Hospitals As Hotels: The Role of Patient Amenities in Hospital Demand*

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Abstract

Amenities such as good food, attentive staff, and pleasant surroundings may play an important role in hospital demand. We use a marketing survey to measure amenities at hospitals in greater Los Angeles and analyze the choice behavior of Medicare pneumonia patients in this market. We find that a one-standard-deviation increase in a hospital's amenities raises its demand by 38.5% on average, whereas demand is substantially less responsive to various measures of clinical quality. These findings imply that hospitals may have an incentive to compete in amenities, with potentially important implications for welfare.

Keywords: Hospital competition; hospital quality

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1 Introduction

There is persuasive evidence that quality of care influences hospital demand. Tay (2003) has found, for example, that demand among heart-attack patients is substantially higher at hospitals with advanced capabilities for cardiac care. This evidence implies that analysts and policy makers must consider clinical quality as well as geography in defining markets for hospital care. Furthermore, such opportunities for differentiation in clinical quality may have important implications for welfare in competitive equilibrium. For example, hospitals might engage in a "medical arms race" by competing for physicians and their patients on the basis of costly and welfare-dissipating investments in medical care [see, e.g., Robinson and Luft (1985); Dranove and Satterthwaite (2000); Gaynor and Vogt (2000); Kessler and McClellan (2000)].

Hospitals may also differentiate themselves in another dimension of quality, amenities. Indeed, Newhouse (1994) likens the hospital enterprise to that of an airline, for which good food, attentive staff and pleasant surroundings are plausibly important aspects of the overall service. Yet good measures of such amenities have been lacking for hospitals. Thus, findings of substantial productive inefficiency among American hospitals may in fact point to a substantial and costly role for amenities [Newhouse (1994)].[1]

In the market that we study, greater Los Angeles, there is circumstantial evidence of competition in amenities. For instance, a Beverly-Hills-based physician group acquired Century City Hospital in west Los Angeles in 2004. The group invested nearly $100 million in improvements to medical care and patient amenities, with "five-star personalized service" including a concierge and nightly turn down; bedside internet portals and flat-screen televisions with movies on demand; and gourmet organic cuisine prepared and served by the staff of chef Wolfgang Puck [Costello (2008)]. This hospital filed for bankruptcy in August, 2008.

Nearby, the Ronald Reagan Medical Center opened in June, 2008, at a cost of $830 million [UCLA Health System (2008a)].[2] UCLA built this hospital to meet new mandates for seismic safety. Even so, an aggressive market-

[1] Zuckerman et al. (1994) attribute nearly 14% of total costs in U.S. hospitals to productive inefficiency. Their analysis, like others, does not account for hospital amenities.

[2] Nationwide, hospital construction has tripled from 1990s levels, reaching almost $30 billion annually [Medicare Payment Advisory Commission (2007)].

ing campaign emphasizes its "hospitality." [UCLA Health System (2008b)] Where UCLA's previous hospital lacked private rooms, the new facility's "large, sunny, private patient rooms not only feature magnificent views and daybeds for family members, but also wireless Internet access for patients and guests, multiple outdoor play areas for children, and a host of other unexpected amenities." Such amenities include massage therapy and "hotel-style" room service for meals.

Our aim here is to develop the first systematic evidence on the role of amenities in hospital demand. We use a survey conducted by a healthcare market-research firm to measure amenities at hospitals in greater LA. We then analyze the choice behavior of Medicare fee-for-service patients with pneumonia in this market. These patients are especially likely to exercise choice among hospitals. In addition, we need not measure, nor deal with the endogeneity of, their out-of-pocket costs, because these costs are uniform across hospitals. A well-suited measure of clinical quality — namely, risk-adjusted mortality rates for community-acquired pneumonia — is also widely available for hospitals in greater LA. We also consider other measures of clinical quality, including some derived from our market survey.

To preview our findings, the mean valuation of a one-standard-deviation increase in amenities is positive and substantial among the Medicare pneumonia patients studied. In addition, a one-standard-deviation increase in amenities raises a hospital's demand among these patients by 38.5% on average, whereas demand is substantially less responsive to various measures of clinical quality. In comparison to pneumonia patients, heart-attack patients appear to value clinical quality more highly in relation to amenities.

In the next section, we describe our approach to analyzing the role of hospital amenities. Our empirical findings are presented in section 3. We then offer some conclusions in a final section.

2 Analytical approach

We analyze the demand for hospitals in greater Los Angeles among Medicare fee-for-service patients with pneumonia. To do so, we motivate a model of patient choice behavior and hospital demand that accounts for amenities as well as clinical quality. We then introduce our measures of these dimensions of hospital quality. Finally, we describe the empirical analysis.

2.1 Patient choice behavior and hospital demand

We assume that Medicare fee-for-service pneumonia patients choose the hospitals that maximize their utility. This kind of assumption has been maintained in a variety of studies of hospital demand and performance [Luft et al. (1990); Gowrisankaran and Town (1999); Kessler and McClellan (2000); Town and Vistnes (2001); Kessler and McClellan (2002); Capps et al. (2003); Gaynor and Vogt (2003); Geweke et al. (2003); Tay (2003); Ho (2006)].

There is reason to believe that many patients are able to select their hospitals, and that Medicare fee-for-service pneumonia patients are especially able to do so. These patients are constrained neither by provider network, nor as a general matter by ambulance transport. Even so, these patients are frequently admitted by physicians whose privileges are limited to a small number of, and potentially only one, hospital. Yet patients may choose doctors partly on the basis of admitting privileges [Dranove et al. (1992); Tay (2003)]; indeed, hospitals actively seek to refer potential patients to physicians [Gray (1986)]. Burns and Wholey (1992) have analyzed the role of doctors in demand by accounting for the proximity of their offices to, and their prior use of, hospitals. While patients are more likely to receive care at hospitals favored by their physicians, patient attributes and preferences nevertheless influence choice. Indeed, in a recent survey, 70% of physicians reported that requests from patients influenced their hospital recommendations [Grote et al. (2007)].[3]

In choosing among hospitals, the utility that patient i expects from hospital h consists of systematic and idiosyncratic components, denoted $\overline{U}_{ih}$ and ϵ_{ih}, as follows:

$$U_{ih} = \overline{U}_{ih} + \epsilon_{ih} \tag{1}$$

The likelihood that a patient chooses a hospital is then:

$$l_{ih} \equiv \Pr\left(U_{ih} \geq U_{ih'} \forall h' \neq h\right) \tag{2}$$

We assume that a patient values hospitals according to their characteristics. In particular, systematic utility is specified as:

[3] Another market-research firm found that 58% of patients admitted for an illness (versus surgery or an accident) chose their hospitals themselves, while another 9% selected from options presented by their physicians [National Research Corporation (1986)].

$$\overline{U}_{ih} = \beta_{d,i} Distance_{ih} + \beta_{p,i} Price_{ih} + \\ \beta_{c,i} Clinical\ quality_h + \beta_{a,i} Amenities_h + \xi_h, \quad (3)$$

in which $Distance_{ih}$ is the distance between the patient's home and a hospital, and ξ_h is an amalgam of additional hospital characteristics, which patients may observe but we as researchers do not. The patient's tastes for distance, price, clinical quality, and amenities are characterized by the $\beta_{d,i}$, $\beta_{p,i}$, $\beta_{c,i}$, and $\beta_{a,i}$ parameters.

