

MSOM

2011 MSOM Annual Conference
Ann Arbor, Michigan, June 26-28, 2011

The Impact of Workload on Hospital Reimbursement: Overworked Servers Generate Lower Income

Adam Powell
University of Pennsylvania

Sergei Savin
University of Pennsylvania

Nicos Savva
London Business School

informs

M MICHIGAN
ROSS SCHOOL OF BUSINESS

The impact of workload on hospital reimbursement: Overworked servers generate lower income

Adam Powell

The Wharton School, University of Pennsylvania, apowell@wharton.upenn.edu

Sergei Savin

The Wharton School, University of Pennsylvania, savin@wharton.upenn.edu

Nicos Savva

London Business School, nsavva@london.edu

Key words: empirical; hospital operations; healthcare reimbursement; workload management

History: MSOM conference extended abstract May 12, 2011

Extended Abstract

Hospitals in the developed world are facing a double challenge. Not only are they treating an ageing population which places more demands on resources, they are also under constant pressure by national as well as private payers to substantially reduce costs. The combination of these effects has led to a substantial and sustained increase on the daily workload of medical practitioners. One suggested solution has been for physicians to spend less time doing paperwork, such as post-discharge record keeping, in order to free up time to devote to treating patients (Gottschalk and Flocke (2005)). McCormick et al. (2004) found that the level of paperwork-related stress today is so great that two thirds of physicians would be willing to give up 10% of their income for a substantial reduction in paperwork.

From an operation management perspective, having high server utilization and reducing the time highly skilled and expensive servers spend performing secondary tasks is desirable. However, reducing the time a physician devotes to ancillary activities such as paperwork might have knock-on effects. Empirical studies have demonstrated that an increase in physician workload has an adverse impact on the quality of residents' discharge summaries (Coit et al. (2010)). Workload induced degradation in quality of medical notes and in particular the discharge note, can have implications for follow-up care. Furthermore, since the discharge note is the primary input for billing, it may also have implications on hospital reimbursement.

In this paper we utilize detailed reimbursement data from the trauma department of a major urban hospital to study the impact of patient generated workload on hospital reimbursement. Our main finding is that the proportion of patients that are assigned a high (as opposed to low) severity Diagnostic Related Group (DRG) code, which maps to 27.8% higher payment on average for the trauma department, is significantly reduced when the physicians experience a higher than average workload. As a preview of our results, figure 1 shows the proportion of patients assigned a high severity DRG code as a function of the number of same-day discharges completed by the discharging physician. As evident in the figure, a physician that discharges a single patient on any given day, and therefore has only one discharge note to write, has a 15% higher chance of getting a high severity assignment for his patient as compared with a physician that has to do 3 or more same-day discharges.

The significant reduction in high severity assignment as workload increases persists even after we control for differences in patient characteristics (gender and age), treatment characteristics (length

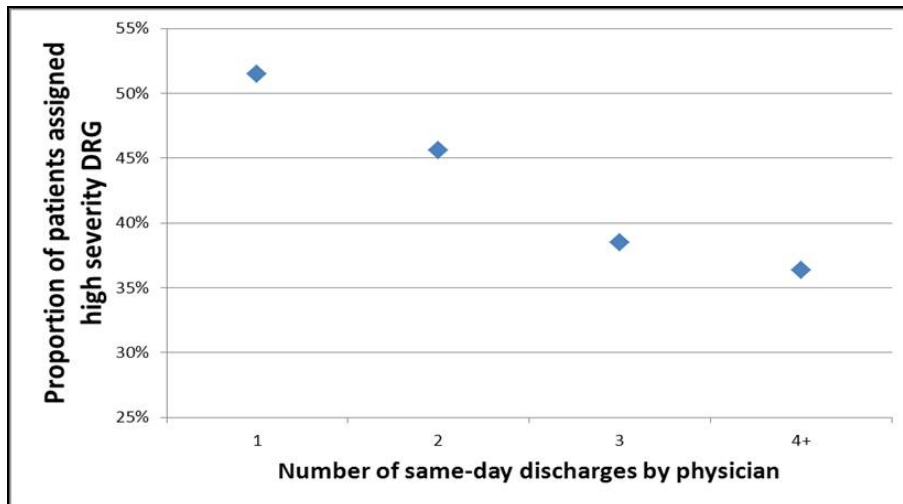


Figure 1 Proportion of patients assigned a high severity Diagnostic Related Group (DRG) code as a function of physician discharge workload. Census data from the trauma department of a major urban hospital, 01 January 2006 to 28 September 2010. A high severity DRG assignment maps to 27.8% higher payment on average for the trauma department than a low severity DRG assignment.

of stay, condition fixed effect, physician fixed effect) and differences in discharge day (day of the week, calendar month fixed effects). We find that this result is robust to alternative model specifications and perform several robustness checks to establish that this is not caused by endogeneity in discharge timing, endogeneity in discharge allocation or selection bias. We also find that besides the number of same-day discharges a physician performs, the number of inpatients under a physician's care also has an impact on the probability that a discharged patient is assigned a higher severity DRG. Interestingly, we find that department level workload does not seem to have an impact on severity assignment, providing support for the hypothesis that physicians do not share paperwork.

