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TRENDS IN THE OVERUSE OF AMBULATORY HEALTH CARE SERVICES IN THE U.S.

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Abstract

Context—Given the rising costs of health care, policy makers are increasingly interested in identifying the inefficiencies in our health care system.

Objective—To determine whether the overuse and misuse of health care services in the ambulatory setting has decreased in the past decade.

Design and Setting—Cross-sectional analysis of the 1999 and 2009 National Ambulatory Medical Care Survey (NAMCS) and the outpatient department component of the National Hospital Ambulatory Medical Care Survey (NHAMCS), which are nationally representative annual surveys of visits to non-federally funded ambulatory care practices. We applied a total of twenty-two quality indicators using a combination of current quality measures and guideline recommendations.

Main Outcome Measures—We estimated the rates of underuse, overuse, and misuse and their 95% confidence intervals.

Results—We observed a statistically significant improvement in 6 out of 9 underuse quality indicators. There was an improvement in the use of antithrombotic therapy for atrial fibrillation, the use of aspirin, beta blockers, and statins in coronary artery disease, the use of beta blockers in congestive heart failure, and the use of statins in diabetes. We observed an improvement in only 2 of 11 overuse quality indicators, 1 indicator became worse and 8 did not change. There was a statistically significant decrease in the overuse of cervical cancer screening in visits for females

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older than 65 and in the overuse of antibiotics in asthma exacerbations. However, there was an increase in the overuse of prostate cancer screening in men older than 74. Out of the 2 misuse indicators, there was a decrease in the proportion of patients with a urinary tract infection who were prescribed an inappropriate antibiotic.

Conclusions—In our examination of ambulatory care in the U.S., we found significant improvement in the delivery of underused care but more limited changes in the reduction of inappropriate care. In an era of heightened alarm about the high cost of healthcare, these results are especially concerning.

Introduction

Given the rising costs of health care, policy makers are increasingly interested in identifying the inefficiencies in our health care system [1]. In an analysis of the estimated \$700 billion that is wasted in our health care system, overuse, or the delivery of services for which the risks exceeds the benefits, has been identified as a significant component, equaling roughly \$280 billion dollars [2]. Interest in overuse has started to gain traction, notably by physician leaders. Several national physicians' groups have tackled the overuse of screening and diagnostic testing, identifying many common scenarios in which services are low-value and high-cost [3-4]. Research has confirmed that overuse is widespread and occurs across multiple specialties [5-6].

Assessments of the current state of our health care system typically examine one of three interrelated dimensions of quality: structure (the characteristics of the resources of the health care system), process (interactions between clinicians and patients), and outcomes (changes in patients' health status) [7]. Evaluations of process measures dominate quality improvement because they are activities that clinicians control most directly. Process measures can be further categorized into overuse, underuse, and misuse. Overuse represents the delivery of health care for which the risks outweigh the benefits (e.g., use of an antibiotic to treat viral respiratory syndromes); underuse represents the failure to deliver health care for which the benefits outweigh the risks (e.g., use of an aspirin in patients with coronary disease); misuse is the delivery of the wrong care (e.g., use of an antibiotic other than nitrofurantoin, trimethoprim-sulfamethoxazole, or quinolone for the treatment of uncomplicated urinary tract infection).

Recent studies have demonstrated an improvement in the underuse of needed medical services [8], however it is unclear whether the rates of misuse and overuse have also decreased over time. Understanding the relationship of changes in underuse to overuse and misuse helps to characterize the state of our evolving health care system, particularly with respect to the quality of care delivered and the growing costs associated with care. In this study, we apply the quality framework of underuse, overuse, and misuse to a nationally representative sample of patients cared for in ambulatory care settings to determine whether the overuse and misuse of health care services has decreased in the past decade.

