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The Effects of Multiple Chronic Conditions on Adult Patient Readmissions and Hospital Finances: A Management Case Study

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Abstract

Medicare and other payers have launched initiatives to reduce hospital utilization, especially targeting readmissions within 30 days of discharge. Hospital managers have traditionally contended that hospitals would prosper better by ignoring the penalties for high readmission rates and keeping the beds more full. We aimed to test the financial effects of admissions and readmissions by persons with and without specified chronic conditions in one regional hospital. This is a management case study with a descriptive brief report. This study was conducted at Winchester Memorial Hospital, a general hospital in a largely rural area of Virginia, 2010-2015. The total margin per admission varied by diagnosis, with the average patient diagnosed with chronic obstructive pulmonary disease, heart failure, pneumonia, or chronic renal disease having negative margins. The largest per-patient losses were in diagnostic categories coinciding with the highest readmission rates. The margin declined into substantial losses with an increasing number of chronic conditions, which also corresponded with higher readmission rates. Patients with 5 or more clinical conditions had highest risk of readmission within 30 days (24.8%) and had an average total loss of $865 per admission in 2015. The adverse financial effects worsened between 2010 and 2015. This hospital might improve its finances by investing in strategies to reduce chronic illness hospitalizations, especially those with multiple chronic conditions and high risk of readmission. These findings counter the common claim that the hospital would do better to fill beds rather than to work on efficient utilization. Other hospitals could replicate these analyses to understand their situations.

Keywords

patient readmission, multiple chronic conditions, hospitals, chronic disease, financial management, hospital, management case studies, community health care

Introduction

Hospitals in the United States are reliably equipped to treat people with acute illnesses and injuries and less well organized to serve the increasing number of people living with serious chronic diseases. Expenses related to repeated hospitalizations have put pressures on the Centers for Medicare & Medicaid Services (CMS) and other payers to introduce readmission penalties with the dual aim of reducing spending and improving the reliability of care transitions and stabilization after discharge.[1] An analysis using the Nationwide Inpatient Sample (NIS) of the Healthcare Cost and Utilization Project (HCUP) showed that a larger number of chronic conditions for any hospitalized adult is associated with higher cost per stay and higher mortality.[2] In recent years, the main contributors to the rise in Medicare spending have been related to chronic conditions such as diabetes, arthritis, hypertension, and kidney disease.[3] Conditions such as chest pain, soft tissue infection, asthma, chronic obstructive pulmonary disease, and urinary tract infection have showed the greatest variation in risk-standardized hospital admission rates implying that some of these admissions might be unnecessary, thereby creating opportunities for improving efficiency and reducing health spending.[4] We undertook this study to examine the financial effects of hospitalizations of patients with various chronic conditions in a regional hospital in rural Virginia.

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Methods

To determine the financial impact of specific clinical conditions, we analyzed the hospital services for patients aged 18 and older, regardless of the payer, admitted to Winchester Medical Center (WMC) between January 1, 2010, and December 31, 2015. Initial admissions to WMC and readmissions only to WMC were considered in the analysis. WMC is part of a local system with associated critical access and urgent care facilities, all of which generally transfer complicated or seriously ill patients to WMC, which is more than 30 miles from any other general hospital. Nearly all local residents who are hospitalized at WMC would return there for any needed rehospitalization.

Chronic Conditions

We classified admitted patients by 1 or more of 7 conditions: acute myocardial infarction (AMI), heart failure (HF), chronic obstructive pulmonary disease (COPD), chronic renal diseases (CRD), end-stage renal disease (ESRD), pneumonia (PN), diabetes mellitus (DM), and hypertension (HYPER). These conditions are common, and AMI, HF, PN, and COPD, along with total hip arthroplasty (THA), total knee arthroplasty (TKA), and coronary artery bypass graft (CABG) surgery, are targeted in the CMS Readmissions Reduction Program.[5] As these are serious chronic conditions, a patient was categorized as having 1 or more of these clinical conditions if any hospitalization during the study period had a recorded diagnosis of that condition. The cohort assignments were not mutually exclusive. If a patient was admitted one time with a COPD diagnosis and another time with an HF diagnosis, then both admissions would appear in each cohort. Similarly, if a patient was admitted with both a COPD and HF diagnosis, then that patient was assigned to both cohorts. Assignment was based on recorded diagnoses using the International Classification of Diseases, Ninth Revision (ICD-9).[6] We used the following ICD-9 diagnosis codes associated with each clinical condition: AMI: 410.00 to 410.91; HF: 402.01 to 428.90; COPD: 490.00 to 496.00; ESRD: 585.10 to 585.90; PN: 481.00 to 486.00; DM: 250.00 to 250.93; HYPER: 401.00 to 405.99.

