Comparison of Self-Reported and Medicare Claims-Identified Acute Myocardial Infarction

Running title: Yasaitis et al.; Self-reported vs. Claims-identified AMI

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Abstract

Background—Cardiovascular disease is often studied through patient self-report and administrative data. Yet, these two sources provide different information, and few studies have compared them.

Methods and Results—We compared data from a longitudinal nationally-representative survey of older Americans with matched Medicare claims. Self-reported acute myocardial infarction (AMI) in the previous two years was compared to claims-identified AMI and acute coronary syndrome (ACS) events. Among the 3.1% of respondents with self-reported AMI, 32.8% had claims-identified AMI, 16.5% non-AMI ACS, and 25.8% other cardiac inpatient visits, 17.3% had no inpatient visits in the previous 2.5 years. Claims-identified AMIs were found in 1.4% of respondents; of these, 67% reported an AMI. Self-reports were less likely among respondents over 75 years (62.7% vs. 74.6%, p = 0.006), with less than high school education (61.6% vs. 71.4%, p = 0.015), with at least one ADL limitation (59.6% vs. 74.7%, p = 0.001), or below the 25th percentile of a word recall memory test (60.7% vs. 71.3%, p = 0.019). Both self-reported and claims-identified cardiac events were associated with increased mortality; the highest mortality was observed among those with claims-identified AMI who did not self-report (OR 2.8, 95% CI 1.5 - 5.1), and among those with self-reported heart attack and claims-identified AMI (2.5, 1.7 – 3.6) or non-AMI ACS (2.7, 1.8 – 4.1).

Conclusions—There is considerable disagreement between self-reported and claims-identified events. Although self-reported AMI may be inaccurate, it indicates increased risk of death, regardless of whether the self-report is confirmed by Medicare claims.

Key words: acute myocardial infarction, acute coronary syndrome, patient reported outcome, Medicare, survival analysis
Introduction

Cardiovascular disease is the leading cause of death in the United States, with acute myocardial infarction (AMI) the focus of much research and numerous policy initiatives\textsuperscript{1-4}. Most of the information we have about the social and clinical epidemiology of the disease comes from self-report or administrative claims \textsuperscript{5-10}. Yet, there have been no nationally representative studies comparing the congruence between these two sources, and the potential implications of divergence – which may indicate poor understanding of medical history – for patient outcomes.

Inaccurate self-assessment of disease status may be particularly important among older patients, those with less education or who have more severe disease, or functional or cognitive impairments\textsuperscript{11,12}. As physicians' understanding of patient history often relies on self-report of previous conditions, such inaccuracies may have implications for treatment decisions. Further, the extent and distribution of any incongruence between self-reported and claims-identified events may help inform the use of both data sources to study the clinical and social epidemiology of cardiovascular diseases.

In this study, we use data from the Health and Retirement Study, a nationally representative survey of older Americans, matched to Medicare claims, to examine the congruence between self-reported and claims-identified AMI. We examine whether patient characteristics are associated with patients self-reporting an AMI without a Medicare claim, or not reporting an AMI when claims indicate one. We also assess the extent to which other diagnoses, both cardiac and non-cardiac, may account for self-reported AMI. Finally, we assess the relationship between one-year mortality and self-reported or claims-identified AMI.
Methods

Study Population

We analyzed data from the Health and Retirement Study (HRS), a longitudinal biennial nationally representative survey of Americans 50 years and older, which includes a wide range of questions on health and sociodemographics\textsuperscript{13}. The majority of respondents have given permission to link their survey data to Medicare claims for research. The linkage between survey responses and Medicare claims is performed by HRS staff based on respondents' Health Insurance Claim number, which is subsequently replaced by a different identifier; these claims are then provided to researchers. We used interview data from the years 1996 – 2008, as the questions regarding cardiac health history were nearly identical, and there was sufficient follow up in future waves to fully assess respondents' survival. As our analysis involved identifying AMI hospitalizations up to 2.5 years preceding each interview, the study population was limited to interviews of respondents at least 67 years old, who had greater than 2.5 years of previous continuous traditional (fee-for-service) Medicare coverage.

Study Variables

Demographic variables included age at the time of interview, gender, race, education, and wealth. We dichotomized education based on whether respondents had completed high school (or GED). We used a measure of wealth that captured the sum of respondents' total assets (including the value of one's primary residence, investments, and retirement accounts, among other assets). Wealth was chosen over income because our study population consisted of older adults, who are more likely to be retired. Wealth was dichotomized based on the median among respondents aged 67 or older.

