri et al., 2019) and, therefore, can result in the reduction of inpatient hospital costs (Levy et al., 2005, Perron-Burdick et al., 2011, Zakaria and Levy, 2012). One notable trend that has demonstrated mixed effects on the profitability of hysterectomies is the increased usage of minimally invasive surgical techniques, including robot-assisted procedures (Wright et al., 2013, Dandolu and Pathak, 2018). On the one hand, robotically assisted hysterectomies are associated with high costs that have raised concerns (Dandolu and Pathak, 2018, Wright et al., 2013, Swenson et al., 2016, Wright et al., 2012), especially because robotically assisted hysterectomies have been found to have higher complication, readmission, and health resource utilization rates compared to other minimally invasive procedures such as laparoscopic hysterectomies (Dandolu and Pathak, 2018). Furthermore, actual reimbursement rates may not reflect the differences in cost between robotic and laparoscopic surgeries (Venkat et al., 2012). On the other hand, other studies, including one based in California, found that hospitals with robotic surgical systems are likely to report more favorable profit margins, though the relationship may only be marginally significant (Shih et al., 2017). A Canadian study suggested that robot-assisted hysterectomy reduces hospital costs (Lau et al., 2012). Furthermore, a 2018 study showed a reduction of 15.5% in mean total costs and 14.3% in mean operative costs after five years of experience performing robotic-assisted hysterectomies, largely attributable to reduced operating room time (Avondstondt et al., 2018).

Although there is not a lot of research with which to characterize the profitability of these services, it is likely that non-obstetric women's health services, such as surgical services, are relatively profitable.

V. Time Varying Profitability

A. Emergency Departments

Emergency departments (EDs) have traditionally been known as one of the least profitable service centers in acute care hospitals; in short, they were known as money pits. However, in recent years, many hospitals have addressed ED costs, some quite aggressively and successfully,

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such that their EDs have become relatively profitable sites of care. Therefore, although for much of the study period it was accurate to characterize EDs as relatively unprofitable in the acute care hospital setting, it is now more accurate to characterize the service as, at least, potentially profitable. Therefore, we characterize EDs as variably profitable over time.

Evidence suggests that, at least until the last decade when profit-making opportunities grew, EDs were largely unprofitable for the same reasons identified in the last Research Note (Horwitz, 2005b); EDs have high operating costs and they disproportionately serve uninsured and poorly insured patients (Kaiser Family Foundation, 2013, Miller, 2013, Rosenthal, 2013b, Woodworth et al., 2017, Zhou et al., 2017). The services are complex and costly for hospitals, sometimes leading to contracting out emergency services (as well as debt collection) (Liss, 2016). In part, this is because their operating costs are largely fixed costs; they need to fully staff and equip a department to serve an unpredictable flow of patients, but they are only reimbursed for patients they treat, and not for the cost of maintaining the ability to treat emergency patients (Miller, 2013). Moreover, because emergency rooms are required by the Emergency Medical Treatment and Active Labor Act to stabilize patients with emergency conditions regardless of the patient's insurance status or ability to pay, ERs remain a site of uncompensated care. That EDs disproportionately transfer uninsured patients and Medicaid beneficiaries, perhaps trying to evade EMTALA, suggests that hospitals perceive EDs as sites that attract unprofitable patients to the hospital (Venkatesh et al., 2019, Wetsman, 2019). Despite evidence of these transfers, EDs tend to provide a great deal of uncompensated care and lead to the admission of patients who tend to be unprofitable, such as those needing inpatient psychiatric services (Barrett, 2018). The early 1990s through the first decade of the 2000s saw large declines in EDs, with widespread closures, particularly among for-profit hospitals (Hsia et al., 2011). More specifically, from 1993 to 2013, the financial strain related to emergency rooms led to the closure of EDs across the country, causing the total number of EDs in the U.S. to decline by 11% among all acute care hospitals (including both rural and urban hospitals) (Shen and Hsia, 2016; Avalere Health for American Hospital Association, 2015).

However, there have been several approaches to increasing profits in EDs over the past decade. For example, some hospitals have opened off-campus emergency departments (OCEDs) or otherwise offered services that are traditionally offered in the hospital ED at non-hospital facilities to capture profits by providing emergency care in settings that are lower cost than a hospital (Alltucker, 2019, Wilson and Cutler, 2014). Despite an overall decrease in EDs in all acute care hospitals (including rural an urban hospitals), total ED visits from 1992 to 2013 increased by over 40%, and, from 2008 to 2016, the number of hospitals with an OCED increased by 97% (Shen and Hsia, 2016, MedPAC, 2017). The rapid rise of OCEDs and freestanding EDs (which are not owned by hospitals) has been attributed to two main factors: 1) lower costs associated with outpatient care, and 2) higher reimbursement rates for Medicare and private insurance patients who receive evaluation visits and ancillary services in off-campus EDs (as opposed to other settings, like physicians' offices) (MedPAC, 2019). As patients seek the convenience of care outside the hospital setting, some hospitals have expanded OCEDs and urgent

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care centers to attract patients, particularly in areas with high concentrations of private coverage (Dark et al., 2017).