Methods

Data Source

We performed a cross-sectional analysis using data from the 1998, 1999, 2008, and 2009 National Ambulatory Medical Care Survey (NAMCS) and the outpatient department component of the National Hospital Ambulatory Medical Care Survey (NHAMCS). The NAMCS and NHAMCS are nationally representative surveys conducted annually by the Centers for Disease Control and Prevention's National Center for Health Statistics. The NAMCS surveys patient visits to physicians in non-federally funded, non-hospital-based

offices; the NHAMCS surveys patient visits to physicians in non-federally funded hospital outpatient departments. The visits sampled take place during a one week period that is randomly assigned for each practice (a 4 week sample period is used in NHAMCS). We pooled 1998 and 1999 data, and 2008 and 2009 data in order to increase the sample sizes.

Both surveys use a multistage stratified probability sampling design which allows for the generation of national estimates on the patient-visit level. Information collected in both surveys includes the visit characteristics, diagnoses, medications, and services ordered.

Quality Measures

We developed our quality indicators using a combination of current performance measures and guideline recommendations (Table 1). Each indicator was chosen because it pertained to outpatient quality of care and could be reliably calculated using information in the NAMCS and NHAMCS survey in the study years. We identified a total of 22 measures, which we organized into one of three categories: underuse (Table 1a), overuse (Table 1b), or misuse (Table 1c) of health care services [9-31]. Although in some cases we applied guidelines recommendations that were published after 1999 or after 2009, this approach allowed for comparative assessments of the quality of care over time and is consistent with previous examinations of quality using NAMCS/NHAMCS [8].

For each indicator we identified the eligible population (denominator) using a combination of variables: the patient's reason for visit, the diagnosis (classified using the International Classification of Diseases, Ninth Revision, Clinical Modification diagnostic codes), and the diagnosis check-boxes (due to changes in survey design this variable was not used to identify eligible visits in the 1998 and 1999 NAMCS/NHAMCS surveys). We excluded patient visits based on clinical contraindications. For example, we were interested in examining the extent to which patients with atrial fibrillation are prescribed anticoagulation, based on a quality measure developed by the American College of Cardiology, American Heart Association and American Medical Association-Physician Consortium for Performance Improvement [9]. We constructed the denominator for this quality indicator by identifying all visits by patients with documented atrial fibrillation who did not have a contraindication to anticoagulation such as a diagnosis of gastrointestinal bleeding. We then measured the proportion of visits in which the patients were prescribed anticoagulation. Medications were identified using a combination of the medication codes developed by the NCHS and the Multum Lexicon Plus database [32].

Statistical Analyses

For each measure, we calculated the weighted proportion of eligible visits in which the patient received recommended care, or, in the case of our overuse and misuse measures, the weighted proportion of eligible visits in which the patient received non-recommended care. We then used the chi-square test to compare differences in these weighted proportions between 1998/1999 and 2008/2009.

We took into account the sampling weights and sample design variables available in NAMCS and NHAMCS in order to generate these weighted, nationally representative estimates. The reliability of the estimates are in accordance with the standards specified by the National Center for Health Statistics, and quality indicators were not included if they had less than 30 unweighted cases in each cell [33]. We generated 95% confidence intervals using Stata statistical software, version 11.0 (Stata Corp., College Station, TX).

Results

Sample Characteristics

In our study sample there were 79,083 and 102,980 unweighted visits by adult patients 18 years of age, in 1998/1999 and 2008/2009 respectively (Table 2). Compared to visits made in 1998/1999, visits in 2008 and 2009 were by slightly older patients (mean age 54.2 in 2008/2009, 50.9 in 1998/1999; $p<.001$), and by more patients insured through Medicare (26.2% versus 22.7%, $p=0.03$). Otherwise, the 1998/1999 and 2008/2009 study samples were similar with respect to patient sex, race, ethnicity, reason for visit, and practice region.