Health status variables included self-rated fair or poor health, and limitation in any of
three activities of daily living (ADLs): bathing, dressing, and eating. Mental status questions included self-rated fair or poor memory, a total word recall score (0-20), and a summary cognitive score (0-35)\textsuperscript{14}. Total word recall was dichotomized based on being below the 25\textsuperscript{th} percentile of all HRS respondents age 67 or older. Overall cognitive score was dichotomized based on a cut-off suggestive of moderate to severe cognitive impairment (score 0-7)\textsuperscript{15}.

Self-reported AMI was defined as a positive answer to one of two questions: “Since (month and year of last interview), have you had a heart attack or myocardial infarction?” or “In the past two years, have you had a heart attack or myocardial infarction?” This question was only asked of respondents who had responded positively to the question: “Has a doctor ever told you that you had a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems?” Therefore, respondents who reported AMI represented a subset of those who reported heart problems.

From Medicare claims, two types of cardiac hospitalizations were defined: acute coronary syndrome (ACS) and AMI. Acute coronary syndrome is a wider diagnostic category, encompassing AMI and other emergent conditions with diminished cardiac blood supply, including unstable angina\textsuperscript{16}. We included these related conditions because their clinical presentations may be indistinguishable from AMI; a patient may reasonably report having experienced an AMI after having had a closely related condition. We identified ACS visits by an ICD-9 code of 410.XX, 411.XX (other acute or subacute ischemic heart disease), or 413.XX (unstable angina) in any position\textsuperscript{17} on an inpatient hospital claim. Among these events, a narrower subcategory of AMI was identified by a primary or secondary ICD-9 diagnosis code of 410.X1 (X being any number 0-9), a definition that has recently been validated with chart review\textsuperscript{18}. We purposely created a relatively broad definition for ACS, and a relatively narrow one for
AMI. For all claims-identified events, we only included the hospitalization if the length of stay was at least three days, in accordance with validated definitions.\(^{18}\)

Medicare claims were used to determine primary and secondary diagnosis codes for all hospitalizations among those with a positive self-report. Additionally, among those with claims-identified AMI, ICD-9 procedure codes for percutaneous stent placement (360X), coronary artery bypass graft (361X), and percutaneous imaging of coronary blood vessels (372X) were recorded, as were the overall length of stay and length of stay in an ICU. Medicare claims data have been shown to be quite accurate in recording cardiovascular health events.\(^{18}\) There are strong incentives for hospitals to report events such as AMI; they only get paid for what they report, and there are substantial penalties for fraudulent claims.\(^{19}\)

**Statistical analyses: study population characteristics**

We assessed summary statistics of the study population: age, gender, race, education, wealth, health, mental status, and self-reported AMI and heart problems. We determined whether there were any significant differences in these characteristics across HRS respondents who were and were not included in the study cohort (those with less than 2.5 years of Medicare claims).

**Statistical analyses: self-reported AMI**

There were two possible AMI definitions: self-reported and claims-identified. First, we determined the percent of each demographic subgroup that self-reported experiencing an AMI in the previous two years. Among these, we assessed the percent that had a claims-identified AMI or ACS in the 2.5 years prior to the interview (as defined above, claims-identified ACS is a broader category, which includes AMI). We used a longer time window in order to allow for respondents' potential mis-remembering of events slightly beyond the horizon about which they were asked.
Some respondents with self-reported AMI may have actually experienced a different cardiac condition, but not AMI or ACS. In an attempt to account for all self-reported events, we recorded all hospitalizations from the previous 2.5 years for respondents with a positive self-report. The most common cardiac and non-cardiac diagnoses were tabulated. We then assigned each respondent a single diagnosis, based on relevance to AMI/ACS. Those with claims-identified AMI were labeled as such; next we identified those with non-AMI ACS. We then assigned respondents a single cardiac diagnosis, with those appearing most frequently in the overall tabulations assigned first. For those with only non-cardiac diagnoses, we assigned either one of the most frequent non-cardiac diagnoses, or a designation of “other”, if there were not enough respondents sharing their diagnoses.

Statistical analyses: claims-identified AMI

The second way we defined AMI events was through Medicare claims. We determined the percent of each demographic sub-group with a claims-identified AMI. Here, we only included those with claims-identified AMI (not the broader ACS) occurring between two consecutive interviews, or within 2 years (if the respondent was not interviewed in the previous wave); this more stringent time window and claims-based definition was used in order to avoid over-counting events, which would have artificially lowered the apparent accuracy of respondents' recall. We then assessed the proportion of these respondents who self-reported an AMI, or reported having heart problems (respondents reporting heart problems comprise a larger group, which includes all those who reported AMI). We compared how frequently respondents with a claims-identified AMI reported a heart attack across categories defined by self-rated health and memory, difficulty with at least one ADL, cognitive function indicators, and clinical treatment: overall length of stay, ICU length of stay, and receipt of cardiac stent, CABG, or percutaneous imaging.
Statistical analyses: trends over time

Due to concerns about potential changes in AMI and ACS diagnosis rates, as well as patient education efforts, over the time period, we examined wave-specific rates of claims-identified AMI, ACS, and self-reported AMI. We also examined wave-specific concordance between the two sources.

