

Econ 771: Health Economics II
Literature Review on:
The Economics of Long Term Care Hospitals

Ka Yan CHENG

Literature Review

This section gives detailed review on 5 selected papers discussing the role, characteristics, and behaviors of Long term care acute care hospitals (LTCHs). For each paper, the review will be structured as follow: First paragraph introduces the paper by presenting their motivation, research question, contributions and findings. Latter paragraph(s) will then focus on their data and identification strategies.

Major references

1 Koenig et al., [2015](#)

Given the fact that usage and availability of LTCHs are highly inconsistent across the state, doubts have been shaded on the necessities of having LTCHs in the health care sector. One valid question to ask would be: is it be possible that there are other settings that can treat patients in LTCHs in a more efficient way? Koenig et al., [2015](#) attempts to address this question by studying the effect of LTCH care on patients' mortality rate and Medicare's payments. Different from other former studies that have been focusing on the subgroup of LTCH patients who needed prolonged mechanical ventilation, Koenig et al., [2015](#) studies nonventilator LTCH patients in their top 5 populated major diagnostic categories (MDCs), namely respiratory (MDC 4), circulatory (MDC 5), digestive (MDC 6), musculoskeletal and connective tissue (MDC 8), and infectious and parasitic diseases and disorders (MDC 18). They also provide insight on how these effects differ for patients with different levels of illness severity. Specifically, they compare the results on overall patients with patients who was in an intensive or cardiac unit for not less than 3 days before transferring to the LTCH, and with patients who had multiple organ failure. They find that, for more than half of the MDCs, patients with the above 2 mentioned severe illness conditions both experienced lower mortality rate with similar or even lower Medicare payment under LTCH care. While these desirable effects failed to be documented when discussions expand to less acuity patients, the paper suggests that LTCH care is efficient way to treat some, but not all groups of patients that they have been treating.

To model the effect of a LTCH transfer on (all-cause) mortality rate and on the amount of Medicare Hospital Insurance Trust Fund payments, a probit model and a generalized linear model have been used respectively. The variable of Medicare payments is constructed so that it counts from the patient's first date of ACH admission until his/her death, or 180 days later. On the other hand, mortality is based on a window starting from the geometric mean number of days before patients' transfer to LTCH within their corresponding MS-DRG group. Window for the mortality closes 365 days after, or immediately after the patient passes away. Major data source is from the CMS's Inpatient, Skilled Nursing Facility, and Home Health Agency Standard Analytic Files.

To handle with the possible selection bias that happens between LTCH and non-LTCH patients, measurable differences between patients are controlled through adding patient demographic control variables in the regression model and by conducting propensity score matching. Other unmeasured differences are then being taken care of by a special instrumental variable method called the 2-stage residual inclusion technique (2SRI) (Terza et al., 2008), which has been widely used in health economics literatures. After the first stage which LTCH transfer status has been regressed on observable controls and instrumental variables, outcomes are being regressed again on the LTCH transfer status, observable controls, and the residuals from the first-stage regressions. Instrumental variables include the number of LTCHs within a patient's referral region and also the driving distance between the ACH and its closest LTCH according to the Bing maps.

2 Liu et al., 2001

As LTCHs are defined as any short term acute care hospitals that have an average length of stay not less than 25 days, the definition of LTCHs is quite board and such a general definition has created huge heterogeneity across the group. Liu et al., 2001 is the first paper that attempts to characterize the nature of LTCHs by grouping the similar ones and then comparing across different sets. In their paper, they conducted a descriptive analysis to describe facilities' structural characteristics (i.e. type of ownership, size, affiliation with other hospitals and geographical location) and patients' utilization characteristics (i.e. payment source and length of stay) of LTCHs. Furthermore, they also tried to identify different specialty groups (e.g. Multispecialty, Respiratory, Rehabilitation and Mental) among the LTCHs and to compare these groups in terms of their length of stay, death rates, admission sources, discharge destinations, and cost of care. They found out that a majority of LTCHs specialize in providing respiratory care or rehabilitation while there are also some niche LTCHs provide uncommon services. For example, some of them serves similar to hospice providers. This kind of information is important for informing better Prospective Payment System (PPS) design for LTCHs. Instead of solely based on patients' DRG group and their length of stay, relating patients to these specialty sub-groups might allow refined adjustments on the payment system.

The data used in this paper includes claims data and cost reports from Medicare, and also data from the Online Survey and Certification Reporting System (OSCAR). The OSCAR data includes detailed characteristics of providers that involve in Medicare and

Medicaid. Liu et al., 2001 uses the OSCAR data to gain information on providers' ownership type, geographic location, size and age (according to their certification date). The authors first group patients based on their MDCs, and then assign facilities into different groups based on the composition of cases they served. To be more specific, LTCHs with more than half of their cases labeled as respiratory (mental) MDC are classified to the respiratory (mental) specialty group. The rehabilitation specialty group is also constructed in the same way except there are three different rehabilitation-related MDCs to be included. Finally all remaining ones are regarded as multispecialty facility group. With these specification, analyses are done through comparing descriptive statistics across groups.