Changes in Underuse Measures

In our analysis of underuse measures, we observed a statistically significant improvement in six out of nine quality indicators (Table 3). In the 10-year interval under consideration, there was an improvement in the use of antithrombotic therapy for atrial fibrillation (45.9% to 71.9%, $p<0.01$). There was also an improvement in the use of aspirin (28.4% to 64.5%, $p<0.01$), beta blockers (28.1% to 55.2%, $p<0.01$) and statins (26.8% to 58.6%, $p<0.01$) in coronary artery disease (CAD). There were also improvements in the use of beta blockers in congestive heart failure (CHF) (20.6% to 59.7%, $p<0.01$) and the use of statins in diabetes (12.1% to 36.2%, $p<0.01$). We did not find statistically significant differences in the remaining underuse quality indicators: the use of ace-inhibitors in CHF, the use of anti-platelets in stroke, and the pharmacologic treatment of osteoporosis.

Changes in Overuse over Time

We observed an improvement in only 2 of 11 overuse quality indicators, 1 indicator became worse and 8 did not change. There was a statistically significant decrease in the overuse of cervical cancer screening in visits for females older than 65, (3.1% to 2.2%, $p=0.02$) and in the overuse of antibiotics for asthma exacerbations (22.3% to 6.8%, $p<0.01$). Rates of urinalysis testing at general medical exams also declined though the difference was of borderline significance (39.9% vs. 25.3%, $p=.05$). However, there was an increase in the overuse of prostate cancer screening in men older than 74, (3.5% to 5.7%, $p=0.03$). There were no changes in the remaining 8 overuse measures: complete blood count and electrocardiogram testing in general medical exams, use of antibiotics for upper respiratory infections and acute bronchitis, mammography for women older than or equal to age 75, and imaging in acute back pain.

Changes in Misuse over Time

Out of the 2 misuse indicators, there was 1 significant improvement. The proportion of patients with a urinary tract infection who were prescribed an inappropriate antibiotic decreased from 24.9% to 2.7% ($p<.01$). There was no change in the proportion of elderly patients who were prescribed inappropriate medications. Adjusting for insurance status to account for potential differences in access to care did not change our results.

Discussion

In our examination of ambulatory health care services over 10 years, we found an improvement in 6 out of 9 measures of underuse but only 3 out of 13 measures of inappropriate care (both overuse and misuse). Our findings of the continued delivery of inappropriate care such as the use of PSA testing in older men and cervical cancer screening in older women are consistent with other studies that demonstrate the persistence of inappropriate care [34, 35]. Our results also suggest that there has been little change in the delivery of inappropriate ambulatory care in the past decade.

Given the questionable sustainability of the current trajectory of health care costs, our findings uniquely inform the discussion of strategies to improve the quality of healthcare, particularly as solutions are analyzed with an eye on their affordability and financial impact. We found considerable room for improvement in most of our overuse measures, a space in which the dual goals of high quality and reduced costs can be met, and demonstrated that attention to underuse and overuse has been uneven. The United States has a higher total expenditure on health relative to its gross domestic product compared to all other countries [36]. Although there is continuing debate about what constitutes a reasonable cost of healthcare, there is growing momentum in delivering higher quality care that costs less. Reducing inappropriate care where patients clearly do not benefit and for which there may be added risk is certainly part of this stated goal [37].

There are several possible explanations for our findings; however among the most likely is that targeting and reducing inappropriate care has not been a real focus of the quality of care movement. In the past two decades, there has been substantial growth in methods to measure quality in healthcare. These quality measures have developed alongside the growing understanding that medicine can and should be delivered based on evidence. Using a combination of information from clinical trials and observational studies, panels of expert physicians have created clinical practice guidelines, a repository of which is maintained by the Agency for Healthcare Research and Quality [38]. The creation of clinical practice guidelines has informed the development of metrics to assess the quality of our health care system [39]. Although quality assessments are dominated by process-based measures, these have mostly taken the form of underuse measures. And despite the acknowledgement that overuse contributes to waste and inefficiency in our health care system, it is not routinely measured in quality assessments. In light of the abundance of literature and practice guidelines related to underuse, our finding that the overuse of ambulatory care may have changed little over the past 10 years is not entirely unexpected. Reducing inappropriate care will require the same attention to guideline development and performance measurement that was directed at reducing the underuse of needed therapies.