Statistical analyses: survival analysis

We assessed the survival consequences of being in each category of self-reported or claims-identified AMI or ACS. Complete assessment of one-year mortality was possible for virtually all respondents (99.9% of HRS respondents either had a valid date of death or were respondents or non-respondents that were ascertained to be alive at the next wave); we therefore performed logistic regression analyses to predict the risk of death within one year of the interview date. In these regressions, we first assessed the unadjusted odds of one-year mortality associated with each of the following five categories: (1) no claims-identified events, but self-reported AMI, (2&3) claims-identified non-AMI ACS (with or without self-report) and (4&5) claims-identified AMI (with or without self-report). The reference group was respondents with no claims-identified ACS and no self-report. We then determined the same statistics controlling for age, gender, race, education, marital status, and household wealth.

Sensitivity Analyses

We performed a variety of sensitivity analyses. First, in our main analyses, all tabulations and regressions were adjusted for the complex survey design and population weights, which assign a value of zero to all institutionalized (e.g. living in a nursing home) respondents, excluding a substantial minority of respondents with either claims-identified or self-reported AMI. We therefore re-ran all of our tabulations and regressions without weights. Additionally, adjusting
regression analyses for the complex survey design precluded the simultaneous inclusion of longitudinal effects; each interview was treated as a separate observation. We addressed the potential for clustering of observations over time by running our regressions with population weights, but with robust standard errors that accounted for clustering within respondents.

In assessing one-year mortality, we made some assumptions regarding the 0.1% of respondents who had neither a reported date of death, nor were ascertained to be alive at the next interview wave. We created alternative mortality outcomes in which all of these respondents were assessed to have lived one year, and in which all were assessed to have died. Additionally, while our main analysis used a dichotomized measure of wealth for consistency with the summary statistics we presented elsewhere, we tested whether controlling for alternative wealth measures – either quintiles, or a continuous variable – affected our logistic regression findings. We also performed alternative survival analyses with a longer follow-up by assessing survival times up to six years for two cohorts of respondents (those who were respondents in 1998 or 2004), and then combining these respondents into a single analytic cohort; these data were then analyzed using Cox proportional hazards regressions, both with and without adjustment for the complex survey design and population weights.

Finally, we tested several alternative claims-based AMI definitions. The most stringent definition included only those inpatient visits with a diagnosis-related group (DRG) code of 121, 122, or 123, while the broadest definition allowed for an ICD-9 code of 410.XX (X being any digit 0-9) in any diagnosis field on the claim. Relatedly, in the main analyses of self-reported AMI, all inpatient admissions from the 2.5 years prior to the interview date were analyzed (despite the interview question asking only about the previous 2 years). It is possible that respondents recalled an AMI correctly, but had experienced one even earlier. We therefore re-
ran this analysis looking back either 3 or 3.5 years. Finally, while the validated definition that we followed had required a minimum length of stay of three days, it is possible that patients with ACS, or even AMI, would be discharged sooner. Therefore, in this analysis, we included all inpatient claims for AMI and ACS events, with no minimum length of stay.

All analyses were adjusted for the complex survey design and representative population weights. Data management of Medicare claims was performed using SAS version 9.3, and all analyses performed using Stata version 12.1. The study was approved by the local Institutional Review Board. All participants provided informed consent for the use of their survey responses and Medicare claims for research purposes.

Results

Respondent characteristics

Table 1 presents demographic and health characteristics among HRS respondents aged 67 and older included in our final study cohort. Among the 65,810 respondents age 67 years and older, 45,335 (68.9%) were included in the study cohort: they both gave permission for their Medicare claims to be used for research, and had at least 2 years of continuous non-HMO Medicare coverage prior to their interview date. Compared with those not in the cohort, there were no significant differences in the distribution of gender, educational achievement, wealth, self-rated health, or frequency of self-reported AMI (data not shown). Those in the study cohort were slightly older (76.7 years vs 75.4, p<0.001), less likely to identify as African American or "Other" race (9.1% vs. 12.2%, p = 0.004), slightly more likely to report difficulty with at least one ADL (16.9% vs. 15.7%, p = 0.02), and more likely to report having heart problems (33.1% vs. 28.9%, p < 0.001).
Self-reported AMI

In Table 2, we present the proportion with self-reported AMI across demographic subgroups, and the proportion of these who had a claims-identified AMI or ACS within the previous 2.5 years (AMI is a subset of ACS here). Overall, 3.1% had a self-reported AMI; of these, 32.3% had a claims-identified AMI, while 48.7% had a claims-identified ACS. Age of respondents was marginally associated with the likelihood of finding a claims-identified AMI, but there were no other significant associations between demographics and the likelihood that a self-reported AMI would be matched with a claims-identified event.

