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No Pain, but No Gain? The Disappearance of Angina Hospitalizations, 1992-1999

Barry G. Saver, M.D., M.P.H.,

Department of Family Medicine and Community Health, University of Massachusetts, Benedict Building A3-146, 55 Lake Avenue North, Worcester, MA 01655-0002, phone 508-856-3458, fax 508-856-1212

Sharon A. Dobie, M.C.P., M.D.,

Department of Family Medicine, University of Washington, Box 356390, Seattle, WA 98195-6390, phone 206-543-9425, fax 206-543-3821

Pamela K. Green, M.P.H., Ph.D.,

Department of Family Medicine, University of Washington, Box 354982, Seattle, WA 98195-4982, phone 206-685-9241, fax 206-616-4768

Ching-Yun Wang, Ph.D., and

Division of Public Health Sciences, Fred Hutchinson Cancer Research Center, 1100 Fairview Avenue North, M2-B500, P.O. Box 19024, Seattle, WA 98109-1024, phone 206-667-6949, fax 206-667-7004

Laura-Mae Baldwin, M.D., M.P.H.

Department of Family Medicine, University of Washington, Box 354982, Seattle, WA 98195-4982, phone 206-685-4799, fax 206-616-4768

Barry G. Saver: ; Sharon A. Dobie: dob@u.washington.edu; Pamela K. Green: bobagirl@u.washington.edu; Ching-Yun Wang: cywang@fhcrc.org; Laura-Mae Baldwin: lmb@u.washington.edu

Abstract

Background—Hospitalization for angina is commonly considered an ambulatory care sensitive hospitalization (ACSH) and used as a measure of access to primary care.

Objective—To analyze time trends in angina-related hospitalizations and seek possible explanations for an observed, marked decline during 1992-1999.

Research Design—We analyzed Medicare claims of SEER-Medicare control subjects for occurrence of angina hospital discharges, using the AHRQ Prevention Quality Indicator (PQI) definition, along with occurrence of related events including angina admissions with revascularization, angina admissions discharged as coronary artery disease (CAD) or myocardial infarction, and overall ischemic heart disease discharges.

Subjects—Approximately 124,000 cancer-free Medicare beneficiaries/year, with subjects contributing data for 1-8 years.

Results—Angina PQI hospital discharges declined 75% between 1992 and 1999. CAD hospital discharges rose in a reciprocal pattern, while angina discharges with revascularization declined and

Correspondence and Reprints: Barry Saver, M.D., M.P.H., Department of Family Medicine and Community Health, University of Massachusetts, Benedict Building A3-146, 55 Lake Avenue North, Worcester, MA 01655-0002, fax 508-856-1212, phone 508-856-3458, barry.saver@umassmed.edu.

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discharges for myocardial infarction and ischemic heart disease were relatively constant during this time period.

Conclusions—The marked decline in angina PQI hospital discharges during 1992-1999 does not appear to represent improvements in access to care or prevention of heart disease, but rather increased coding of more specific discharge diagnoses for CAD. Our findings suggest that angina hospitalization is not a valid measure for monitoring access to care and, more generally, demonstrate the need for careful, periodic reevaluation of quality measures.

Keywords

Health services accessibility; hospitalization; angina; ischemic heart disease

In 1993, the Institute of Medicine (IOM) recommended the use of ambulatory care sensitive hospitalization (ACSH) rates as a measure of access to primary care.¹ Based on this concept, the Agency for Healthcare Research and Quality (AHRQ) published criteria defining 14 Prevention Quality Indicators (PQIs) for adults.^{2, 3} These represent potentially-preventable admissions – both chronic conditions for which good access to ambulatory care over a prolonged period of time ought to be protective and acute conditions for which prompt access to ambulatory care early in an episode of illness ought to be protective.

PQI 13 measures hospitalization for “angina without procedure.” Good access to ambulatory care might lead to better primary prevention through improved control of cardiovascular risk factors, and better secondary prevention of admission for accelerated or unstable angina among persons with angina through outpatient management of chest pain and risk factors. Angina care can thus be considered as representing a blend of ambulatory care for both chronic and acute conditions.