Developing guidelines and performance measures to reduce inappropriate care may be easier said than done. There are many methodological, political, and cultural challenges that have impeded progress in these areas. There are two main methodological challenges to creating quality measures that address the delivery of inappropriate care [40]. First, overuse, unlike underuse, is not easily studied within publically reported databases or within hospital claims data. For example, if a patient has an acute myocardial infarction, all that may be needed to determine whether a patient appropriately received an aspirin is the discharge diagnosis, inpatient medication list and discharge medications. The second challenge is the difficulty in creating guidelines and measures around overuse of many types of health care services. Determining if a patient inappropriately received a procedure requires a much more detailed set of clinical criteria than what is required for assessments of underuse. Although there are methods for assessing the appropriate use of services, such as the RAND Appropriateness Method, they are typically time-consuming and expensive processes [41]. For example, creating appropriateness criteria using the RAND appropriateness method for the appropriate insertion of tympanostomy tubes requires not only a systematic review of the literature, but also assembling an expert panel composed of physicians from multiple specialties, such as pediatricians and pediatric otolaryngologists grading an exhaustive and mutually exclusive list of clinical factors, such as the presence of hearing or language delay [42]. Some specialty organizations (e.g., American College of Cardiology /American Heart Association [43]) have developed appropriateness criteria around a number of procedures and diagnostic tests. However, the methodology has not been widely implemented to develop a robust set of guidelines across a large spectrum of services.

There has also been no formal effort to develop and promote the use of standardized overuse measures even though there are some simple measures of overuse that could be easily implemented and studied. For example, there is good evidence that screening for prostate cancer in the very elderly and infirm is not beneficial [44] and yet it continues to be performed at alarming rates [45]. Despite being easily measured, this practice has not been evaluated as a potential performance measure or adopted by the Healthcare Effectiveness Data and Information Set (HEDIS).

There are political and cultural challenges to addressing overuse as well, namely resistance to limiting access to health care services. For example, the Agency for Healthcare Research and Quality (formerly, the Agency for Health Care Policy and Research), whose charge includes the creation of practice guidelines, was nearly dissolved when it recommended against the use of surgery in the initial management of low-back pain [46]. The government has not since taken up the mantle of addressing inappropriate care through the creation of practice guidelines. The unwillingness of our society to address overuse to achieve both high quality and affordability reflects the pervasive fear of rationing [47] and the interests of industry stakeholders.

The reactions by physicians to limit inappropriate care have been mixed. For example, when the USPSTF recently updated and published their draft recommendations discouraging the use of PSA screening in asymptomatic men, they received strong words of rebuke from the American Urologic Association [48]. However not all physicians are opposed to limiting care with unclear benefits. Recently, the National Physicians Alliance through its Good Stewardship project launched a campaign to limit inappropriate ambulatory care and proposed a set of 5 overused practices in the fields of internal medicine, family medicine, and pediatrics [3,5]. The American Board of Internal Medicine Foundation followed suite and launched the *Choosing Wisely* campaign, in which they coordinated with nine physician specialty organizations, including cardiologists, radiologists, and oncologists, to identify tests or procedures that are commonly used and not always appropriate [49]. The campaign is notable for the collaboration with many procedure-oriented physicians' groups, who are valuing high quality care over financial gains. These initiatives may be foreshadowing a change in practice culture that may be necessary to begin the hard work of addressing the delivery of inappropriate care in the US health care system.

There are limitations to the conclusions of our study. The number of underuse, overuse, and misuse measures available in the NAMCS and NHAMCS data sets is limited, thus our study presents just part of the picture of appropriateness of care in ambulatory care settings and we cannot conclude with statistical confidence that misuse occurred with greater frequency than underuse. Second, some of the observed differences may not be statistically significant because of insufficient statistical power. Third, we were limited by the availability of data in the NAMCS database. For example, the NAMCS surveys only document 6-8 medications per visit and it is possible that appropriate or inappropriate medications were not documented for some visits, leading to over- or under-estimation. Fourth, we may have underestimated the receipt of some services because NAMCS only documents care at one visit per year. However, the trends remain informative because biases arising from a once-a-year assessment apply equally to all years of study. Lastly, we were unable to examine explanatory mechanisms for underuse or overuse, such as physician rationale and decision making. Understanding the root cause of overuse will require looking beyond most public use data sets or claims based data.