Previous research has consistently found that patients have a strong preference for hospitals that are close to their homes. As to prices, Gaynor and Vogt (2003) analyze the demand of privately funded patients for California hospitals in 1995 and estimate an average price elasticity of 4.85. Prices do not affect the hospital choices of the Medicare patients studied here, as we explain in section 2.3.

There is also considerable evidence that clinical quality influences hospital demand. Luft et al. (1990) analyzed hospital choices for patients with a variety of surgical procedures and medical conditions (including pneumonia) in three metropolitan areas in California in 1983. For 5 of 7 procedures and 2 of 5 conditions, demand was significantly lower at hospitals with higher-than-expected rates of complications and mortality. When New York began to report cardiac mortality rates in the early 1990s, the market shares of hospitals with low rates grew [Mukamel and Mushlin (1998)].

More recently, Tay (2003) has studied hospital choice in urban California, Oregon and Washington in 1994 among elderly Medicare patients with acute myocardial infarction, or heart attack. Prompt transport to a hospital is critical for this life-threatening condition. Even so, many patients willingly passed by hospitals near their homes to be treated at hospitals with advanced cardiac care. Tay estimates that demand increased by nearly 88% on average when hospitals developed a capability for angioplasty or coronary bypass surgery. Gaynor and Vogt (2003) find that patients prefer high-tech, as well as teaching, hospitals.

We argued in the introduction that hospital patients plausibly value amenities such as good food, attentive staff, and pleasant surroundings. Yet there is no direct evidence on the role of patient amenities in hospital demand. Tay (2003) and Ho (2006) did find that demand is greater at hospitals with more nurses per bed, but nursing may be an input into both clinical quality and amenities. Good measures of hospital amenities have been unavailable.

2.2 Measuring amenities and clinical quality in greater Los Angeles

We measure hospital amenities based on the Healthcare Market Guide (HCMG). The National Research Corporation (NRC), a healthcare marketing-research firm, promotes the HCMG to hospitals and others as the "most sophisticated and comprehensive consumer market intelligence." The HCMG summarizes the results of an annual NRC survey of households in the 48 contiguous states. Sample households are invited — by mail prior to 2005 and over the internet since — to complete self-administered questionnaires, and responses are weighted according to household characteristics to ensure their representativeness within each market area. We were able to access the 2002 HCMG for the Los Angeles-Long Beach, Orange County, and Riverside-San Bernardino primary metropolitan statistical areas; these MSAs contain the greater Los Angeles hospital market, as defined in the next section.

The HCMG reports the weighted numbers of respondent households in each MSA who named hospitals as their first choice for best accommodations/amenities and other attributes (see Appendix Table A1). We aggregate responses across the three MSAs, weighting by the number of households in each MSA in the 2002 American Community Survey. Table 1 describes our measure of amenities at the 117 hospitals studied, the percentage of the 5,479 survey respondents who named a hospital as their first choice for "best amenities." This measure ranges from a minimum of zero percent (at 28 hospitals) to a maximum of 16.1 percent.[4]

Our benchmark measure of clinical quality is a hospital's mortality rate for patients with community-acquired pneumonia. This measure is well-suited to an analysis of choice behavior among pneumonia patients. As others have recognized, patients are fundamentally concerned with health outcomes [see, e.g., Luft et al. (1990); Mukamel and Mushlin (1998); Gowrisankaran and Town (1999); Kessler and McClellan (2000); Geweke et al. (2003)], and death is not infrequent among pneumonia patients. Yet there is evidence

[4]One fifth of respondents named hospitals outside the greater Los Angeles market, as defined in the next section. Many of these hospitals are located in the Palm Springs area, which lies within the Riverside-San Bernardino MSA.

that mortality is weakly correlated with process-oriented measures of clinical quality in hospitals (e.g., oxygenation assessment within 24 hours of admission) [Werner and Bradlow (2006); Bradley et al. (2006)].

Pneumonia mortality rates are widely available for California hospitals. The Office of Statewide Health Planning and Development (OSHPD) has computed 30-day rates; these rates account for determinants of patient severity, using risk-adjustment models developed and validated by academic health researchers [Haas et al. (2000)].[5] We average rates over the years 2000-2004, because rates are unavailable for some hospitals in some years[6], and averaging may smooth these noisy outcomes [McClellan and Staiger (2000)]. As Table 1 shows, pneumonia mortality ranged from a minimum of 6.6 percent to a maximum of 19.6 percent at 117 sample hospitals.[7] Hospitals with low pneumonia mortality tended to have slightly better amenities in this sample ($\rho = +0.086$).

These rates proxy for patient information about the clinical quality of hospitals. Pneumonia mortality rates were first publicly reported only after the patients studied made their hospital choices. Even so, patients may be reasonably well informed about clinical quality from their physicians, friends and families [Harris and Buntin (2008)]. Evidence that patient choice was related to hospital mortality in the absence of public reporting is consistent with this view [Luft et al. (1990)]. In addition, in the context of health insurance, Dafny and Dranove (2008) find that Medicare patients were somewhat aware of the quality of health plans prior to the dissemination of plan report cards.

In sensitivity analyses described below, we consider alternative measures of clinical quality motivated by prior research. We also consider heart-attack patients.

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[5] Risk factors include patient characteristics (age and gender), pneumonia type (e.g., gram negative), co-morbidities (liver disease, various cancers, and more), and number of prior admissions. OSHPD publishes two sets of rates according to whether a "Do not resuscitate" order is included in the model. We use the rates that account for DNR orders.

[6] A hospital's rate is not reported in any year if there were fewer than 30 patients in the analysis sample, or the hospital closed or changed ownership, during the year.

[7] If mortality were reported throughout greater LA, the numbers of hospitals and patients in our benchmark analysis would increase from 117 to 130 and from 8,721 to 9,077, respectively. The number of patients averaged 74.5 at hospitals for which pneumonia mortality was reported, versus 27.4 at hospitals whose mortality was not reported.

2.3 Empirical specification

In analyzing the role of amenities in hospital demand, we estimate a mixed-logit model of hospital choice by maximum simulated likelihood. To do so, we use discharge abstracts for California hospital patients compiled by the California Office of Statewide Health Planning and Development. For each hospital stay, these abstracts identify the hospital from which a patient is discharged. In addition, they report a variety of patient characteristics, including principal diagnosis and other medical conditions; payer; age, gender and race; residential zip code; and source of admission (e.g., from home).