In addition to providing more emergency care in OCEDs, some hospitals have been able to mitigate the financial burden of emergency services by increasing prices, particularly for privately insured patients. The Health Care Cost Institute Prices found that among privately insured patients under the age of 65, prices for ER services increased by 176% between 2008 and 2017, and the average revenue from an ER visit has gone up by more than 150% over the last decade (Alltucker, 2019). From 2012 to 2017, Medicare spending for outpatient hospital emergency departments rose by 72%, from $2.4 billion to $4.1 billion. In fact, some regional research studies have targeted hospital emergency departments as significant contributors to soaring health care costs through monopoly-level pricing. For example, Providence Alaska Medical Center, a large nonprofit hospital in Anchorage, has been found to mark up costs of emergency room services by 626% (Wohlforth, 2016). Similarly, California Pacific Medical Center has nearly doubled the price of its emergency room fees on its chargemaster since 2005 (Wohlforth, 2016, Rosenthal, 2013b).

Moreover, just before the implementation the ACA, total hospital revenue from ED care—in on-site EDs and off-campus EDs combined—exceeded the costs of care by $6.1 billion in 2009, leading to a 7.8% profit margin, "primarily because hospitals make enough profit on the privately insured ($17 billion) to cover underpayment from all other payer groups, such as Medicare, Medicaid, and unreimbursed care." (Wilson and Cutler, 2014). Hospitals were found to have margins of -54.4% for uninsured patients, -35.9% for Medicaid patients, -15.6% for Medicare patients, and +39.6% for privately insured patients in 2009 (Wilson and Cutler, 2014).

The implementation of the Affordable Care Act did two things to increase emergency room revenue. By expanding insurance coverage, the ACA increased the percentage of reimbursed and profit-generating ER visits (Wilson and Cutler, 2014). By categorizing ER visits as an essential health benefit, the ACA also forced private insurers, who typically pay higher rates than Medicare or Medicaid, to pay for previously uncovered ER care (Cho and Hong, 2018, Wilson and Cutler, 2014), enabling some hospitals to charge uncompetitively high prices for out-of-network ER services (Melnick, 2018).

Even for those hospitals that do not have profitable EDs, an ED can act as a loss leader; an ED visit results in profitable inpatient care (e.g., cardiac care) even though the profit is likely realized and accounted for within that inpatient service and not in the ED component (Kellermann et al., 2013).

In sum, characterizing the profitability of EDs is complicated. On the one hand, hospitals often generate losses from providing ED services because of high costs (particularly fixed costs), as well as because of low reimbursement rates for emergency care and the need to treat uninsured and poorly insured patients in EDs. On the other hand, for the several reasons identified above, the opportunities to make profits have grown a great deal over the past decade, with many EDs showing high profits. Therefore, we characterize the service as having time-varying profitability.

B. Skilled Nursing Facilities/Home Health Care

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The previous Research Note (Horwitz, 2005b) categorized both skilled nursing facilities (SNFs) and home health care (HHC) as having "variable profits," a category we have re-named as "time-varying profitability." The Note categorized the services as becoming quite profitable starting with the implementation of the prospective payment system (PPS) in the early to mid-1980s, a system that initially did not apply to post-acute services such as skilled nursing and home health. However, as the last Research Note explained, the Balanced Budget Act of 1997 introduced several measures that greatly restricted profit-making opportunities. Over the past two decades, these services have become relatively unprofitable for hospitals. In this section, we summarize and quote extensively from the last Research Note, where more detail can be found on pages 29-32. We then discuss more recent evidence suggesting that these services have been relatively unprofitable for general hospitals for the past couple of decades.

The PPS, which was passed in 1983 and implemented in 1984, made post-acute services profitable relative to non-acute services offered by hospitals. Although the incentives for hospitals to offer post-acute services in the ways described here were in place before then, it was only in 1987 that eligibility and coverage guidelines were clarified in two court cases.[4] First, rather than paying hospitals a single per-episode payment for each patient, Medicare paid hospitals a cost-related reimbursement for post-acute services that were separate from the acute care reimbursement under the new payment system. For example, for SNFs, hospitals could receive daily operating service payments up to 112% of the national average and reasonable cost payments for ancillary services such as therapy and capital costs. Home health services were also reimbursed by cost, up to 112% of the national mean per visit (Newhouse, 2002b).

Second, the payment system was particularly generous to new entrants, exempting SNFs and HHC from cost limits for the first three to four years of operation (Newhouse, 2002a). Third, these generous reimbursements, coupled with the fixed payments built into the DRG system, made post-acute services particularly valuable for acute care hospitals. Hospitals could increase reimbursement by unbundling services and transferring a patient to a post-acute bed at the end of the patient visit (Cutler and Horwitz, 2000). There is considerable evidence of these transfers; for example, between 1988 and 1996, acute care lengths of stay fell 27% for Medicare patients and only 15% for all patients; during the same period, post-acute service usage and payment rose rapidly (Newhouse, 2002b). In addition to unbundling the patient visit to increase profits, hospitals could manage the allocation of joint costs between the two units to increase reimbursement.