In our examination of ambulatory care in the U.S., we found an improvement in most of the underuse measures but limited changes in the delivery of inappropriate care. Reducing health care costs and improving the quality of care in the US can be achieved by reducing

overuse and misuse of health care services, but it will require making uncomfortable decisions that patients, physicians and policymakers have been historically unwilling to make. Developing clinical practice guidelines that define when care should not be delivered and performance measures to address inappropriate care are critical steps to advance the mission of increasing the value and efficiency of health care delivery.

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Table 1a

Underuse quality indicators

Quality Indicator	Denominator	Numerator	Exclusion	Quality Indicator Source or Clinical Guideline
Antithrombotic therapy for AF	Visits by adults with AF	Visits by adults with AF who received warfarin, dicumarol, anisindione, or aspirin as antithrombotic therapy	Visits by adults with GI bleeding, gastritis, duodenitis, alcoholism, drug abuse, gait abnormality, alzheimer's, cerebral hemorrhage, or thrombocytopenia	ACC/AHA/AM A-PCPI [9]
ACE Inhibitor use for CHF	Visits by adults with CHF	Visits by adults who received ACE-I or ARB	Visits by adults with hyperkalemia or angioedema	CMS Joint Commission [10]
Aspirin use for CAD	Visits by adults with CAD	Visits by adults who received antiplatelet agents	Visits by adults with GI bleeding, gastritis, duodenitis, cerebral hemorrhage	ACC/AHA/PCPI [11]
Blocker in CHF	Visits by adults with CHF	Visits by adults with CHF who received Blocker	Visits by adults with asthma, COPD, or heart block	ACC/AHA/PCPI [12]
Blocker in CAD	Visits by adults with CAD	Visits by adults with CAD who received Blocker	Visits by adults with asthma, COPD, or heart block	ACC/AHA/PCPI [13]
Anti-platelet use for ischemic stroke	Visits by adults with history of ischemic stroke	Visits by adults with history of ischemic stroke who receive aspirin, aspirin plus dipyridamole, or clopidogrel monotherapy	Visits by adults with GI bleeding, gastritis, duodenitis, cerebral hemorrhage	AAN/ACR/PCPI/NCQA [14]
Statin use in CAD	Visits by adults with CAD	Visits by adults with CAD who are prescribed a statin medication	Visits by adults with liver disease, alcohol abuse or specific concomitant medication use	UMHS [15]
Statin use	Visits by adults age 40 with diabetes	Visits by adults with diabetes who received a prescription for statin	Visits by adults with liver disease, alcohol abuse or specific concomitant medication use	HDC [16]
Pharmacologic therapy for osteoporosis	Visits by adults with osteoporosis	Visits by adults with osteoporosis who are prescribed pharmacologic therapy for osteoporosis (bisphosphonate, calcitonin, estrogen, pth, SERM, calcitriol)	None	AAFP/ AAOS/AACE/AACR/ ES/PCPI/ NCQA [17]