In the benchmark analysis, we consider Medicare fee-for-service pneumonia patients discharged from general acute-care hospitals in greater Los Angeles in 2002. Los Angeles hospitals have been widely studied [Luft et al. (1990); Gowrisankaran and Town (1999); Town and Vistnes (2001); Geweke et al. (2003); Tay (2003); Romley and Goldman (2008)]. In addition, as discussed in the preceding section, risk-adjusted pneumonia mortality rates are widely available for LA hospitals during this time frame.

The benchmark sample includes 8,721 patients who resided in metropolitan LA's five counties and were admitted with a principal diagnosis of pneumonia to one of the 50 hospitals nearest their homes [Tay (2003)].[8] A small number of patients chose more distant hospitals, yet this restriction on the choice set facilitates estimation of the choice model. Only 44.4% of our patients chose the nearest hospital, consistent with a willingness to travel for better clinical quality or amenities.

The sample also excludes patients whose age, gender or race was masked for privacy reasons; patients whose reported zip code could not be matched to a zip-code database are likewise excluded [ESRI (2001)]. In addition, we exclude patients who were not admitted from home, because choice in other settings (such as nursing homes) may have been influenced by unobserved factors [Geweke et al. (2003)]. Patients who were less than 65 years old are also excluded. Finally, we exclude patients whose nearest hospital did not belong to the greater Los Angeles market. Summary statistics for this patient sample are reported in the appendix.

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[8] The 50 hospitals closest to each patient includes any facilities whose clinical quality was not available, that is, hospitals that are themselves excluded from the choice analysis.

The ICD-9-CM code for a pneumonia patient begins with the numbers *481*, *482*, *485*, *486* or *4838*. The ICD code of heart-attack patients (whom we consider in an alternative analysis) begins with *410*.

These patients chose from 117 hospitals for which the benchmark measures of clinical quality and amenities in the preceding section were available (see Appendix Table A3). Our definition of the greater LA market excludes hospitals in the Ventura and Palm Springs Hospital Referral Regions [Dartmouth Medical School, The Center for the Evaluative Clinical Sciences (1998)], as well as some remote hospitals. In an earlier study, we found that the excluded hospitals did not compete with hospitals in our market [deleted for anonymity]. Kaiser Permanente hospitals have also been excluded, because these facilities did not regularly admit Medicare fee-for-service patients.

Under the model presented in section 2.1, the likelihood that a patient chooses a hospital is equal to the likelihood that a hospital maximizes her utility in equation 1. We assume that idiosyncratic tastes for hospitals are distributed i.i.d. type-1 extreme-valued and that all potential patients elect to receive care at some hospital. Then, conditional on systematic utility $\overline{U}_{ih}$, the choice likelihood takes the logit form [McFadden (1974)]:

$$e^{\overline{U}_{ih}} \Big/ \sum_{h'} e^{\overline{U}_{ih'}}, \tag{4}$$

Systematic utility in equation 3 simplifies as:

$$\overline{U}_{ih} = \beta_{d,i} Distance_{ih} + \beta_{c,i} Clinical\ quality_h + \beta_{a,i} Amenities_h + \xi_h \tag{5}$$

Hospital prices can be excluded from systematic utility because Medicare insures fee-for-service beneficiaries for almost all of the costs of inpatient care [Tay (2003)]. This feature of the analysis is convenient. Researchers generally cannot observe hospital prices (as opposed to unadjusted charges.) Furthermore, under plausible models of oligopolistic competition, a hospital's price is correlated with the unobserved characteristic ξ_h, so that an instrument would be needed for price [Berry et al. (1995)]. Under our approach, amenities are valued in utils, and their value may be compared to the value of clinical quality (or proximity to home.)

For the distance between a patient's home and a hospital, we calculated straight-line distances between hospital street addresses and the centroids of patient zip codes.[9] Our measures of clinical quality and amenities were

[9] The latitudes and longitudes of zip centroids in the year 2000 were obtained from a commercial GIS database [ESRI (2001)]. Hospital geocoordinates were reported in a 2006 regulatory database [California Office of Statewide Health Planning and Development (2006)]. We used an online geocoding tool to determine the locations of hospitals that

described in the preceding section. We use the negative of the pneumonia mortality rate, because higher clinical quality corresponds to lower mortality.

We allow for heterogeneity in patient tastes for clinical quality, amenities and distance as follows:

$$\beta_{x,i} = \beta_x^0 + \beta_{j,75+\ years} 75+\ years_i + \beta_{j,Female} Female_i + \beta_{j,Black} Black_i + \beta_x^{CDI} CDI_i + \beta_x^{Income} Income_i + \beta_x^{\upsilon} \upsilon_i^x,\ x = c, a, d \tag{6a}$$

in which the variable $75 + years_i$ equals one if a patient is at least 75 years old in the discharge abstract and zero otherwise, and $Female_i$ and $Black_i$. The Charlson-Deyo index CDI_i measures poor health based on other medical conditions reported in the discharge abstract [Quan et al. (2005)]. Household income is estimated from Census data on a patient's zip code, following Geweke et al. (2003).[10] Age, gender, race, health and income have been found to be related to hospital choice in prior research [see, e.g., Gaynor and Vogt (2003) and Tay (2003)]. Finally, υ_i^x is a random component of the taste for x that we as researchers do not observe.

The empirical analysis proceeds in two stages. These stages correspond to the following restatement of equation 5:

$$\overline{U}_{ih} = \beta_{d,i} Distance_{ih} + \left(\beta_{c,i} - \overline{\beta}_c\right) Clinical\ quality_h + \left(\beta_{a,i} - \overline{\beta}_a\right) Amenities_h + \delta_h, \tag{7a}$$

$$\delta_h = \overline{\beta}_c Clinical\ quality_h + \overline{\beta}_a Amenities_h + \xi_h \tag{7b}$$

in which $\overline{\beta}_x$ denotes the mean taste for hospital characteristic x in the patient sample. Hospital-specific δ_h parameters embody the mean valuations of each hospital's clinical quality and amenities, as well as the unobserved characteristic ξ_h.

ceased operation after 2002; see http://geocoder.us/.

[10] We first match the five-digit zip code of a patient's home to the five-digit Zip Code Tabulation Area (ZCTA) defined by the Census to approximate U.S. Postal Service zip codes. Where there is no match, we match the patient to the ZCTA whose centroid is nearest to the centroid of her USPS zip code. We then estimate average income among black and non-black households headed by persons aged 65-74 and 75 or older within the ZCTA. The Census reports the number of households within income intervals (e.g., $35,000 to $39,999), and we use the midpoint of each bounded interval (and a value of $280,000 for the unbounded highest-income interval) to compute an average. When there are no black households within a ZCTA, we use average income among all racial groups.