The Balanced Budget Act of 1997 (BBA) included several reforms that restricted the profit-making opportunities described above. First, it set the percentage by which hospital payments would increase in 1998 to zero, reduced the growth rate more generally with stringent cost limits, eliminated the benefits for new entrants, and lowered payments for some post-acute patients who were transferred after a short, acute-service stay (Newhouse, 2002b). In addition, the BBA ordered

[4] Fox v. Bowen, 656 F.Supp. 1236 (D.Conn., 1987). The case held that fiscal intermediaries' practice of using rule of thumb procedures to deny skilled nursing facility claims violated due process. Duggan v. Bowen, 691 F.Supp. 1487 (1988). The case prevented Medicare from denying coverage to home health patients whose needs exceeded four days per week of care.

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the Health Care Financing Agency (now known as CMS) to develop a prospective payment system for post-acute services, which was eventually implemented in 1998 for SNFs (Zinn et al., 2003) and 2000 for home health (Schlenker et al., 2005). The BBA seemed to have controlled costs with respect to post-acute services: "Between 1997 and 1999 home health spending fell 45%, from $17.5 billion to $9.7 billion, and SNF payments fell 17%, from $11 billion to $9.4 billion (nominal dollars)," (Newhouse, 2001).

Reforms related to the BBA that constrained profits seemed to have had a dramatically different effect on hospitals than on free-standing post-acute service providers. MedPAC has warned in annual reports from 2005 to 2020 that the average Medicare profit margins for HHC and freestanding SNFs are more than 10% overall (MedPAC, 2020). In addition, MedPAC notes that the current reimbursement system provides financial incentives for providers to select patients and does not improve the quality of care (MedPAC, 2020). Over the past 20 years, hospitals have generated substantial financial losses from providing HHC and skilled nursing services, leading them to exit these markets. At the same time, the home health and skilled nursing industries have garnered attention for their ability to earn high profit margins and domination by for-profit providers, as evidenced by the consistent increase of for-profit, freestanding providers and total investment in both markets (Cabin et al., 2014, Pfeifer, 2013, Varney, 2016). Consequently, many hospitals and health systems have been phasing out their home health and skilled nursing services due to a lack of profitability and to the changing government reimbursement schemes (McDermott et al., 2017, Ho, 2018, Stavola, 2017). The Bipartisan Budget Act of 2018 called for changes in the prospective payment system for post-acute services, but it is less clear how these payment reforms may affect the profit losses faced by hospitals or whether hospitals will directly invest in post-acute services in the future (McDermott et al., 2017).

For more than a decade, hospitals have had well-documented negative margins related to Medicare reimbursement. Losses have been attributed to several factors that contribute to higher costs for routine hospital-based SNFs as compared to free-standing SNFs, including higher-skilled staffing rates and shorter stays over which to allocate costs (MedPAC, 2019). For example, of the $28.5 billion Medicare spent on SNFs in 2018, just 3% of the funds were received by hospital-based SNFs, which account for 4% of all SNFs. Although freestanding SNFs had average Medicare margins of 10.3%, hospital-based SNFs had striking negative Medicare margins of -63% (MedPAC, 2020).

With respect to HHC, in 2018, freestanding agencies (which accounted for over 90% of episodes) had average Medicare profit margins of 15.3%; hospital-based HHC had margins of -16.6%. Similar to the case of hospital-based SNFs, the losses associated with hospital-based HHC services are attributable to higher costs of care and overhead costs from the parent hospital institution transferred to the HHC (MedPAC, 2019, MedPAC, 2020).

Despite facing losses on these services, hospitals may have some financial incentive to provide SNFs and HHC, as offering these services comes with opportunities to manage the total cost of care of patients, allowing hospitals to earn higher value-based reimbursements (Berklan, 2016). Hospital-based SNFs and HHC may help hospitals keep costs down by providing beds to

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which patients can be transferred from more expensive sites of care in the hospital. Moreover, transferring patients from longer inpatient stays to SNFs and HHC frees up acute care beds that can, in principle, be filled with newly admitted patients bringing a new reimbursement (MedPAC, 2019).

In fact, there is some evidence that hospitals manage discharges from acute care to HHC to maximize Medicare reimbursements (Kim et al., 2015). They may do so for reasons consistent with good quality care; at its best, HHC—compared to hospital-based care—can be lower-cost, more convenient, higher-comfort, and safer (Greene, 2017, Greene, 2018a, Stinnett, 2019). Many hospitals thus use HHC to help patients manage chronic health issues and avoid costly returns to the hospital (Burling, 2017). However, some hospitals may engage in fraudulent behavior in this dimension (Berens, 2017).