3 Einav et al., 2018a

The post-acute care (PAC) sector is consist of two big parts: facility-cased care and home-based care. Facility-cased PAC facilities includes skilled nursing homes (SNF), inpatient rehabilitation facilities (IRFs) and long-term care hospitals (LTCHs) while home-based PAC is performed by home health agencies (HHAs). As design of the system is to have LTCHs provide the most intensive care then the others, they are also getting paid the most. However, can care performed by LTCHs be substituted by other lower cost PACs? Based on this question, Einav et al., 2018a studies the impact of LTCHs. More specifically, they investigate whether the idea of having LTCHs is generating waste in the US health-care spending. In their paper, they found that without LTCH, approximately four-fifths of the patients would have been discharged to a SNF instead. Based on this, they conclude that by eliminating the option of being discharged to LTCHs, Medicare could save up to around 4.6 billion per year without imposing negative effect on patients' welfare.

The study uses data from four different sources, which are the 100% Medicare Provider and Analysis Review (MedPAR), the Medicare Annual Beneficiary Summary File, the Provider of Service (POS) dataset and the American Hospital Association's (AHA) annual survey. For Medicare patients' each stay at ACHs, LTCHs, SNFs or IRFs, MedPAR records their admission/discharge dates, procedures detail, DRGs, and Medicare payments. For other data sources, the beneficiary summary file provides patients' demographic information, the POS dataset gives providers' ZIP codes, and finally the AHA survey contains information on providers' ownership type, and their latitude and longitude, which to be used to calculate distances between facilities. These data are merged together to estimate the effect of LTCH discharge on different outcomes through an IV specification. LTCH discharge is being instrumented by LTCH's entry into a local hospital market, through an event study framework.

4 Eliason et al., 2018

Following reform of the PPS system in 2002, reimbursement system for LTCHs follows a special pattern that involve a sharp jump after a prespecified number of days. Once a LTCH patient's length of stay exceed the short-stay outliers (SSOs) threshold, which defined as five-sixths of the geometric mean of the length of stay for each DRG, LTCHs will

be given a fixed, predetermined, and big amount of reimbursement. Such a "Magic day" design gives LTCHs a financial incentive to discharge patient strategically. Based on this phenomenon, Eliason et al., 2018 attempts to answer two related questions. First of all, given the financial incentives, do LTCHs demonstrate strategic discharge and how is the SSO threshold effect? Secondly, how LTCHs would behave under alternative payment schemes? Corresponds to the first question, they found that outside of clinical considerations, LTCHs respond to the financial incentives by holding patients until exactly the magic day. Besides, they showed that alternative payment systems without a sharp jump would bring Medicare a huge saving.

The SSO threshold effect is first proved with graphical evidence by plotting the distribution of LTCH patients against their day of discharge relative to the magic day. It is conducted with a series of robustness check, which includes comparisons between different profit types (for-profit v.s. nonprofit; as for-profit ones should be more sensitive to financial incentives), different location types (colocated v.s. standalone; as colocated LTCHs should have less difficulties in manipulating the discharge) and different discharge destinations (home, SNFs, ACHs, and death; as discharge to death should be most unlikely to be able to manipulate, while discharging to home and to SNF are comparatively easier). Such effect is then quantified by a probit model. After that, counterfactual analysis is made with a dynamic structural model which models the daily decision of an LTCH to decide whether to discharge a patient or not. More details of the structural model will be discussed in next subsection when comparing with the work of Einav et al., 2018b. All these empirical study is based on the data from the claims dataset from the CMS and hospital characteristics data from the AHA guide together with the POS files from the CMS.

5 Einav et al., 2018b

Closely related to Eliason et al., 2018's work, Einav et al., 2018b also studies how LTCHs react to the financial incentives created by the "magic day" invention in LTCHs' PPS. Both of these two papers have provided similar descriptive evidence to support the hypothesis that strategic discharge happens between LTCHs, and both of them also used a dynamic structural discrete choice model to conduct their counterfactual analysis on different payment policy settings. While Eliason et al., 2018's model allows a high level of heterogeneity across different types of LTCHs and patients, Einav et al., 2018b's model is in a more parsimonious way that they focus only on the mean response across groups. On the other hand, Einav et al., 2018b also provides more discussions on patients' outcomes. The two papers therefore complemented each other to inform policy makers in different ways.

Einav et al., 2018b found that, according to their their model, there are several possible payment mechanisms that can be regarded as a "win-win" one. That is, the one that not only induces lower Medicare payment, but also gives LTCHs a (weakly) better outcome. Among their proposed alternatives, the best performing one is the one that pays a flat per diem rate up to a one day after the current SSO threshold. It reduces Medicare

payments by 5.9% while increases LTCHs' profits by 4.5%. Although payment to LTCHs has declined, the increase in their profits is realized by a lower cost with patients' length of stay being around 2 days shorter. Their results suggests that, by making appropriate adjustments on the payment schedules, pareto improvement is possible to take place in the LTCH industry.