In a study examining non-cancer-related care of colorectal cancer survivors, we evaluated temporal patterns in ACSHs and noted a marked decline in the angina PQI, quite unlike the flat or rising trends observed for the other PQIs. Given the major changes in management of **coronary atherosclerosis** over recent years, we sought to understand whether this trend was driven by a true decrease in the incidence of unstable or accelerated angina leading to hospitalization or by changes in care and coding resulting in fewer discharges qualifying for the PQI definition. The former would suggest an improvement in quality of care, perhaps in response to use of this measure; the latter would suggest problems with validity of the measure.

Methods

Study Population

The ongoing study that led to this analysis used SEER-Medicare linked data^{4, 5} and compared care for Medicare beneficiaries aged 65 and older with cancer to care for similarly aged, cancer-free control subjects. This study utilizes Medicare part A (hospital inpatient) and part B (physician and supplier) claims data for SEER-Medicare control subjects – persons who resided in the SEER registry counties, without a SEER-captured cancer diagnosis, who were in the Medicare 5% random sample of beneficiaries. At the time of this study's first year, the SEER program included five state registries (Connecticut, Hawaii, Iowa, New Mexico, and Utah) and seven county-based registries (Atlanta, Detroit, rural Georgia, Los Angeles, San Francisco, San Jose, and Seattle/Puget Sound) in four other states. These subjects are comparable to the general US Medicare population, with the exception of being somewhat more urban and having a higher proportion of foreign-born persons and, as SEER controls, not having had any cancer diagnoses reported to a SEER registry.⁶ We utilized Medicare claims data from 1992-1999. Depending on year of entry into the cohort and mortality, subjects could contribute from 1 to

9 years of data. We included only persons aged 65 and above with full-year Medicare parts A and B coverage who were not enrolled in a Medicare HMO during each observation year.

Outcome Measures

Our primary outcome measure was an individual having any hospital discharge meeting the AHRQ angina PQI definition during a calendar year. Eligible hospitalizations are defined based on primary discharge diagnosis codes (ICD-9 CM codes 411.1, 411.81, 411.89, 413.0, 413.1, and 413.9), not admitting diagnosis codes.² We did not evaluate occurrence of repeat events in a year for this or any of our other outcome measures.

A decline in angina PQI discharges could result from one or more causes: 1) fewer hospital discharges for angina due to better prevention, either just of angina or reflecting an overall decline in ischemic heart disease; 2) fewer qualifying discharges due to increased use of revascularization, as the PQI definition disqualifies these hospitalizations, even if angina was coded as the primary discharge diagnosis; or 3) fewer qualifying discharges due to increased use of more specific discharge diagnoses than angina, specifically **coronary atherosclerosis** (as might occur with more frequent use of coronary angiography to establish this diagnosis) or acute myocardial infarction (AMI) (as might occur through use of new, more sensitive criteria for AMI, such as troponin⁷).

To examine the first possibility, we determined whether angina as an *admitting* diagnosis (using the PQI ICD-9 CM codes²) declined over time. We also evaluated trends in overall ischemic heart disease hospital discharges (primary discharge ICD-9 CM diagnosis 410-414).

For the second possibility, we looked at trends in the frequency of hospitalizations with a discharge diagnosis of angina in which a revascularization procedure, as specified by AHRQ² was performed.

For the third possibility, we tabulated trends in the frequency of hospitalizations with primary discharge diagnoses of coronary atherosclerosis (ICD-9 CM codes 414.0X) and AMI (ICD-9 CM codes 410.XX), along with coronary angiography (indicated by part B claims with CPT-4 codes 93508, 93510-93529, 93539-93540, 93543, and 93545-93552⁸). We also conducted a confirmatory analysis among persons hospitalized with a primary admitting diagnosis of angina, evaluating trends in the rates and proportions who qualified for the PQI at discharge and who were discharged with a diagnosis of **coronary atherosclerosis**.

Results

As shown in the Table, the study population ranged from 121,682 to 125,920 persons, with modest fluctuations from year to year. Consistent with the aging of the Medicare population, our population grew progressively older between 1992 and 1999, with 26.4% aged 80 and above in 1992 and 29.6% aged 80 and above in 1999. Just over 1/3 were men and over 80% resided in urban areas.