We attribute this significant reduction in the high severity assignment to workload related degradation of quality in the discharge notes. This is consistent with a misconception among surgeons that more diligence during the billing process will not increase reimbursement. Since a higher DRG assignment is associated with an average extra payment of 27.8%, we estimate the loss of revenue to the hospital due to workload related misassignment to be approximately 0.9% (with a 95% confidence interval of 0.3% and 1.5%) of the total revenue. This amount, even at the lower end of the confidence interval, is substantial and it would more than cover the costs of any changes in the discharge process at the hospital that would prevent such a regular misassignment.

Furthermore, we find that the impact of workload on the probability that a patient is assigned a higher severity DRG code is moderated by experience. The more experienced the trauma department is in treating a specific condition the less impact an increase in workload will have on the probability that a patient is assigned a higher severity DRG code. This reflects the underlying causes of the misclassification. Physicians, in general, try to get the high DRG assignment for their high severity patients. However, when other activities compete for their time and attention they do not put as much time and/or effort into writing the discharge note. This is less problematic for routine cases for which they know what to write in the discharge note in order to get the higher DRG assignment.

Given the significant magnitude of lost revenue to the hospital, our research can be used to point to specific suggestions on how hospitals could avoid the losses associated with workload related severity misclassification. One possibility is to try to reduce the the workload on a provider by handing off a patient from one provider to another. While this can benefit care quality to the extent that it enables the patient to be treated by a less stressed or exhausted provider, handoffs

can also reduce care quality because some information may not be shared between the providers. Discontinuity of care has been shown to increase the prevalence of preventable adverse events (Petersen et al. (1994), Saultz and Lochner (2005)). A more promising approach is to try to decouple workload from note keeping; the primary input for DRG assignment. As the moderating impact of experience suggests, providing extra training for physicians and making more information resources available seems to be an obvious candidate. A more fundamental reorganization where a fully trained nurse contributes to the discharge process, particularly in non-routine cases during busy times, would be another possibility.

Besides hospital reimbursement, our paper has wider implication for operations management. It points to a behavioral impact on system performance that the operations management community, to the best of our knowledge, has not studied before. As workload increases, not only is speed and quality affected (see KC and Terwiesch (2009)) but also ancillary activities that are secondary to quality of outcomes, but essential to generating income, are compromised. Moreover, this has implications for the optimal design of reimbursement systems (in healthcare and elsewhere). One of the fundamental assumptions behind the literature is that patient diagnosis and outcome of patient care are observable by the payer (see Fuloria and Zenios (2001)). Our research shows that this might not be the case and that the system performance (such as average workload) can impact the accuracy with which the state of the system is observed. Further research needs to investigate whether other settings exhibit a similar response to workload. For example, relying on managerial reports to compile near-miss statistics (Dillon and Tinsley (2008)) might be problematic if near misses are more likely when the system is operating at a higher workload than average *and* the quality of the data collection process is compromised at higher workload. Similarly, sophisticated knowledge management systems, an important driver of performance for knowledge based organizations such as consulting or financial services firms (see Ofek and Sarvary (2001)), might be less effective if the quality (and quantity) of content that goes into the system is compromised under high workload conditions. Our empirical findings opens up the possibility for further empirical and analytical work in these areas.

References

- Coit, M., J. Katz, G. McMahon. 2010. The effect of workload reduction on the quality of residents discharge summaries. *Journal of General Internal Medicine* 1–5.
- Dillon, R.L., C.H. Tinsley. 2008. How near-misses influence decision making under risk: A missed opportunity for learning. *Management Science* 54(8) 1425–1440.
- Fuloria, P.C., S.A. Zenios. 2001. Outcomes-adjusted reimbursement in a health-care delivery system. *Management Science* 47(6) 735–751.
- Gottschalk, A., S.A. Flocke. 2005. Time spent in face-to-face patient care and work outside the examination room. *Annals of Family Medicine* 3(6) 488–493.
- KC, D., C. Terwiesch. 2009. Impact of workload on service time and patient safety: An econometric analysis of hospital operations. *Management Science* 55(9) 1486–1498.
- McCormick, D., D.U. Himmelstein, S. Woolhandler, D.H. Bor. 2004. Single-payer national health insurance: Physicians' views. *Arch Intern Med* 164 300–304.
- Ofek, E., M. Sarvary. 2001. Leveraging the customer base: Creating competitive advantage through knowledge management. *Management Science* 47(11) pp. 1441–1456.
- Petersen, L.A., T.A. Brennan, A.C. O'Neil, T.H. Lee. 1994. Does housestaff discontinuity of care increase the risk for preventable adverse events? *Annals of Internal Medicine* 121(11) 866–872.
- Saultz, J.W., J. Lochner. 2005. Interpersonal continuity of care and care outcomes: A critical review. *Annals of Family Medicine* 3(2) 159–166.