In the first stage, we estimate the parameters of the choice model, namely, the hospital-specific δ_h parameters in equation 7a together with the taste parameters of equation 6a.[11] To do so, we de-mean the patient characteristics in equation 6a and interact them with distance, clinical quality and amenities. The parameters on these interactions then indicate deviations from mean tastes according to patient characteristics.[12]

The choice likelihood in equation 4 is conditional on systematic utility, which is random due to the random components of tastes in equation 6a. The unconditional likelihood that a patient is observed to choose a hospital in equation 2 is therefore:

$$l_{ih} = \int \left(\frac{e^{\overline{U}_{ih}}}{\sum_{h'} e^{\overline{U}_{ih'}}} \right) f\left(\boldsymbol{\nu}_i\right) \boldsymbol{d\nu}_i, \tag{8}$$

where $f\left(\boldsymbol{\nu}_i\right)$ is the joint density of the random tastes. This model of hospital choice belongs to the mixed-logit class, which can approximate any random utility model to any degree of accuracy [McFadden and Train (2000)]. Mixed-logit models do not exhibit independence of irrelevant alternatives or the restrictive substitution patterns of the logit [Train (2003)].

The parameters of our model are estimated by maximum simulated likelihood [Hajivassiliou and Ruud (1994)]. We assume that $f\left(\boldsymbol{\nu}_i\right)$ is multivariate standard normal; the parameter β_x^v in equation 6a is therefore the standard deviation of the random taste for x. The likelihood that each patient chose the observed hospital is then simulated by taking repeated draws on random tastes and averaging over the resulting likelihoods for each of the draws. We use 50 shuffled Halton draws (based on primes of 2, 3 and 5 and a burn-in of 30 draws) throughout the analyses; our benchmark results were very similar with 100 draws. In simulating a mixed-logit model, Halton draws can be more accurate than a larger number of pseudorandom draws [Bhat (2001)]. Hess and Polak (2003) describe the construction of shuffled draws and find that such draws outperform standard (as well as scrambled) Halton draws; Chiou and Walker (2007) show that shuffled draws may be relatively effective in revealing a lack of identification in mixed-logit models.

[11] A normalization on δ_h is required. We set $\delta_h = 0$ for Cedars-Sinai Medical Center.

[12] When patient characteristics are demeaned, the constant in our specification of the taste for distance is equal to the mean distaste for distance in the sample. That is, $\beta_{d,0} = \overline{\beta}_d$.

The choice analysis cannot separately identify the components of δ_h. In the second stage, we determine the mean valuations of clinical quality and amenities. To do so, we regress equation 7b using estimates of δ_h from the first-stage choice analysis. Prior research has applied generalized least squares based on the estimated variance-covariance of the δ_hs in the first stage[13], as well as ordinary least squares [Nevo (2001); Gaynor and Vogt (2003)]. We take both approaches.

The second-stage analysis delivers unbiased estimates of $\overline{\beta}_c$ and $\overline{\beta}_a$ if clinical quality and amenities are uncorrelated with the unobserved product characteristic ξ_h. This kind of assumption has been widely maintained in empirical studies of differentiated-products demand. In the hospital setting, there is evidence of a "volume-outcome relationship" in which adverse health outcomes such as mortality are less common at hospitals with high patient volume [Luft et al. (1987)]. One explanation for such a relationship is that patients prefer hospitals with high clinical quality, i.e., $\overline{\beta}_c > 0$. An alternative explanation is that "practice makes perfect." Under this explanation, clinical quality is positively correlated with ξ_h, if patients choose hospitals based on characteristics that researchers do not observe. Estimates of the mean valuation of clinical quality could then be biased upward. In the case of pneumonia, however, the evidence for a volume-outcome relationship is weak at best [Lindenauer et al. (2006)].[14]

[13] We use the generalized inverse of the variance-covariance matrix, because the regression includes a δ_h that is normalized to zero and thus non-stochastic.

[14] Recent studies that have carefully assessed the direction of causality between volumes and outcomes suggest that practice sometimes does make perfect, for instance, in the performance of coronary bypass surgery [Gaynor et al. (2005); Gowrisankaran et al. (2006)].

3 Findings[15]

In this section, we first present our findings on the role of amenities in patient utility. We then describe our findings on the role of amenities in hospital demand. We also considered clinical quality as a basis of comparison. In doing so, we analyzed one-standard-deviation increases in clinical quality and amenities. Elasticities would often be undefined, because the measure of hospital amenities is frequently zero. In addition, standardization is useful because the variability of these dimensions of quality differs.

3.1 Amenities and patient utility

Table 2 summarizes the value of improvements in hospital amenities and clinical quality for the benchmark analysis of Medicare pneumonia patients described in section 2. The benchmark results are reported in full in Appendix Tables A5 and A6; sensitivity analyses (e.g., for alternative measures of clinical quality) are presented in a subsequent section.

The mean valuations of one-standard-deviation increase in hospital amenities and clinical quality are +0.486 and +0.173 utils, respectively, when equation 7b is estimated by OLS. Both values are statistically distinguishable from zero at a 10% level, and so is the difference between them. A patient with mean tastes would be willing to travel 0.55 for increased amenities and .20 miles for clinical quality; Tay (2003) found that heart-attack patients will travel 1.22 miles for cardiac catheterization. Under GLS, the mean valuation of a standardized improvement in clinical quality can no longer be distinguished from zero, while the value of amenities increases to +0.714. The OLS specification is more conservative in quantifying the impact of amenities on demand, and we use it in the remaining analyses.

This evidence that amenities are valued more highly than clinical quality is surprising insofar as mortality would seem to be of paramount concern to most patients. Our analysis may understate the value of clinical quality.

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[15] **Some of the findings presented here differ slightly from those reported in deleted for anonymity. For example, the mean impact of improved amenities on a hospital's demand has increased from 38.4% to 38.5%. In refining our analysis, we discovered that the Stata mdraws procedure does not replicate draws exactly even when the random seed is fixed. We have raised this issue with the procedure's creators and preserved the sets of random draws that underly our refined analyses.**

As noted in section 2.2, mortality rates proxy for patient information about clinical quality, which may be limited. In addition, patients may recognize that quality information is subject to sampling variability and discount apparent differences. Finally, there is evidence that people systematically overstate low-probability mortality risks while understating high-probability risks [Lichtenstein et al. (1978)]. Pneumonia mortality averaged 12.5% at the hospitals studied. Patients may underestimate the average level of pneumonia mortality and, moreover, may "under-react" to differences across hospitals. Our analysis is informative about the role that clinical quality has played in hospital choice, insofar as mortality rates and the alternative measures considered below are good proxies for patient information about clinical quality. In any event, patients do appear to value amenities.