Figure 1 addresses the first hypothesis mentioned above. There was a marked, 75% drop in the angina PQI discharge rate between 1992 and 1999, from 9.82/1,000 subjects having any such discharge in 1992 to 2.47/1,000 subjects in 1999. The rate of having any hospitalization with a primary admitting diagnosis of angina also declined over this period of time, but only by 36%, from 11.0/1,000 to 7.01/1,000. The overall rate of having any hospital discharge with a primary diagnosis of ischemic heart disease was quite steady from 1992-1999.

Addressing the second hypothesis, overall annual revascularization rates rose substantially during this same period, from 8.92/1,000 to 12.5/1,000, but this did not appear to be a major

driver of the decline in angina PQI discharges via disqualification – the proportion of discharges with a primary diagnosis of angina disqualified because of a revascularization procedure declined from 20.6% (315/1529 discharges) in 1992 to 2.8% (9/324 discharges) in 1999.

Figure 2 addresses the third hypothesis, the use of more specific discharge diagnoses. We have repeated the angina PQI discharge trend data in this figure to facilitate comparison with the other trends. Hospital discharges for **coronary atherosclerosis** rose in a complementary pattern to the decline in angina PQI discharges, increasing from 3.59/1,000 in 1992 to 11.4 in 1999. In contrast, AMI discharges were essentially unchanged during this time period. In addition, Figure 2 shows coronary angiography increasing from 12.0/1,000 in 1992 to 16.6/1,000 in 1999, with the greatest part of this increase occurring in 1993-1996, similar to the patterns for coronary atherosclerosis and angina PQI discharges. Figure 3 shows our confirmatory analyses, examining trends in angina PQI and **coronary atherosclerosis** discharges specifically among persons hospitalized with a primary admitting diagnosis of angina, who should be the persons most likely to have a discharge diagnosis of angina. Rates of having an angina PQI discharge with an angina admitting diagnosis dropped substantially, from 8.17/1,000 (74% of angina admissions) in 1992 to 1.45/1,000 (21% of angina admissions – a 53 percentage point drop) in 1999, while rates of **coronary atherosclerosis** discharge diagnoses with an angina admitting diagnosis rose from 0.68/1,000 (6% of angina admissions) in 1992 to 3.49/1,000 (50% of angina admissions – a 44 percentage point increase) in 1999.

Discussion

We observed a decline of 75% in hospital discharges meeting the criteria for the AHRQ angina PQI between 1992 and 1999; this trend is consistent with findings of two other studies reporting on hospitalizations for angina in a similar timeframe.^{9, 10} While one would hope this steep decline came from improvements in access to care and/or prevention, our analyses do not support either of these potential explanations. Overall hospitalization risk for ischemic heart disease was relatively constant and showed no parallel decline, making better prevention an unlikely explanation. We also refuted our hypothesis that increasing frequency of revascularization might explain much of this decline by increasing the number of angina discharges disqualified from the PQI by revascularization. Although revascularization rates did rise substantially over this time period, the rise was not large enough to account for the decline in angina PQI discharges and the proportion of angina discharges disqualified by revascularization, rather than rising, fell almost to zero.

Another hypothesis, that practice changes such as measurement of troponin levels⁷ were leading to increased diagnosis of myocardial infarction among persons admitted with angina was also not sustained – the risk of hospitalization with a discharge diagnosis of AMI was nearly constant during this time period. Our findings parallel those of Bertoni *et al.*, using the Nationwide Inpatient Sample, who found an 87% decline in hospital discharges for unstable angina but no significant change in discharges for AMI between 1988 and 2001.⁹

What did change was the risk of hospitalization with a discharge diagnosis of **coronary atherosclerosis**, in a manner virtually mirroring the fall in angina PQI discharge risk. The proportion of persons admitted with a diagnosis of angina who qualified for the PQI dropped 53 percentage points from 1992-1999, while the proportion discharged with a diagnosis of coronary atherosclerosis increased 44 percentage points. Not only will ascertainment and coding of **coronary atherosclerosis** as a discharge diagnosis prevent a hospitalization from qualifying as an angina PQI discharge, it will also likely result in subsequent hospital admissions and discharges for chest pain being coded as **coronary atherosclerosis**. This latter factor seems to be the most likely explanation for the decline in hospitalizations with a primary admitting diagnosis of angina despite overall stability of hospital discharge rates for IHD and