Financial Analysis

We examined the reimbursement received (not charges or expected reimbursement) and total cost for inpatient care provided, for all admissions including readmissions. WMC uses a generally accepted cost accounting methodology, which assigns costs to an individual inpatient hospital stay as follows: Direct Labor Cost, calculated as the average labor cost per patient day multiplied by the length of stay; Material Cost, calculated as all materials and supplies such as medications, testing materials, and disposable equipment used in the direct care of the specific patient; and Indirect Cost, which are allocated to each inpatient as appropriate for the type of cost, with examples in Table A1. The Direct Labor Cost varies by length of stay and by inpatient clinical unit of the hospital. The Material Cost assigned to a particular inpatient stay varies by the materials (including pharmaceuticals) required in the care of that patient. CMS readmission penalties and other quality bonuses or penalties were not considered in the calculation of reimbursement or cost.

30-Day Readmission Rates

We computed 30-day all-cause readmission rates based on the date of discharge and readmission. For example, a patient who was discharged on Day 1 and readmitted on Days 10, 33, and 93 would have 4 admissions and 2 readmissions (Days 10 and 33, each of which is within 30 days of a discharge). Only readmissions to WMC were available for analysis. Patients transferred from our hospital to another acute care facility during their stay were counted as discharges, and transfers into WMC were tallied as admissions. We kept in-hospital deaths in the database to estimate the costs more accurately, though this slightly understates the observed readmission rates.

Results

WMC is a 445-bed main hospital for a 6-hospital system serving the Shenandoah Valley in Western Virginia. In 2015, 2659 (12.1%) of inpatients were below the age of 18, 9524 (43.4%) were 18 to 64 years of age, and 9767 (44.5%) were 65 years or older. In 2015, 3224 (14.7%) were enrolled in Medicaid and 10 874 (49.5%) were enrolled in Medicare. Of adult patients admitted in 2015, 78.7% had at least 1 of the selected chronic conditions. The illnesses and referral patterns had no major changes between 2010 and 2015.

Figure 1 presents the total margin per admission for 2015 (left vertical axis) and 30-day readmission rate (right vertical axis) by clinical condition of interest, including none of these conditions being present. Four of the 7 chronic conditions examined had a negative total margin. Readmission rates ranged from 14.9% for HYPER to 28.8% for ESRD, with the rates generally increasing as the margin worsened.

Figure 2 presents similar information by the number of select clinical conditions. As one might expect, the readmission rate increases with the number of clinical conditions present, but also, the margin declines with an increasing number of conditions present. Patients with 1 selected clinical condition present had the highest margin per admission ($2912) and patients with no selected clinical conditions had the lowest readmission rate (3.2%). Patients with 5 or more clinical conditions are most likely to be readmitted within 30 days (24.8%) and had, on average, a total loss of $865 per admission in 2015.

The 30-day all-cause readmission penalties from CMS have received considerable attention. Without accounting for