The historically high profit margins and potential for fraudulent use attributed to SNFs and HHC have led MedPAC to call for significant reimbursement reforms in every annual report from 2008 through 2019 (MedPAC, 2019). In response, the Bipartisan Budget Act of 2018 required CMS to implement major changes to the home health Prospective Payment System (PPS) and led to an overhaul of the SNF PPS in 2020. Notably, CMS substantially redesigned SNF PPS in October of 2019 in an attempt to increase payments for high-cost, complex care patients and discourage patient selection. Changes to reimbursements for HHAs include increased payments to nonprofit and hospital-based HHAs, though MedPAC continues to recommend overall home health payment reductions (MedPAC, 2020). In addition, changes to Medicare reimbursement in recent years have consisted of imposing financial penalties on avoidable hospital readmissions for skilled nursing and home health patients (Greene, 2019, Rau, 2019). As home health and skilled nursing providers adjust to the newly implemented PPS, it will be important to examine industry trends and their subsequent effects on hospital profitability.

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VI. Uncertain Profitability

A. Adult Intensive Care Units

This section covers only general adult intensive care units. Neonatal intensive care units, which are relatively profitable, are addressed in an earlier section. Pediatric intensive care units, which are also of uncertain profitability for general acute care hospitals, are discussed in a later section.

Intensive care units (ICUs) are one of the highest cost areas in the hospital, but they also may bring significant revenue (Dogra and Dorman, 2016). Most of the high costs in an ICU are fixed costs, which one study suggests may be as high as 80% of overall costs (Khandelwal et al., 2017). These costs mainly include expensive technology and staff costs. Because of these high fixed costs, there are strong incentives for hospitals to generate revenue by filling ICU beds. Yet only some patients need to be in an ICU because some patients are too healthy (i.e., care can be safely administered in a lower cost setting) and others are too sick (i.e., requiring palliative care in a lower cost setting) (Butterfield, 2013).

Nonetheless, large hospitals in urban settings are able to raise revenue by treating marginal patients who may not be appropriate for an ICU setting, whereas other hospitals are not able to implement this strategy (Butterfield, 2013, Farwell, 2013). According to one estimate, patients who are not well-suited for treatment in the ICU because they are "too sick"—generally patients 65 and older, who are Medicare eligible—account for more than half of the 4-6 million patients admitted to ICUs annually (Khandelwal et al., 2019). Despite the high out-of-pocket costs faced by patients for this type of end-of-life care (Khandelwal et al., 2019), hospitals would likely be reticent to allow ICU beds—and the high costs associated with them—to go unfilled in order to divert more patients to lower cost hospice care (Gozalo et al., 2015). And it appears that some acute care hospitals also admit patients that are too healthy for similar reasons, because if a patient spends time in an ICU, the hospital's reimbursement rates for post-ICU care will be higher (Kim et al., 2015).

To spread some of the high fixed costs of providing ICU care, some hospitals have implemented tele-ICU models, in which some ICU care is coordinated remotely (Farwell, 2013, Kumar et al., 2013, Lilly et al., 2017). In these settings, intensive care specialists and teams can provide and supervise care remotely for several hospitals, ensuring that their utilization is comparatively higher than if they were based at one hospital (Kumar et al., 2013, Lilly et al., 2017). These types of programs require significant start-up costs to improve a hospital's electronic infrastructure, but some have resulted in significant cost-savings that have made ICUs far more profitable (Kumar et al., 2013, Lilly et al., 2017). Medicare reimbursement rates for telehealth services for ICU patients may also enable rural hospitals to bill more than urban hospitals (MedPAC, 2018). Even so, the start-up and continuing costs can be daunting for smaller hospitals (Farwell, 2013, Kumar et al., 2013).

In sum, whether an ICU is profitable depends a great deal on the hospital's patient mix, size, location, and overall demand for ICU services. It also depends on whether the hospital can

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treat marginal patients in the ICU. To some extent these factors are true of many hospital services but are likely more extreme in this setting. Moreover, the ACA does not have a variable for intensive care services generally and, instead, has variables for unit-specific intensive care services. Therefore, we characterize the profitability of adult ICU care as uncertain because it likely varies to such a great extent among hospitals.

B. Mammography

There is extensive research on the cost-effectiveness of mammography but little evidence regarding its profitability for hospitals. Older studies suggested that mammography, particularly diagnostic mammography, was relatively unprofitable (Enzmann et al., 2001, Newstead, 2006, Feig, 2005). Other older studies showed that it was becoming less unprofitable (Newstead, 2006), could be designed to be profitable (Chen et al., 2004, Feig 2005, Kolb 2002), or had even become profitable (Hall, 2008).

Although we characterize mammography as having uncertain profitability, there is some evidence that it may have become or is in the course of becoming profitable for hospitals. Importantly, the ACA includes mammograms as a preventive health service. The ACA has required insurers to cover screening mammograms every twelve months for women aged 40 years or older (Health Resources and Services Administration, 2020c). In addition, for women in a specified age range and as a Medicare Part B benefit with no copay or deductible, screening mammograms became fully covered on condition that the screening mammogram is the principal reason for the consultation and is not billed separately from it, and that it is carried out by an in-network provider (Centers for Medicare and Medicaid Services, n.d.-c). Diagnostic mammograms, those prescribed by a physician based on a prior exam to diagnose breast abnormalities, are not covered as women's preventive health services under the ACA. Medicare Part B covers medically necessary diagnostic mammograms for patients who pay a copayment of 20% of the Medicare-approved amount, in addition to the Part B deductible. (Centers for Medicare and Medicaid Services, n.d.-c).