Primary data source of the work is also the MedPAR claims data from the CMS. It is supplemented with Medicare's beneficiary summary files and the AHA survey to provide information on patient and hospital characteristics.

Other related works

To the best of my knowledge, Kim et al., [2015](#) is actually the pioneer work of studying LTCH's response to the reform of the PPS system. While Kim et al., [2015](#) provides stylized descriptive facts on LTCH's behaviors, Eliason et al., [2018](#) and Einav et al., [2018b](#) enriched the discussions by adding counterfactual analysis through structural modelling.

Besides the special sharp jump design in LTCHs' payment schedule, there are also some other distinguishing and interesting features of LTCHs. For example, approximately one-third of the LTCH are located within an ACH, which called Hospital-within-hospitals (HwH). Regarding to this phenomena, Kahn et al., [2015](#) compares behaviors of colocated and standalone LTCHs by using a multivariate regression model with propensity matching. Related to Eliason et al., [2018](#) and Einav et al., [2018b](#), they found that patients in an ACH colocated with an LTCH is having higher chance to be sent to an LTCH.

Future works

List of open questions in the literatures

1. Mechanisms behind the the variations - Effect of LTCH care on mortality rates and Medicare spending across different MDCs.

While Koenig et al., [2015](#) points out that LTCHs care does not bring efficiency gain (lower mortality rates and lower Medicare spending) for all groups of patients which they have been treating, a question left to be answered is how the variation take place across groups, and what is the reason behind such variation.

2. Comparison between LTCHs and their Medicare financed providers counterparts before the establishment of the LTCH system.

Liu et al., [2001](#) suggests that to better inform an optimal design of PPS system for LTCHs, one should compare both patient characteristics and services being pro-

vided between LTCHs and their Medicare financed providers counterparts before the establishment of the LTCH system.

3. Impact of providers' financial incentives on other parties of the healthcare system.

While both Eliason et al., 2018 and Einav et al., 2018b have been discussing how the payment schedule of LTCHs' PPS influences the providers, their patients, and the Medicare's payments. Such discussion should be expanded to other parties in the PAC sector, or even outside the PAC sector. One of the most immediate objects to investigate should be SNFs, which are the closest substitutes of LTCHs.

Proposed strategy for answering question 1

To answer the first question, it will be interesting to explore the potential linkage between Koenig et al., 2015's work with Eliason et al., 2018 and Einav et al., 2018b's studies. My preliminary hypothesis is that, the efficiency loss that happened in LTCHs treating less severe groups of patients might due to LTCHs' manipulations targeting to these specific groups. Therefore, a proposed strategy for answer question one would be to re-conduct a similar dynamic structural discrete choice model as in Einav et al., 2018b, but allow for heterogeneity by adding indicator variables according to the grouping constructed in Koenig et al., 2015. Or, more ideally, to combine the structural model in Einav et al., 2018b and Eliason et al., 2018 for accommodating high level of heterogeneity while addressing the payment jump's impact on patients' outcomes.

References

- Einav, L., Finkelstein, A., & Mahoney, N. (2018a). Long-term care hospitals: A case study in waste. *The Review of Economics and Statistics*, 1–57.
- Einav, L., Finkelstein, A., & Mahoney, N. (2018b). Provider incentives and healthcare costs: Evidence from long-term care hospitals. *Econometrica*, 86(6), 2161–2219.
- Eliason, P. J., Grieco, P. L., McDevitt, R. C., & Roberts, J. W. (2018). Strategic patient discharge: The case of long-term care hospitals. *American Economic Review*, 108(11), 3232–65.
- Kahn, J. M., Barnato, A. E., Lave, J. R., Pike, F., Weissfeld, L. A., Le, T. Q., & Angus, D. C. (2015). A comparison of free-standing versus co-located long-term acute care hospitals. *PloS one*, 10(10), e0139742.
- Kim, Y. S., Kleerup, E. C., Ganz, P. A., Ponce, N. A., Lorenz, K. A., & Needleman, J. (2015). Medicare payment policy creates incentives for long-term care hospitals to time discharges for maximum reimbursement. *Health Affairs*, 34(6), 907–915.
- Koenig, L., Demiralp, B., Saavoss, J., & Zhang, Q. (2015). The role of long-term acute care hospitals in treating the critically ill and medically complex: An analysis of nonventilator patients. *Medical care*, 53(7), 582.

- Liu, K., Baseggio, C., Wissoker, D., Maxwell, S., Haley, J., & Long, S. (2001). Long-term care hospitals under medicare: Facility-level characteristics. *Health care financing review*, 23(2), 1.
- Terza, J. V., Basu, A., & Rathouz, P. J. (2008). Two-stage residual inclusion estimation: Addressing endogeneity in health econometric modeling. *Journal of health economics*, 27(3), 531–543.