Table 1b

Overuse quality indicators

Quality Indicator	Denominator	Numerator	Exclusion	Quality Indicator Source or Clinical Guideline
Prostate cancer screening in men age > 74	Visits by men age 75	Visits by men age 75 who are ordered a PSA	Visits by adult men age 75 with prostate cancer	USPSTF [18]
Screening ECG in adults in GME	Visits by adults who present for GME	Visits by adults who present for GME and are ordered an ECG	Visits by adults with CAD, arrhythmia, chest pain, HTN, palpitations, dyspnea, or syncope	USPSTF [19]
Screening UA in adults in GME	Visits by adults who present for GME	Visits by adult men and non-pregnant women who present for GME and are ordered a UA	Visits by adults with urologic disease, pregnancy, or diseases of genital organs	USPSTF [20]
Screening CBC in adults in GME	Visits by adults who present for GME	Visits by adults who present for GME and are ordered a CBC	Visits by adults with cancer, hematologic abnormalities	USPSTF [21]
Screening X-ray in adults in GME	Visits by adults who present for GME	Visits by adults who present for GME and are ordered a chest x ray	None	USPSTF [22]
Cervical cancer screening in women age > 65	Visits by women age 65	Visits by women age 65 who were ordered a pap test	Visits by women age 65 with cervical cancer, uterine cancer, cervical dysplasia or vaginal bleeding	USPSTF [23]
Mammography screening for women age 75	Visits by women age 75	Visits by women age 75 who received a mammogram	Visits by women age 75 with history breast cancer, breast mass, lump	USPSTF [24]
Xray for back pain in adults age 18-55	Visits by adults with acute back pain	Visits by adults with acute back pain who received xray	Visits by adults with malignancy, weight loss, fever, cachexia, neurological signs	NCQA [25]
Antibiotics for URTI	Visits by adults with uncomplicated URTI	Visits by adults with uncomplicated URTI who received any antibiotic medication	Visits by adults with HIV, COPD, cancer	ICSI [26]
Antibiotics for acute bronchitis	Visits by adults with acute bronchitis	Visits by adults with bronchitis who received any antibiotics	Visits by adults with HIV, cystic fibrosis, cancer, chronic bronchitis, emphysema, bronchiectasis, extrinsic allergic alveolitis, chronic airway obstruction, tuberculosis, pneumoconioses	NCQA [27]
Antibiotics for acute asthma exacerbation	Visits by adults with acute asthma exacerbation	Visits by adults with acute asthma exacerbation who receive any antibiotics	None	NAEP [28]

Table 1c

Misuse quality indicators.

Quality Indicator	Denominator	Numerator	Exclusion	Quality Indicator Source or Clinical Guideline
Antibiotics other than nitrofurantoin, trimethoprim-sulbactam, or quinolone use for UTI	Visits by female adults with uncomplicated UTI	Visits by female adults with uncomplicated UTI who receive abx other than nitrofurantoin, trimethoprim-sulbactam, or quinolone	Visits by female adults with vaginitis/cervicitis, skin infections, kidney infections, STD, history of DM, cancer, pregnancy nephrolithiasis, urologic procedures	IDSA [29]
Inappropriate medications in the elderly	Visits by adults age 65 with reported medications	Visits by adults age 65 who received any of 33 potentially inappropriate medications	Visits by adults age 65 with diabetes	Beers [30] & Zhan [31]

Abbreviations: AF, atrial fibrillation; ACC/AHA/AMA-PCPI, American College of Cardiology/American Heart Association/American Medical Association-Physician Consortium for Performance Improvement; CHF, congestive heart failure; Ace-I, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CMS, Centers for Medicare and Medicaid Services; CAD, coronary artery disease; AAN/ACR/PCPI/NCQA, American Academy of Neurology, American College of Radiology, Physician Consortium for Performance Improvement, National Committee for Quality Assurance; UMHS, University of Michigan Health System; HDC, Health Disparities Collective; AAFP/AAOs/AACE/AACR/ES/PCPI/NCQA, American Academy of Family Physicians, American Academy of Orthopaedic Surgeons, American Association of Clinical Endocrinologists, American College of Rheumatology, Endocrine Society, Physician Consortium for Performance Improvement, National Committee for Quality Assurance; PSA prostate specific antigen; USPSTF, United States Preventive Services Task Force; ECG, electrocardiogram; GME, general medical exam; HTN, hypertension; CBC, complete blood count; UA, urinalysis; URTI, upper respiratory tract infection; COPD, chronic obstructive pulmonary disease; ICSI, Institute for Clinical Systems Improvement; NAEP, National Asthma Education Program; IDSA, Infectious Diseases Society of America.