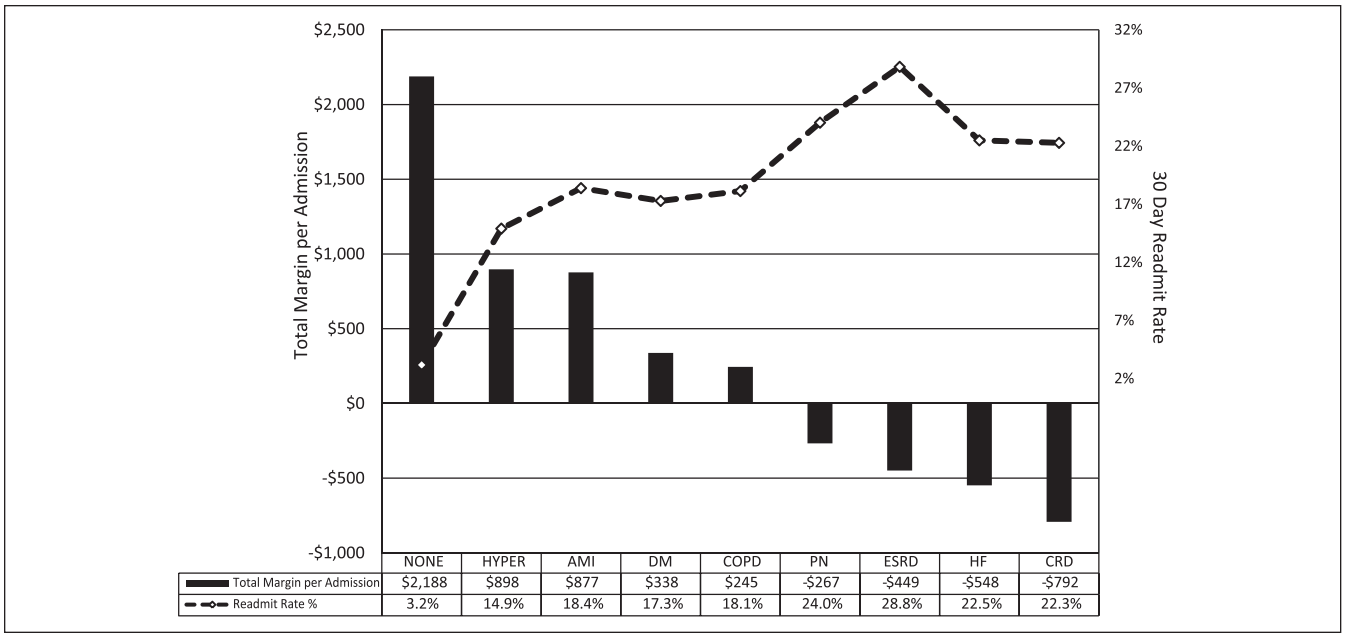

Figure 1. Total margin per admission and readmission rate by clinical condition for 2015.
Note. HYPER = hypertension; AMI = acute myocardial infarction; DM = diabetes mellitus; COPD = chronic obstructive pulmonary disease; PN = pneumonia; ESRD = end-stage renal disease; HF = heart failure; CRD = chronic renal disease.