However, somewhat surprisingly, studies that have analyzed the effect of the ACA's elimination of cost-sharing for screening mammography report that, rather than increasing, screening rates have either remained roughly stable or even declined (Alharbi et al., 2019, Steenland et al., 2019, Bhandari and Li, 2019, Han et al., 2015). These results are confirmed by data from the National Health Interview Survey; in 2005, 72.02% of women aged 50 to 74 years declared having had a mammogram within the past two years whereas the proportion was 71.57% in 2015 and 72.80% in 2018 (National Cancer Institute, 2020). These findings suggest that hospitals may not be benefiting financially from coverage changes.

However, reimbursement changes made by CMS over the past few years may well increase the profitability of mammograms. As of January 1, 2018, the previous Medicare reimbursement codes for mammograms have been replaced and bundled in standard CPT codes, including Computer-Aided Detection for all mammograms and waiving co-insurance and deductibles (Centers for Medicare and Medicaid Services, 2017). Typically, such bundling leads to a decrease

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in reimbursement; however, the bundling of the mammogram codes resulted in a reimbursement increase (Health Administrative Partners, 2016, DeMartini, 2018).

Furthermore, although CMS will slightly reduce mammogram reimbursement in 2021, it has expanded the ability of nurse practitioners, clinical nurse specialists, physician assistants, and certified nurse midwives to supervise the performance of diagnostic tests (Health Administrative Partners, 2020; Medicare Program, 2020, pp. 84590-84592, 85001-85002), thus potentially increasing volume and reducing costs. In addition, coverage for 3D mammography has been increasing over the last few years (DeMartini, 2018); besides the add-on codes for tomosynthesis (3D mammography) established by CMS in 2015 (Centers for Medicare and Medicaid Services, 2014b), Medicaid programs now cover 3D screenings in 36 states and Washington D.C., and 16 states require private insurers to cover them (Szabo, 2019). In addition, an analysis of the Medicare Open Payments database found that 3D equipment manufacturers paid teaching hospitals and doctors over $9.2 million related to 3D mammograms from 2013-2018. And "just over half of that money was related to research; other payments covered speaking fees, consulting, travel, meals or drinks" (Szabo, 2019). It is unclear whether the additional payment, potential profitability, or quality is motivating hospitals to adopt 3D mammography.

Finally, even if mammography is relatively unprofitable for some hospitals, mammography can be characterized as a loss leader because, like other services that are largely used by women, it attracts them and their families to the hospital for other services (Luthra, 2018) and it is a pathway to oncology, a profitable service (Szabo, 2019).

Given this evidence, we categorize mammography as uncertain, but it would be reasonable, particularly in the most recent years, to consider it a profitable service.

C. Cardiac services

i. Adult cardiac rehabilitation

Cardiac rehabilitation is available to any patient recently hospitalized for a heart attack or cardiac procedure, including CABG, angioplasty, or valve replacement. Standard cardiac rehabilitation includes exercise, counseling, and education for patients who had a recent heart attack or cardiac procedure. Medicare reimburses for standard rehabilitation as well as a small number of intensive rehabilitation programs that provide more complete education and exercise programs (Centers for Medicare and Medicaid Services, n.d.-a). Cardiac rehabilitation has long been underutilized. One study in 2009 found that only 12% of Medicare patients who were hospitalized for acute-coronary syndrome, CABG surgery, or angioplasties used cardiac rehabilitation (Dickson, 2014).

Existing research does not directly address the profitability of cardiac rehabilitation services, perhaps because the service is traditionally provided in cardiac rehabilitation centers away from the hospital (Pack et al., 2014). However, cardiac rehabilitation can have an indirect effect on a hospital's bottom line. In 2012, Medicare began a program that financially penalizes hospitals with high rates of patient readmission (Centers for Medicare and Medicaid Services, 2018a). Cardiac rehabilitation has been demonstrated to reduce patient readmission, both related

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to cardiovascular disease and related to other causes (Dunlay et al., 2014). Increasing cardiac rehabilitation use would thus help the hospital improve their readmission number to avoid possible financial penalties from Medicare. Furthermore, Medicare has acknowledged the readmission reduction from cardiac rehabilitation. In 2017, they provided hospitals payment incentives of $25-$175 per rehabilitation session in an attempt to improve utilization (Whitman, 2016). They ended these incentives for the 2018 financial year but continue to reimburse for cardiac rehabilitation services (American College of Cardiology, 2017). Although this service may well have become profitable with the introduction of some reimbursement and readmission policies, there is so little evidence of the profitability of this service for hospitals that we classify it as uncertain.