AMI. Thus, the decline in angina PQI hospital discharges (and angina admissions) seems to be due to increased use of discharge diagnoses reflecting the definitive diagnosis of **coronary atherosclerosis**. These more definitive discharge diagnoses can also lead to diagnosis-related group classification with higher reimbursement. Medicare DRG weights for angina pectoris (DRG 140) were modestly higher than for atherosclerosis without complication/comorbidity (DRG 133) and both declined throughout this period. Atherosclerosis with complication/comorbidity (DRG 132) had a higher, though also declining, Medicare DRG weight in this timeframe. Perhaps more importantly, circulatory disorders without AMI but with cardiac catheterization (DRGs 124 and 125) both had substantially higher and steadily increasing Medicare DRG weights.¹¹ It is possible that the rollout of the Resource-Based Relative Value Scale (RBRVS) by Medicare between 1992 and 1995¹² may have played a role, such as by increasing use of coronary angiography. Maxwell *et al.*, in a study of changes in use of physicians' services under the RBRVS, found that cardiology physician RVUs per Medicare beneficiary increased over 100% between 1992 and 2002, far more than for any other studied specialty.¹³ Furthermore, Medicare first added billable codes for a number of noninvasive tests that can lead to a diagnosis of coronary atherosclerosis in 1992.¹⁴ A focused review of charts of patients hospitalized during 1992-1996 might clarify how these factors are related to the observed changes.

Our study has several limitations. Exclusion of persons with cancer from the SEER-Medicare control population means our population was slightly healthier than the overall Medicare population and hence might have had a slightly greater chance of undergoing cardiac catheterization for chest pain. A somewhat higher proportion of urban residents might also modestly increase the odds of undergoing cardiac catheterization. In addition, Medicare managed care enrollees, who increased from 4.4% of Medicare enrollment in 1992¹⁵ to about 17% in 1999,¹⁶ are not represented in the SEER-Medicare data. None of these limitations should significantly affect interpretation of our findings because, while they might modestly alter the absolute rate figures, they could not change the overall patterns we observed.

In sum, we conclude that the marked decline in angina PQI hospitalizations in the years after the publication of the IOM report does not appear to reflect improved access to primary care services, or improvement in preventive care for heart disease. Rather, it reflects trends in more aggressive diagnosis of **coronary atherosclerosis** leading to different discharge diagnoses, perhaps driven by changes in reimbursement and coding as well as ongoing changes in clinical practice. It appears that the AHRQ angina PQI measure has been vitiated by changes in cardiology practice that occurred in the 1990's. Any quality measure based on administrative data may be subject to a variety of influences, such as changes in medical practice, the underlying population, and coding practices – whether due to regulatory changes, improved accuracy, or gaming. Our findings emphasize the importance of periodic reassessment of proposed quality measures and warn against the assumption that temporal trends in these measures necessarily reflect changes in quality – or, for that matter, that lack of change reflects stasis. This is particularly important in areas where practice is known to have been changing rapidly, such as the treatment of coronary atherosclerosis.

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Figure 1. Trends in IHD discharges and angina hospitalizations, 1992-1999

Figure 2. Trends in coronary atherosclerosis, AMI and angina PQT discharges, and coronary angiography, 1992-1999

Figure 3. Trends in discharge diagnoses of persons admitted for angina, 1992-1999

Table

Population Characteristics by Year

Characteristic	1992	1993	1994	1995	1996	1997	1998	1999
Number of subjects	124186	125474	125920	125879	125335	123509	121682	123160
Age								
66-69	26%	25%	24%	24%	23%	22%	21%	21%
70-74	27%	28%	28%	28%	28%	27%	27%	27%
75-79	21%	21%	21%	21%	21%	22%	22%	23%
80+	26%	27%	27%	28%	28%	28%	29%	30%
Female	64%	64%	63%	63%	63%	63%	62%	62%
Race/ethnicity								
Black	7%	7%	7%	7%	7%	7%	7%	7%
Hispanic	2%	2%	2%	2%	2%	2%	2%	2%
Asian/Pacific Islander	2%	3%	3%	4%	4%	4%	5%	5%
Non-Hispanic white	86%	85%	85%	85%	84%	84%	83%	83%
Other	3%	3%	3%	3%	3%	3%	3%	3%
End-stage renal disease or disabled	6%	6%	6%	6%	6%	6%	6%	6%