The value of quality improvement varies across patients, as shown in Table 3. When the index of poor health increases by a standard deviation from its mean level, the value of a standardized increase in clinical quality increases by nearly half.[16] In addition, African Americans value clinical quality less highly than others. Indeed, for African Americans with average health status, etc., the estimated value is negative, though imprecise.[17] Our choice model also allows for randomness in tastes. There is substantial variation in unobserved tastes for clinical quality. None of the other relationships between patient characteristics and the two dimensions of hospital quality is statistically significant at a 10% level.

Alternative specifications We first considered alternative measures of clinical quality, as shown in Table 4. When we used mortality rates

[16] $(0.263 - 0.173)/0.173 = 51.9\%$.

[17] $-0.133 = \sigma_c \left[\overline{\beta_c} + \left(1 - \pi^{Black}\right) \beta_c^{Black}\right]$, in which σ_c is the standard deviation of clinical quality at hospitals and π^{Black} is the proportion of blacks in the patient sample.

This statistic depends on parameters from both stages of the analysis, and its estimate includes sampling variability from each stage [Murphy and Topel (1985)]. Valid standard errors were obtained by bootstrapping as follows: We used the estimated asymptotic distribution of the parameters of the first-stage choice analysis to take 1000 draws of these parameters. For each draw, we sampled the hospital δs with replacement and estimated the mean values of hospital characteristics in the second stage. The joint variance-covariance matrix of the first- and second-stage parameters was then estimated by the empirical variance-covariance of the bootstrapped sample of parameter estimates. Finally, we computed standard errors for the statistics of interest according to the delta method. We thank Dan Ackerberg for suggesting this approach.

for 2002 only, the mean value of clinical quality attenuated toward zero. The value was also indistinguishable from zero when clinical quality was measured based on latest technology / equipment and best doctors in the HCMG survey, as well as by teaching status.[18] Thus, our benchmark analysis makes the strongest case for a role for clinical quality. Across the alternative quality measures, the value of amenities is similar to the benchmark estimate.

While we have argued that hospitals are differentiated in clinical quality and amenities, our amenities measure could be proxying for some other hospital attribute. News media or paid advertising may influence a hospital's overall image or reputation. We therefore included hospital reputation from the HCMG survey as an additional attribute in the benchmark analysis. As Table 5 shows, the estimated value of amenities increases, while the mean value of reputation is indistinguishable from zero.

Finally, we compared pneumonia patients to heart-attack patients, as shown in Table 6. We first measured the clinical quality of hospitals by risk-adjusted mortality for coronary bypass artery graft surgery, obtained from the California Office of Statewide Health Planning and Development. The mean value of clinical quality was indistinguishable from zero, perhaps because this measure was available for only 35 hospitals in the benchmark sample.

We therefore measured clinical quality for heart-attack care based on pneumonia mortality. The value of clinical quality to heart-attack patients is estimated to be nearly twice as large as among pneumonia patients: 0.337 vs. 0.173 at the mean. Heart-attack patients also value amenities; indeed, the estimated value is higher than for pneumonia patients. Nevertheless, the marginal rate of substitution of clinical quality for amenities is estimated to be nearly forty percent lower for heart-attack patients (1.70 vs. 2.81), consistent with the notion that more acutely ill patients should value clinical quality more highly in relation to amenities.

We also considered latest / technology equipment in the HCMG survey, as well as the availability of cardiac catheterization.[19] Under the former

[18]Summary statistics for these measures are reported in Appendix Table A2.

Teaching status is defined as membership in the Council of Teaching Hospitals or the presence of a residency training program approved by the American Council for Graduate Medical Education, as reported in the American Hospital Association's 2002 Survey. We used information from surveys in 2000 and 2004 for two hospitals whose status was not reported in 2002.

[19]Catheterization availability was obtained from financial reports that hospitals submit

measure, the mean value of clinical quality is again indistinguishable from zero. Under the latter measure, the value was substantial, as Tay (2003) found. Indeed, the value of cardiac catheterization exceeds the value of amenities. Even so, heart-attack patients value amenities nearly as much as pneumonia patients do.

3.2 Amenities and hospital demand

We used the results of the benchmark choice analysis to assess the role of amenities in hospital demand. To do so, we aggregated the predicted likelihoods of patient-level hospital choices up to expected hospital-level demand. We first determined the impact of a standardized increase in each hospital's amenities on its own demands and that of its competitors. This counterfactual holds fixed the locations of patients and hospitals and their other characteristics, including the amenities of competitors as well as the clinical quality of all hospitals.[20] Table 7 summarizes the results.

When amenities increase by one standard deviation, a hospital's demand among the pneumonia patients studied increases by nearly 38.5% on average in greater LA. By comparison, Tay (2003) found that availability of cardiac catheterization increases demand among heart-attack patients by 70.8% on average. Increased amenities decrease demand at competing hospitals: 8.4% on average at facilities located within 2 miles, 5.2% at facilities that are 2-5 miles distant, 1.6% at facilities that are 5-10 miles distant, and 0.03% at facilities more than 10 miles away. The impact is smaller at more distant hospitals because patients strongly prefer hospitals close to home, so that hospitals tend to compete more intensely with their geographic neighbors.

We also determined the impact of standardized increases in clinical qual-

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annually to OSHPD. These reports generally correspond to fiscal years ending in June. We use 2001-2002 reports. The availability of catheterization changed between 2001-2002 and 2002-2003 at only 3 hospitals.

[20] Our analysis understates the impact of amenities. When more patients name a hospital as their top choice for amenities, other hospitals must be named by fewer patients. Ideally, our amenities measure would decrease at other hospitals according to the number of patients who no longer prefer it. That information is unknown, and so our amenities measure is held fixed at other hospitals. In principle, hospital amenity levels might be inferred from the HCMG survey. Under our simpler approach, the role of amenities would be understated modestly if patients changed their preference from hospitals throughout the market.

ity. A hospital's own demand increases by 12.7% on average. The estimated impact of increased clinical quality is smaller than the impact of increased amenities, much as we found in the preceding section that pneumonia patients value lower reported mortality rates less than improved amenities. The impact on the demand for competitors again decreases with distance, from 2.7% on average at facilities within 2 miles to only 0.01% at facilities farther than 10 miles.

4 Conclusions

This study has assessed the role that amenities play in hospital demand. Analyzing the hospital choices of Medicare pneumonia patients in greater Los Angeles, we found that the mean value of amenities (as measured by a market survey) is positive and substantial. A one-standard-deviation increase in a hospital's amenities increases its demand among the patients studied by 38.5% at the average hospital. A standardized improvement in pneumonia mortality increases a hospital's demand by only 12.7% on average; the impact of clinical quality is even smaller under alternative measures. These findings indicate that hospitals may have an incentive to compete in amenities, with potentially important implications for welfare.