ii. Pediatric cardiac services

In this service entry, we include several individual pediatric services listed in the AHA: pediatric cardiology services, pediatric diagnostic cardiac catheterization, pediatric cardiac surgery, and pediatric interventional cardiac catheterization. Pediatric services are not as consistently profitable as other cardiac services for hospitals. Pediatric cardiological services are generally more expensive than adult services because of increased complexity and higher likelihood of complications (Wittlieb-Weber, 2015). In 2012, children with congenital heart defects made up 23% of total hospital costs while only comprising 4.4% of hospital patients (Faraoni et al., 2016). Since 92% of children in the United States have some type of insurance, these high costs are reimbursed to hospitals for certain procedures, such as surgeries (Gaul, 2011). Some pediatric operations even have high profit margins. For example, the Norwood procedure, the first operation in a series of open-heart procedures to correct congenital birth defects, brings in an average profit of $188,000 (Kogon et al., 2015).

However, other pediatric services may cause hospitals to lose money due to low reimbursement rates, often from Medicaid. Over one-third of American children are covered under Medicaid (Colvin et al., 2016). Medicaid reimbursement rates for children are often based on costs for standard adult patients, even though pediatric patients often require specialized equipment and personnel that increase costs (Brennan et al., 2015). Thus, Medicaid tends to reimburse below hospital costs, causing hospitals to lose money when treating pediatric patients covered by Medicaid (Colvin et al., 2016).

Pediatric catheterization labs are an example of services that generate losses for many hospitals, as they require specialized equipment that must be designed specifically for the smaller and variable size of their patients. For many cath lab services there is not a separate Medicaid billing code for the pediatric version, which means that Medicaid reimburses similar amounts for a routine angiogram of an otherwise healthy adult and an infant who requires special equipment and personnel (Brennan et al., 2015). As a result, many for-profit hospitals are not willing to pay the price of installation. According to a 2017 study, 94% of pediatric catheterizations are performed in teaching hospitals, suggesting that hospitals have difficulty obtaining full reimbursement for pediatric cath lab care (Kim et al., 2017).

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Given this evidence, and the fact that these services may mostly be provided by children's hospitals, we categorize pediatric cardiac services as uncertain.

D. Pediatric Intensive Care

Like adult intensive care units, discussed earlier, pediatric intensive care units have very high fixed costs and profitability depends on occupancy. However, unlike NICUs, which we categorized as profitable, pediatric intensive care units (PICUs) do not have the stream of patients coming from an obstetric service. Another difference between PICUs and NICUs is that the profitability of the former faces competition from children's hospitals (Gaul, 2011), a factor that would not apply to NICUs, which are located in acute care hospitals with obstetric services. In fact, a great deal of pediatric intensive care occurs in specialty children's hospitals and not general acute care hospitals. And in children's hospital markets, large independent children's hospitals capture much of the profit, while others, especially smaller non-specialized hospitals that lack sufficient patient volume, struggle to break even (Gaul, 2011). One study about PICU finances explained that clinical revenue does not cover costs in large PICUs and also relies on funding from hospitals, suggesting that the service is not profitable for the hospital overall (Schleien, 2013). It is not clear how these factors balance, and we are therefore uncertain about the relative profitability of PICUs in general acute care hospitals.

E. Trauma Centers

Like Emergency Departments, trauma centers have traditionally been considered highly unprofitable, in part because they often play the "safety net" role in the medical system by providing care to the most acutely ill emergency patients (Faul et al., 2015). The high operating costs required to maintain standby capacity in trauma centers, coupled with low reimbursement rates for patients who are disproportionately underinsured and uninsured, place significant financial strain on hospitals. As a result, the number of trauma centers fell from 1,125 to 786 between 1990 and 2005 (Johnson, 2015).

However, the profitability of trauma centers is highly variable, depending on the location of the trauma center, insurance status of local patients, and profit status of the hospital providing the trauma care (Faul et al., 2015), making them difficult to categorize overall. In fact, many for-profit hospital chains have found ways to generate profits by opening trauma centers in areas with well-insured patient populations, charging very high prices, and negotiating favorable reimbursement rates with private insurers (McGrory, 2017, Johnson, 2015, Times Staff Writer, 2014). Yet trauma centers typically remain unprofitable for many hospitals, and public and nonprofit hospitals are more likely than for-profit hospitals to serve uninsured patients and function as community resources in urban settings (Faul et al., 2015).

Trauma centers are one of the highest-cost settings in the hospital, requiring significant fixed costs with medical staff and technology. Traumatic injuries are the leading cause of death for people under 45, and trauma centers must be prepared to provide life-saving care to patients suffering from automobile accidents, falls, and gun and knife violence 24 hours per day (Galewitz,

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2012). Maintaining standby capacity required to initiate orthopedic or neurosurgery at any time places a significant financial burden on hospitals (Faul et al., 2015).