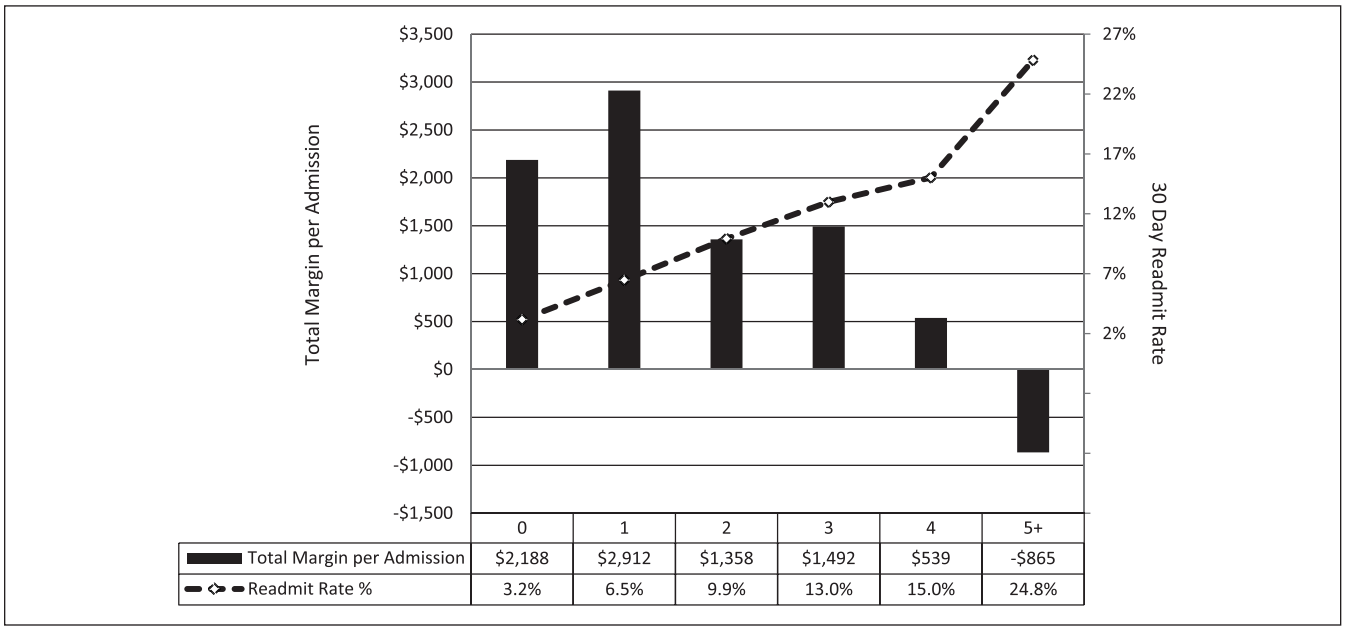

Figure 2. Total margin per readmission and readmission rate by number of select clinical conditions for 2015.
Note. "Select Clinical Conditions" includes AMI, HYPER, DM, COPD, CRD, HF, ESRD and PN. AMI = acute myocardial infarction; HYPER = hypertension; DM = diabetes mellitus; COPD = chronic obstructive pulmonary disease; CRD = chronic renal disease; HF = heart failure; ESRD = end-stage renal disease; PN = pneumonia.

CMS penalties, however, we still find 30-day readmission to be a marker of lack of profitability for particular patient populations. This hospital's experience regarding persons who are readmitted within 30 days, with and without the identified chronic conditions from 2010 to 2015, is shown in Table 1. When the patient has none of the select chronic conditions, the margin has been consistently greater than zero and does not show a clear trend. For the much larger number of patients with 1 or more of the select chronic conditions, however, care provided during the readmission had an increasingly negative

Table 1. Total Margin by Presence of Select Chronic Conditions and by Year, 30-Day Readmits.

	30-day readmits—no select conditions present						30-day readmits—at least 1 select condition present					
Year	Reimbursement per admission	Total cost per admission	Margin per admission	Number of unique patients	Number of admissions	Total margin	Reimbursement per admission	Total cost per admission	Margin per admission	Number of unique patients	Number of admissions	Total margin
2010	$8013	$7608	$405	163	193	$78 000	$10 407	$9835	$572	1450	2091	$1 195 000
2011	$7961	$6312	$1649	168	200	$330 000	$10 087	$10 472	(–$385)	1611	2316	(–$892 000)
2012	$7872	$7075	$797	160	201	$160 000	$10 841	$11 366	(–$525)	1607	2283	(–$1 198 000)
2013	$11 474	$9579	$1895	129	147	$280 000	$11 510	$11 989	(–$479)	1414	1992	(–$954 000)
2014	$11 905	$8683	$3222	122	136	$438 000	$11 800	$11 793	$7	1497	2141	$15 000
2015	$11 194	$9110	$2084	107	133	$277 000	$11 810	$12 263	(–$454)	1510	2169	(–$983 000)

margin each year. For patients with none of the selected chronic diseases, cost per admission has risen, but reimbursement has outpaced this growth. For patients with 1 or more chronic conditions, however, reimbursement has also increased but at a slower pace than cost.

Discussion

In our study, patients with certain chronic conditions generated a negative margin for the hospital. Taken on their own, COPD, ESRD, HF, and PN had negative total margins, whereas AMI, HYPER, and DM had positive margins. However, as the number of chronic diseases for an individual increases, the margin decreases, becoming negative at a total of 5 chronic conditions, and the readmission rate rises. COPD, CRD, HF, and PN had consistently higher all-cause 30-day readmission rates than AMI, HYPER, and DM. Although both reimbursement and the total cost of care rose from 2010 to 2015, the increase in reimbursement for patients with chronic diseases did not keep pace with the total cost of care. The total losses were substantial, and worsened over the study period. This study represents data from only a single medical center and the findings may not apply to other hospitals and health systems, though the methods should be replicable. The prevalence of particular chronic diseases varies widely by geographic location as do the multitude of factors that influence care delivery. This study is also limited by using diagnoses from claims and by having only the records from the target hospital and not those from readmissions of these patients elsewhere. Our method of assigning patients to diagnostic categories by virtue of any diagnosis throughout the time period incurs some imprecision alongside its simplification, as some patients will have developed a particular condition during the time period.