The welfare consequences of competition among hospitals in clinical quality have been widely studied [see, e.g., Robinson and Luft (1985) or Kessler and McClellan (2000)]. These analyses were motivated in part by a concern that limited price competition under fee-for-service reimbursement could lead to a wasteful "arms race" in medical services, with more intense competition resulting in greater waste. As managed care has grown in importance, there is evidence that hospital demand is responsive to price. For example, Gaynor and Vogt (2003) found that the elasticity of demand averaged 4.85 at California hospitals in the mid-'90s. This result is consistent with positive price-cost margins.

Imperfect competition in amenities need not result in a welfare-maximizing equilibrium. Consider a hospital's incentives to deviate from the social optimum in its provision of amenities. On the one hand, we have found that increased amenities steal business and thus net income from competing hospitals. A hospital ignores this impact on the welfare of competitors and may therefore provide too many amenities. On the other hand, a hospital may be unable to appropriate the full value of improved amenities to patients, potentially resulting in too few amenities. A hospital supplies the optimal level of amenities only if these offsetting incentives cancel. Similar reasoning applies to the supply of clinical quality.

These observations are of considerable relevance to public policy. Under Medicare's prospective payment system, reimbursement for medical services and amenities are bundled. Such reimbursement is neutral with respect to the potential trade-off between the supply of clinical quality and amenities, and the incentive to supply each turns on their benefits and costs to hospitals. As the Centers for Medicare and Medicaid Services increasingly pursue "value-based purchasing" [U.S. Department of Health and Human Services (2007)], the societal benefits and costs of amenities and clinical quality, and the provision of each in market equilibrium, become all the more important. These are worthwhile directions for future research.

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Table 1: Summary Statistics for Hospitals					
Variable	*Mean*	*Std. Dev.*	*Min.*	*Max.*	*N*
"Best amenities" in 2002 Health Care Market Guide Survey (percent)	0.7	1.8	0.0	16.1	117
30-day risk-adjusted mortality rate for community-acquired pneumonia, 2000-2004 (percent)	12.5	2.6	6.6	19.6	
Number of patients	74.5	59.2	2	365	

Notes: Statistics correspond to benchmark analysis of Medicare fee-for-service pneumonia patients age 65 and older in metro LA in 2002. See Table A1 for definition of best amenities.

Table 2: Mean Valuation of Standardized Increases in Hospital Amenities and Clinical Quality		
Specification	Mean valuation (Standard error)	
	Amenities	*Clinical quality*
Ordinary least squares (OLS)	0.486*** (0.188)	0.173* (0.104)
Generalized least squares (GLS)	0.714*** (0.036)	0.154 (0.199)

Notes: OLS standard errors are robust to heteroscedasticity of unknown form; Breusch-Pagan test of homoscedasticity was rejected. GLS uses generalized inverse of estimated variance-covariance matrix of hospital δs from first-stage choice analysis; δ is non-stochastic for hospital whose δ is normalized to zero. Benchmark measures of amenities and clinical quality are described in Table 1. Increases are equal in magnitude to standard deviations reported there. Mean valuation is with respect to the characteristics of the benchmark sample of patients reported in Table A4. * denotes statistical significance at the 10% level, ** at 5%, and *** at 1%.

Table 3: Mean Valuation of Increases in Amenities and Clinical Quality, By Patient Characteristics		
Patient characteristic	Amenities	Clinical quality
Age		
65-74	0.473 (0.377)	0.245 (0.202)
75+	0.491 (0.368)	0.150 (0.197)
Gender		
Male	0.494 (0.374)	0.188 (0.200)
Female	0.480 (0.368)	0.163 (0.196)
Race		
Non-black	0.485 (0.367)	0.196 (0.196)
Black	0.501 (0.399)	-0.133^^ (0.231)
Income		
Mean level	0.486 (0.188)	0.173 (0.104)
Mean level +1 standard deviation	0.519 (0.368)	0.192 (0.202)
Charlson-Deyo index of poor health		
Mean level	0.486 (0.188)	0.173 (0.104)
Mean level +1 standard deviation	0.480 (0.368)	0.263^^^ (0.199)
Unobserved taste		
Mean level	0.486 (0.188)	0.173 (0.104)
Mean level +1 standard deviation	0.546 (0.369)	0.254^^^ (0.197)

Notes: When contrasting preferences based on a patient characteristic, all other characteristics are fixed at their mean levels in the patient sample. Standard errors appear in parentheses and were bootstrapped as described in section 3.1.
^ denotes statistically significant difference in value of amenities or clinical quality by patient characteristic at the 10% level, ^ at 5%, and ^^^ at 1%. These contrasts contain sampling variability only from the first-stage choice analysis, so the standard errors reported in Table A5 are used for these tests.
Increases in amenities and clinical quality are equal in magnitude to standard deviations reported in Table 1. Mean level of value for each characteristic is with respect to the mean characteristics of the benchmark sample of patients described in Table A4; standard deviations of income and the health index are also described there.

Table 4: Mean Valuation of Increases in Amenites and Clinical Quality, by Alternative Measures of Clinical Quality

Specification	Mean valuation (Standard error)	
	Amenities	*Clinical quality*
Benchmark analysis based on pneumonia mortality over 2000-2004	0.486*** (0.188)	0.173* (0.104)
Clinical quality measured by		
Pneumonia mortality in 2002 only	0.477*** (0.110)	0.064 (0.111)
First choice for "latest technology / equipment" in HCMG survey	0.662* (0.350)	-0.209 (0.202)
First choice for "best doctors" in HCMG survey	0.529 (0.402)	-0.038 (0.245)
Teaching hospital	0.546*** (0.203)	-0.325 (0.310)

Notes: Reported results are for OLS decomposition of hospital δs. Mean valuation is with respect to the mean characteristics of the benchmark sample of patients reported in Table A4. Increase in amenities is equal to standard deviation in benchmark sample reported in Table 1. Increases in other characteristics are equal in magnitude to one for dichotomous hospital characteristics and to standard deviations of continuous characteristics as reported in Table A2. * denotes statistical significance at the 10% level, ** at 5%, and *** at 1%. Standard errors are heteroscedasticity-robust where homoscedasticity could be rejected.

Table 5: Mean Valuation Accounting for Hospital Reputation

Specification	Mean valuation (Standard error)		
	Amenities	*Clinical quality*	*Best reputation*
Benchmark analysis	0.486*** (0.188)	0.173* (0.104)	—
First choice for "best image / reputation" in HCMG survey included as an additional hospital characteristic	1.344* (0.692)	0.194* (0.105)	-0.875 (0.602)

Notes: Reported results are for OLS decomposition of hospital δs. Mean valuation is with respect to the mean characteristics of the benchmark sample of patients reported in Table A4. Increase in amenities is equal to standard deviation in benchmark sample reported in Table 1. Increases in other characteristics are equal in magnitude to one for dichotomous hospital characteristics and to standard deviations of continuous characteristics as reported in Table A2. * denotes statistical significance at the 10% level, ** at 5%, and *** at 1%. Standard errors are heteroscedasticity-robust where homoscedasticity could be rejected.