In addition to high costs, hospitals have historically struggled to operate trauma centers profitably because they treat relatively high proportions of uninsured and underinsured patients, in part because the patients tend to be young and are therefore not covered by Medicare. Often located in dense urban settings, many trauma centers serve patients whose insurance coverage does not reimburse total costs of care and populations with relatively high rates of crime and drug-related violence. In urban areas, it has been shown that up to "40% of the injuries treated were repeat victims of violence and most of these patients were uninsured (58%)" (Faul et al., 2015, pg. 103). Approximately 37% of trauma centers exist within public or county safety net hospitals (SNHs), which receive federal and state funding to provide a proportionately higher number of uninsured and publicly insured patients than non-SNHs (Knowlton et al., 2018). Demonstrating the wide variation of patient populations seen by hospitals with different ownership types, one study examined the payer mix of trauma centers from 2010 to 2015 within county SNHs, nonprofit SNHs, and non-safety net hospitals in California, finding that 45%, 36%, and 12% of patients were covered by MediCal in the hospitals, respectively. Furthermore, 31% of patients served by county SNHs were uninsured, compared with 9% of patients served by non-SNHs. And the variance in the payer mix of patients served by hospital type directly affects a hospital's profitability. While non-SNHs reported mean operating profit margins of approximately +10.0%, county SNHs had "consistently negative operating margins around -16.5%, ranging between -34.0% and 7.0%" (Knowlton et al., 2018).

Despite the financial losses incurred by many SNH and nonprofit hospitals across the country, some hospitals earn significant profits from their trauma centers. One way some hospitals generate profits is through charging high trauma response or activation fees, which were first approved by the National Uniform Billing Committee in 2002 in an attempt to address the financial strain and closures of trauma centers nationally (Gold and Kliff, 2018). For privately insured payers, hospitals could charge trauma activation fees that are largely unregulated (Gentry, 2019, Galewitz, 2012). This charge—as much as $33,000 per patient—was added to patient bills even if patients did not need to receive care in a trauma setting (Humburg et al., 2014).

In addition, by opening trauma centers in locations with higher proportions of well-insured patients, for-profit hospitals began to notice the "halo effect" of trauma centers, finding that trauma centers can grow the brand perception of a hospital and capture new patients seeking emergency care (Johnson, 2015). As a result, some for-profit hospitals have made trauma centers into profitable service lines, including HCA, a large for-profit hospital chain that has opened several trauma centers in Florida in recent years while simultaneously increasing profits by negotiating lucrative contracts with private insurers (Galewitz, 2012, Humburg et al., 2014, Times Staff Writer, 2014). Between 2012 and 2015, 117 Level 1 and Level 2 trauma centers opened in the U.S, according to the American Trauma Society, and this growth has mainly occurred in areas where patients are more reliably insured (Johnson, 2015, Knowlton et al., 2018). Despite national trends showing that the number of fatalities from firearms and car accidents has declined over the past

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decade, the number of cases reported from trauma centers in the U.S. increased from 681,000 to 860,000 between 2010 and 2014 (Johnson, 2015, Galewitz, 2012). From 2000 to 2011, approximately half of all trauma injuries involved a fall, with motor vehicle accidents as the second most common cause of traumatic injury (DiMaggio et al., 2016).

However, trauma centers within nonprofit and SNHs continue to generate negative operating margins and struggle to stay financially afloat. Although the ACA has provided many patients who were previously uninsured with Medicaid or private insurance coverage, payments to hospitals tend to inadequately cover trauma center costs for many community hospitals. Especially for urban trauma centers, where the proportion of uninsured patients is highest, the risk of uncompensated, expensive care continues to make trauma centers a financial drain for these hospitals (Faul et al., 2015, Knowlton et al., 2018).

Because there is variation in the profitability of trauma centers, in part relating to ownership form, we are unable to categorize the service.

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VII. Review of Profitability of Community Outreach and Enabling Services

In this edition of the Research Note, we include a new category of services from the AHA Survey: community outreach and enabling services. The AHA survey measures six distinct services in this category: community outreach, enabling services, linguistic aid, nutritional services, community education, and patient enrollment services. However, there is considerable overlap among them, both in practice and in research regarding the services. For example, research on public health and health services defines enabling services as efforts to address "a combination of social determinants of health and barriers to access to primary care and are intended to reduce health disparities" (Yue et al., 2019). Consistent with this definition, enabling services commonly include community health education, non-emergency transportation to care, food assistance, signing up for benefits, and language services. Moreover, because these services require outreach to the community, they overlap significantly with community outreach services, which researchers define as efforts to "provide health-related services to community residents who are at a socioeconomic disadvantage" (Shin et al., 2020). Therefore, we have not reviewed community outreach separately. In addition, the services we have reviewed separately tend to overlap.