One objection to computing margin by subtracting both direct and indirect costs is that some fixed costs that are allocated through indirect costs will remain unchanged during deliberate reductions in utilization while lower occupancy will reduce revenue available to cover those fixed costs. While this is true in the short term, in the long term, a well-managed facility that is growing can displace lower margin and potentially avoidable readmissions with higher margin admissions. Also, a facility that has a trend of declining admissions (or even just declining reimbursement relative to cost) may have to reduce fixed costs. Judicious fixed cost adjustments could improve the margins for nearly all admissions.

Incentives for reducing readmissions, including both at-risk contracting and penalties for excess readmissions, enhance the opportunity to invest in outpatient care programs for reducing unnecessary readmissions. Success with such programs may serve to improve both hospital margins and negotiations with payers for quality-based incentives. For this hospital, leadership chose to invest in supplemental services to keep chronically ill patients stable in the community and, for patients nearing death and preferring supportive care, with planned dying in hospice and palliative care. If an investment of less than about $150 000 per year yielded a reduction of approximately one-fifth in rehospitalizations of persons with the targeted chronic conditions, the hospital could have come out ahead in 2015 ($354 loss per readmission with 1 or more chronic condition, × 1/5 of 2169 readmissions = $153 565). The ominous time trend implies that the return on investment might continue to increase.

For this hospital, an investment strategy to reduce preventable admissions and readmissions of people with multiple chronic conditions was financially attractive. Indeed, this facility is investing in enhancements to outpatient chronic care, starting with COPD. Such investments not only enhance the hospital's financial situation but also are likely to improve long-term care supports, primary care delivery and advance care planning and to strengthen partnerships with community organizations and outpatient providers. Other hospitals may be in the same position and should consider examining their revenue and costs similarly to understand the financial impact of their clinical strategies and operations and their dependence upon the adequacy of community care.

Appendix A

Table A1. Examples of the Methodology Used to Assign Indirect Costs to a Particular Inpatient Stay.

Department	Cost allocation statistic
Housekeeping	Square footage of the specific unit as a percentage of all square footage covered by Housekeeping creates a ratio which is used to allocate that same percentage of all Housekeeping costs to a particular unit. These expenses are proportionally attached to individual patients according to charges via a predetermined Relative Value Unit (RVU) system.
Maintenance	Square footage of the specific unit as a percentage of all square footage covered by Maintenance creates a ratio which is used to allocate that same percentage of all Maintenance costs to a particular unit. These expenses are proportionally attached to individual patients according to charges via a predetermined RVU system.
Laundry	Pounds of laundry used by specific unit as a percentage of the total pounds of laundry creates a ratio which is used to allocate that same percentage of all laundry costs to a particular unit. Expenses are proportionally attached to individual patients according to charges using a predetermined RVU system.

(continued)

Appendix A (continued)

Department	Cost allocation statistic
Human Resources	Total salaries of specific unit (including benefits) as a percentage of total salaries (and benefits) for the hospital creates a ratio that is used to allocate that portion of Human Resource expenses to the Unit. These expenses are proportionally attached to individual patients according to charges using a predetermined RVU system.
Administration (Includes Finance, Information Systems, and Administration)	Total expenses of a particular unit as a percentage of total cost for the hospital creates a ratio that is used to allocate Administration costs to a specific unit. These expenses are proportionally attached to individual patients according to charges using a predetermined RVU system.
Purchasing	Total purchases of a particular unit as a percentage of the cost of all purchases for the hospital creates a ratio that is used to allocate that portion of hospital Purchasing expenses to the particular unit. These expenses are then proportionally attached to individual patients according to charges using a predetermined RVU system.
Patient Accounts	Gross charges of specific unit as a percentage of gross charges by the hospital creates a ratio that is used to allocate the same percent of Patient Accounts expenses to specific units. These expenses are then proportionally attached individual patients according to charges using a predetermined RVU system.

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Declaration of Conflicting Interests

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