Table 6: Mean Valuation, Pneumonia Versus Heart-Attack Patients

Specification	Mean valuation (Standard error)	
	Amenities	*Clinical quality*
Benchmark analysis of pneumonia patients	0.486*** (0.188)	0.173* (0.104)
Heart-attack patients, with clinical quality measured by		
Coronary artery bypass graft mortality over 2000-2004	0.760*** (0.458)	-0.207 (0.345)
Pneumonia mortality over 2000-2004	0.571*** (0.145)	0.337*** (0.147)
First choice for "latest technology / equipment" in HCMG survey	0.428* (0.143)	0.003 (0.239)
Availability of cardiac catheterization	0.395*** (0.148)	1.376*** (0.296)

Notes: Reported results are for OLS decomposition of hospital δs. Mean valuation for heart-attack patients is with respect to the mean characteristics of these patients at benchmark sample of hospitals. Increase in amenities is equal to standard deviation in benchmark sample reported in Table 1. Increases in other characteristics are equal in magnitude to one for dichotomous hospital characteristics and to standard deviations of continuous characteristics as reported in Table A2. * denotes statistical significance at the 10% level, ** at 5%, and *** at 1%. Standard errors are heteroscedasticity-robust where homoscedasticity could be rejected.

Table 7: Impact of Standardized Increases in Hospital Amenities and Clinical Quality on Demand

Average percentage change in number of patients at	*Standardized increase in*	
	Amenities	Clinical quality
Own hospital	+38.5%	+12.7%
Other hospitals within 2 miles	-8.4%	-2.7%
Other hospitals within 2-5 miles	-5.2%	-1.8%
Other hospitals within 5-10 miles	-1.6%	-0.5%
Other hospitals at 10+ miles	-0.03%	-0.01%

Appendix

Not for Publication

Table A1:
2002 Healthcare Market Guide Survey, Question 5

5.	**What is your first choice hospital/facility for…?**	**Name**
	a. Best doctors	________________________
	b. Best nurses	________________________
	c. Best image/reputation	________________________
	d. Most personalized care	________________________
	e. Best overall quality	________________________
	f. All your household's health care needs	________________________
	g. Best at providing community health programs	________________________
	h. Providing care to those unable to pay	________________________
	i. Latest technology and equipment	________________________
	j. Widest range of services	________________________
	k. Academic or research facility	________________________
	l. Best accommodations/amenities	________________________
	m. Hospital most conveniently located to you	________________________
	n. Hospital/facility web site used most often	________________________
	o. The hospital advertising that comes to mind first	________________________

Source: National Research Corporation

Table A2: Summary Statistics for Alternative Measure of Clinical Quality at Hospitals					
Variable	*Mean*	*Std. Dev.*	*Min.*	*Max.*	*N*
Pneumonia mortality in 2002 only (percent)	12.2	3.6	0.0	21.4	114
First choice for "latest technology / equipment" in HCMG survey (percent)	0.7	2.2	0.0	17.4	117
First choice for "best doctors" in HCMG survey (percent)	0.7	1.8	0.0	12.7	117
Teaching hospital	0.197	0.399	0	1	117
Coronary artery bypass graft mortality over 2000-2004 in hospital, risk-adjusted (percent)	0.9	0.4	0.1	2.2	35
Availability of cardiac catheterization	0.500	0.502	0	1	116

Table A3: Benchmark Sample of Hospitals			
Hospital	*OSHPD ID*	*Clinical quaity*	*No. of patients*
Alhambra Hospital	190017	10.66	122
Anaheim General Hospitals	301097	19.62	39
Anaheim Memorial Medical Centers	301098	13.72	100
Arrowhead Regional Medical Center	364231	15.88	40
Bellflower Medical Center	190066	11.08	43
Beverly Hospital	190081	10.64	198
Brea Community Hospital	301126	13.66	8
Brotman Medical Center	190110	12.42	75
California Hospital Medical Center - Los Angeles	190125	13.12	37
Cedars Sinai Medical Center	190555	9.86	365
Centinela Hospital Medical Center	190148	12.52	122
Century City Hospital	190155	9.72	55
Chapman Medical Center	301140	14.84	13
Chino Valley Medical Center	361144	12.30	75
Citrus Valley Medical Center - Ic Campus	190413	11.58	111
Citrus Valley Medical Center - Qv Campus	190636	10.38	96
City Of Angels Medical Center-Downtown Campus	190661	14.67	6
City Of Hope National Medical Center	190176	12.55	2
Coast Plaza Doctors Hospital	190766	17.88	39
Coastal Communities Hospital	301258	16.52	33
Community & Mission Hosps Of Hntg Pk	190197	7.94	24
Community Hospital Of Gardena	190196	14.44	48
Community Hospital Of Long Beach	190475	15.10	31
Community Hospital Of San Bernardino	361323	13.08	55
Corona Regional Medical Centers	331152	15.36	114
Doctors' Hospital Medical Center Of Montclair	361166	12.08	57
Downey Regional Medical Center	190243	12.98	105
East Los Angeles Doctors Hospital	190256	7.84	69
East Valley Hospital Medical Center	190328	13.58	22
Encino-Tarzana Regional Med Ctr-Encino	190280	12.16	113
Encino-Tarzana Regional Med Ctr-Tarzana	190517	10.52	133
Foothill Presbyterian Hospital-Johnston Memorial	190298	12.86	57
Fountain Valley Rgnl Hosps & Med Ctrs	301175	10.90	64
Garden Grove Hospital & Medical Center	301283	16.10	55
Garfield Medical Center	190315	8.80	141
Glendale Adventist Medical Center - Wilson Terrace	190323	11.56	127
Glendale Memorial Hospital & Health Center	190522	10.74	114
Good Samaritan Hospital-Los Angeles	190392	11.06	114
Granada Hills Community Hospital	190348	7.85	57
Greater El Monte Community Hospital	190352	10.94	34
Henry Mayo Newhall Memorial Hospital	190949	10.70	78
Hoag Memorial Hospital Presbyterian	301205	11.24	309
Hollywood Community Hospital Of Hollywood	190380	9.30	4
Huntington Beach Hospital	301209	13.60	81
Huntington Memorial Hospital	190400	11.92	177
Irvine Regional Hospital And Medical Center	304045	9.20	64
La Palma Intercommunity Hospital	301234	12.28	28
Lakewood Regional Medical Center	190240	14.28	32
Little Company Of Mary Hospital	190470	12.52	139
Loma Linda University Medical Centers	361246	13.16	73
Long Beach Memorial Medical Center	190525	14.70	122
Los Alamitos Medical Center	301248	13.80	100
Los Angeles Co Harbor-Ucla Medical Center	191227	16.20	22
Los Angeles Co Martin Luther King Jr/Drew Med Ctr	191230	11.30	43
Los Angeles Co Usc Medical Center	191228	11.40	12
Los Angeles Community Hospital	190198	9.82	15
Los Angeles County Olive View-Ucla Medical Center	191231	10.48	18
Los Angeles Metropolitan Medical Centers	190854	12.10	17
Memorial Hospital Of Gardena	190521	13.30	68