Table 2

Characteristics of adult visits to physicians in 1998/1999 and 2008/2009

Visit characteristic	1999, % ^a N=79,083	2009, % N=102,980	p-value
Patient Sex			
Male	36.1	37.9	.16
Female	63.8	62.1	
Patient Age, mean	50.9	54.2	<.001
Patient Race			
White	80.9	83.8	.22
Black	15.6	11.6	
Other	3.5	4.6	
Patient Ethnicity			
Hispanic	6.9	8.1	.50
Non-Hispanic	26.8	29.9	
Blank	66.3	62.0	
Patient Insurance Status			0.03
Private	50.4	50.8	
Medicare	22.7	26.2	
Medicaid	7.7	9.9	
Other	19.2	13.1	
Reason for visit			
New problem	32.3	30.9	.24
Chronic problem	50.9	50.0	
Preventive care	14.9	17.3	
Other	1.9	1.8	
Practice Census Region			.88
Northeast	18.4	19.4	
Midwest	18.4	21.8	
South	42.0	38.1	
West	21.2	20.8	
Practice Location in a Metropolitan Statistical Area			.27
Yes	83.1	88.7	
No	16.9	11.3	

Table 3

Comparison of underuse, overuse, and misuse in 1999 to 2009

	1999	2009	
	% (95% CI)	% (95% CI)	P value
Underuse Measures Group			
Antithrombotic therapy for AF	45.9 (33.4 – 59.0)	71.9 (66.5 – 76.7)	<.01
ACE Inhibitor use for CHF	44.8 (37.6 – 52.4)	41.6 (37.4 – 45.9)	.47
Aspirin use for CAD	28.4 (22.4-35.3)	64.5 (60.2-68.5)	<.01
BB in CHF	20.6 (11.8 – 33.4)	59.7 (53.8 – 65.4)	<.01
BB in CAD	28.1 (22.1 – 35.2)	55.2 (51.7 – 58.8)	<.01
Anti-platelet use for stroke	51.0 (36.7 – 65.2)	48.7 (41.1 – 56.3)	.78
Statin in CAD	26.8 (19.7 – 35.2)	58.6 (54.1 – 63.0)	<.01
Statin in DM	12.1 (9.23 – 15.57)	36.2 (33.4 – 39.2)	<.01
Pharmacologic therapy for osteoporosis	35.3 (23.6 – 48.9)	45.1 (37.8 – 52.7)	.21
Overuse Measures Group			
Prostate cancer screening in men age > 74	3.5 (2.4 – 5.1)	5.7 (4.6 – 7.0)	.03
Screening EKG in adults in GME	6.1 (3.1 – 11.5)	11.3 (5.9 – 20.8)	.20
Screening UA in adults in GME	39.9 (29.5 – 51.4)	25.3 (17.2 – 35.6)	.05
Screening Xray in adults in GME	4.7 (2.4 – 9.1)	7.0 (3.2 – 14.5)	.47
Screening CBC in adults in GME	22.3 (13.1 – 35.3)	37.9 (26.8 – 50.6)	.08
Cervical cancer screening in women age> 65	3.1 (2.6 – 3.8)	2.2 (1.8 – 2.7)	.02
Mammography screening for women age >74	2.1 (1.5 – 3.0)	2.6 (2.0 – 3.5)	.35
Imaging for back pain in adults age >18	19.1 (15.2 – 24.1)	22.8 (18.4 – 27.9)	.25
Abx for URI	37.8 (34.4-41.3)	40.2 (36.6-43.9)	.36
Abx for acute bronchitis	60.8 (51.4 – 69.5)	58.8 (47.3 – 69.4)	.78
Abx for asthma	22.3 (13.9 – 33.9)	6.8 (4.9 – 9.3)	.001
Misuse Measures Group			
Abx other than Nitrofurantoin/Trimethoprim/Quinolone use for UTI	24.9 (18.1 – 33.2)	2.7 (1.2 – 5.7)	<.01
Inappropriate meds in the elderly	6.5 (5.8 – 7.3)	7.2 (6.3 – 8.1)	0.29