A. Relatively Unprofitable Community Outreach Services

i. Community health education

Community health education consists of providing educational health messages to patients who are not currently using services but could benefit from them. Evidence for the effectiveness of the services, however, are largely from the developing world. A review of over 1,000 studies found that community education may be associated with reduced incidence of malaria, increased breast feeding, and better adherence to recommended care for newborns (Gilmore and McAuliffe, 2013). Other studies of community health education focus on services provided by community health workers, as opposed to community health education provided by hospitals. For example, a study of colorectal cancer screening education provided in rural Kentucky increased colorectal screening rates (Feltner et al., 2012). Although some states fund community health workers, who may provide health education as part of their work (Centers for Disease Control and Prevention, 2014), there are few sources of direct reimbursement for community health education provided by acute care hospitals.

ii. Transportation services

Non-emergency transportation to the hospital is a type of community outreach and enabling service. Providing transportation increases access to care, which could have benefits for hospital operations, such as reducing missed appointments (Syed et al., 2013). However, a systematic review of recent studies on transportation services found only limited evidence for a relationship between transportation and patient outcomes (Solomon et al., 2020).

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Although we were unable to find quantitative studies regarding the costs or profitability of providing transportation services, we believe that the category is likely to be relatively unprofitable. First, patients who need the service tend to be lower-income and, therefore, be insured by Medicaid. Second, reimbursement and eligibility for non-emergency transportation varies across payers and states, making reimbursement uncertain. All states must cover certain non-emergency transport for eligible Medicaid patients (Centers for Medicare and Medicaid Services, 2016b). However, reimbursement is made through various financing mechanisms—ranging from fee-for-service to preferred contractor models to managed care approaches requiring prior authorization (Myers, 2015)—all of which have different coverage implications. Furthermore, not all Medicaid patients are eligible for transportation services, as patients must demonstrate that transportation is not otherwise available to them (Centers for Medicare and Medicaid Services, 2016a). Medicare also covers non-emergent transportation, but not all trips are eligible, and eligibility may depend on local protocols and physician certification (MedPAC, 2013b).

iii. Linguistic services

Linguistic services commonly include translation, as well as programs to provide culturally appropriate care in the processes of informed consent or collection and use of patient data (Wilson-Stronks and Galvez, 2007). Language services are associated with improved patient satisfaction, fewer adverse events, and generally increased quality of care (Flores, 2005; Divi et al., 2007). Despite making care more effective, it is unlikely to be profitable for hospitals since public payers generally do not reimburse for these services; Medicare, for example, does not cover linguistic services. However, Medicaid and the Children's Health Insurance Programs provide matching federal funds for language access services, and providers who receive federal financial assistance must provide services under Title VI of the Civil Rights Act of 1964 and the ACA's nondiscrimination provision (Ku and Flores, 2005). Sign language services are typically required under the Americans with Disabilities Act.

As of 2017, only 15 states reimbursed providers for the direct costs of language services (U.S. Department of Health and Human Services, 2020e, Youdelman, 2017). Thus, indirect costs are not recovered, and, for many providers, direct costs are not recovered. Therefore, if the benefits of translation services cannot be directly tracked to savings, this service is likely to be unprofitable. Additionally, many uninsured households contain individuals whose primary language is something other than English (Bosworth et al., 2021).

iv. Nutritional services

Nutritional services may also improve patient care. Approximately 8% of patients with hospital stays in the United States are malnourished (Barrett et al., 2018). In addition, access to food is an important contributor to recovery and improved health (Barker et al., 2011, Yue et al., 2019). However, nutrition services for inpatients are typically not covered by insurers (Lee, 2020). Under Medicare's prospective payment system, nutritional services are not reimbursed separately

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from the billed diagnosis-related group. In the outpatient setting, nutritional services are generally provided incident to physician services (Institute of Medicine, 2000), meaning that dieticians and nutritional services providers cannot bill independently from a physician. Therefore, because nutritional services are unlikely to be fully reimbursed when provided in a hospital outpatient department, and because they are likely to be disproportionately needed by patients with low SES, they are likely to be unprofitable for hospitals to offer.

B. Community Outreach Services with Uncertain Profitability

i. Enrollment services and patient representatives

Although these services are likely to be most needed by uninsured patients and patients who are eligible for insurance with low reimbursement rates, they may be financially helpful to hospitals for at least two reasons. First, Medicaid allows patients to register retroactively such that it will cover hospital bills up to three months prior to the application date (Musumeci and Rudowitz, 2017). However, 11 states have pursued waivers to limit eligibility through this pathway and five have been granted (Kaiser Family Foundation, 2021; Meyer, 2019).

Second, enrollment services representatives can screen patients for eligibility for hospital financial assistance policies. Federal tax code § 501(r) and related regulations mandate that nonprofit hospitals meet various patient financial assistance requirements as a condition of tax exemption and other benefits related to charitable status; screening patients to determine their income in relation to federal poverty levels helps hospitals identify which patients are eligible for financial assistance. Perhaps because of this policy, firms that provide enrollment services and patient representative services market patient screening services to nonprofit hospitals (AccessHealthcare, n.d.; Conifer Health Solutions, 2021; Outsource Strategies International, 2021).

On the other hand, because these services tend to be needed by patients who are uninsured or poorly insured, offering these services may attract patients who are relatively unprofitable for the hospital. Therefore, it is uncertain whether the services are, on balance, profitable or not.

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