Methodist Hospital Of Southern California	190529	13.38	210
Midway Hospital Medical Center	190534	14.76	78
Mission Community Hospitals	190524	10.38	52
Mission Hospital Regional Medical Center	301262	11.24	117
Monrovia Community Hospital	190541	11.30	30
Monterey Park Hospital	190547	9.06	41
Moreno Valley Community Hospital	334048	10.44	67
Motion Picture & Television Hospital	190552	6.57	16
Northridge Hospital Medical Center	190568	9.72	68
Northridge Hospital Medical Center - Sherman Way	190810	11.32	53
Norwalk Community Hospital	190570	15.32	15
Orange Coast Memorial Medical Center	300225	13.00	52
Pacific Alliance Medical Center, Inc.	190307	10.98	64
Pacific Hospitals Of Long Beach	190587	10.84	69
Pacifica Hospital Of The Valley	190696	15.06	16
Parkview Community Hospital Medical Center	331293	18.74	50
Placentia Linda Hospital	301297	18.46	23
Pomona Valley Hospital Medical Center	190630	11.90	94
Presbyterian Intercommunity Hospital	190631	11.50	137
Providence Holy Cross Medical Center	190385	10.20	68
Providence Saint Joseph Medical Center	190758	11.62	151
Queen Of Angels/Hollywood Presbyterian Med Center	190382	11.00	110
Redlands Community Hospital	361308	16.92	73
Riverside Community Hospital	331312	15.58	134
Riverside County Regional Medical Center	334487	18.00	16
Robert F. Kennedy Medical Center	190366	13.36	54
Saddleback Memorial Medical Center	301317	15.42	204
San Antonio Community Hospital	361318	12.02	146
San Dimas Community Hospital	190673	15.28	37
San Gabriel Valley Medical Center	190200	11.88	106
Santa Ana Hospital Medical Center Inc	301314	10.40	7
Santa Monica - Ucla Medical Center	190687	10.96	77
Santa Teresita Hospital	190691	17.45	19
Sherman Oaks Hospital And Health Center	190708	11.34	105
South Coast Medical Center	301337	10.44	30
St. Bernardine Medical Center	361339	17.06	74
St. Francis Medical Center	190754	14.00	101
St. John'S Hospital & Health Center	190756	9.76	123
St. Joseph Hospital - Orange	301340	13.96	122
St. Jude Medical Center	301342	13.10	122
St. Luke Medical Center	190759	12.15	4
St. Mary Medical Center	190053	14.02	74
St. Vincent Medical Center	190762	8.42	98
Temple Community Hospital	190784	8.33	11
Torrance Memorial Medical Center	190422	15.02	166
Tri-City Regional Medical Center	190159	10.63	5
Ucla Medical Center	190796	9.50	135
University Of California Irvine Medical Center	301279	8.52	31
Usc University Hospitals	194219	12.15	4
Valley Plaza Doctors Hospital	332172	14.38	8
Valley Presbyterian Hospital	190812	14.38	104
Verdugo Hills Hospital	190818	13.96	72
West Anaheim Medical Center	301379	13.36	94
West Hills Hospital & Medical Center	190859	10.72	95
Western Medical Center - Santa Ana	301566	15.78	37
Western Medical Center Hospital - Anaheim	301188	16.14	21
White Memorial Medical Center	190878	8.88	75
Whittier Hospital Medical Center	190883	13.52	41

Notes: Table lists all hospitals in greater LA for which clinical quality is available. Benchmark measure of clinical quality is described in Table 1. Hospital-level amenities measure cannot be disclosed per agreement with National Research Corporation. Number of patients corresponds to benchmark analysis of Medicare fee-for-service pneumonia patients age 65 and older in metro LA in 2002. OSHPD ID is the hospital identifier used by the California Office of Statewide Health Planning and Development.

Table A4: Summary Statistics for Patients					
Variable	*Mean*	*Std. Dev.*	*Min.*	*Max.*	*N*
75+ years old	0.752	—	0	1	8721
Female	0.579	—	0	1	
Black	0.067	—	0	1	
Income (thousands of dollars)	44.0	17.5	5.0	155.7	
Charlson-Deyo index of poor health	2.1	1.8	0	15	
Distance between home and chosen hospital (miles)	3.2	2.7	0.01	26.8	

Notes: Statistics correspond to benchmark analysis of Medicare fee-for-service pneumonia patients age 65 and older in metro LA in 2002.

Table A5: Hospital Choice Analysis	
Parameter (Standard Error)	
Distance, in miles	-0.875*** (0.082)
Distance*75+ years old	-0.023 (0.038)
Distance*Female	0.041 (0.034)
Distance*Black	-0.067 (0.092)
Distance*Income ($000)	0.002** (0.001)
Distance*Charlson-Deyo index	0.004 (0.010)
Distance*Unobserved taste for distance	0.251*** (0.014)
Clinical quality*75+ years old	-0.036 (0.024)
Clinical quality*Female	-0.009 (0.020)
Clinical quality*Black	-0.126** (0.049)
Clinical quality*Income ($000)	0.000 (0.001)
Clinical quality*Charlson-Deyo index	0.019*** (0.006)
Clinical quality*Unobserved taste for clinical quality	0.031*** (0.007)
Amenities*75+ years old	0.010 (0.064)
Amenities*Female	-0.008 (0.053)
Amenities*Black	0.008 (0.086)
Amenities*Income ($000)	0.001 (0.001)
Amenities*Charlson-Deyo index	-0.002 (0.013)
Amenities*Unobserved taste for amenities	0.033 (0.023)
Hospital δs	Included
Other Statistics	
Number of patients	8721
Number of hospitals	117
Log likelihood	-13501.28

Notes: Results correspond to benchmark analysis. Benchmark measures of clinical quality and amenities are described in Table A1. Uninteracted amenities and clinical quality are collinear with and embodied in hospital δs and thus do not appear separately. All patient characteristics are demeaned relative to benchmark patient sample; distance "intercept" is therefore mean distaste. * indicates statistical significance at the 10% level, ** at 5%, and *** at 1%.

Table A6: Regression of First-Stage Estimates of Hospital δs	
Parameter (Standard Error)	
Constant	-1.378 (0.520)
Clinical quality	0.066* (0.040)
Amenities	0.270*** (0.104)
Other Statistics	
R squared	0.167
N	117

Notes: Results correspond to benchmark analysisi.e., OLS decomposition of benchmark pneumonia sample. * indicates statistical significance at the 10% level, ** at 5%, and *** at 1%. Standard errors are robust to heteroscedasticity of unknown form.