To explore different possible sources of self-reported events, we investigated Medicare claims of all respondents with self-reported AMI. We identified all inpatient visits for 2.5 years before the interview, and assigned to each respondent a diagnostic category, giving priority first to the most relevant diagnoses. In Figure 1, we display the accounting of all respondents with self-reported AMI; 32.3% had claims-identified AMI, and 16.5% non-AMI ACS. An additional 25.8% of the respondents had alternative cardiac hospitalizations: 8.5% each heart failure and other ischemic heart diseases, 4.9% dysrhythmia, and 3.9% other cardiac diagnoses. Among the remaining respondents, 1.1% had an inpatient admission for urinary tract infection, 0.7% for pneumonia, and 6.3% had some other non-cardiac admission. For 17.3% of those with self-reported AMI, we found no inpatient admissions of any type in the previous 2.5 years.

Claims-identified AMI

We found claims-identified AMI during the previous 2 years in 1.4% of the population; of these, 67.8% self-reported AMI, and 90.5% reported heart problems in that time period (by design of the survey, all those reporting AMI also reported heart problems). Respondents over age 75 were less likely to report AMI (62.7% vs. 74.6%, p = 0.006) and heart problems (88.0% vs.
93.9%, p = 0.042), and those with less than a high school education were less likely to report AMI (61.6% vs. 71.4%, p = 0.015).

In Figure 2, we compared the likelihood that respondents with claims-identified AMI had a positive self-report, across categories defined by health and mental status, and clinical treatment. Respondents were equally likely to report an AMI if they had fair/poor self-rated health or memory, but they were less likely to report one if they had at least one ADL limitation (59.6% vs. 74.7%, p = 0.001), or were below the 25th percentile of word recall (60.7% vs. 71.3%, p = 0.019). The only clinical treatments that were associated with likelihood of self-report were the receipt of cardiac stent (82.8% among those with stent vs. 61.4%, p < 0.001) and percutaneous imaging of cardiac vessels (74.1% vs. 61.4%, p = 0.018).

**Trends over time**

We examined wave-specific rates of claims-identified AMI and ACS events, as well as self-reported AMI. Both types of events fluctuated, and were somewhat lower in the final three waves; claims-identified AMI was between 1.1% and 1.2% in the waves corresponding to years 2004, 2006, and 2008, down from rates between 1.3% to 1.7% in the waves from 1996 – 2002. Concordance between self-reported and claims-identified events, however, showed no clear trend over the time period; we therefore presented the pooled estimates of concordance in Table 2.

**Survival analysis**

To understand the differences in mortality associated with each category of self-reported and claims-identified AMI or ACS, we performed logistic regression, assessing one-year mortality as a function of each of the six categories identified (respondents with no self-reported AMI and no claims-identified events served as the reference). In Figure 3, we present the unadjusted estimates in Panel A, and in Panel B the same estimates adjusted for age, sex, race, marital
status, education, and wealth.

Even among those with no claims-identified ACS, self-reported AMI was associated with increased one-year mortality (unadjusted OR 2.4, 95% CI 1.9 – 3.1; adjusted OR 2.0, 95% CI 1.5 – 2.6). The highest odds of one-year mortality were found among those who had a claims-identified AMI but did not report it (unadjusted OR 3.8, 95% CI 2.1 - 6.6; adjusted OR 2.7, 95% CI 1.5-5.1), as well as those with both self-reported AMI and claims-identified non-AMI ACS (unadjusted OR 3.2, 95% CI 2.1-4.8; adjusted OR 2.7, 95% CI 1.8 - 4.1) or AMI (unadjusted OR 2.8, 95% CI 1.9 - 4.0, adjusted OR 2.5, 95% CI 1.7 - 3.6).

Sensitivity analyses

Our results remained nearly identical when we ran our regressions under various specifications, including without weights, accounting for clustering of observations within individuals over time, and controlling for cognitive function. While the point estimates changed slightly, none of our conclusions were affected by the use of population weights, and none of the alternative regression specifications affected our estimates greatly. Specifically, our estimates of the odds of one year mortality associated with each self-reported/claims-identified event category changed little when we represented wealth as a continuous variable, or as quintiles.

In using different criteria to define AMI or ACS, a DRG-based definition identified only about half as many admissions (338 admissions compared to 712), while a broader definition, which included claims with a wider range of ICD-9 codes, in any position on the claim, identified about 20% more claims (882 compared to 712). Our main conclusions remained unchanged after considering the broader AMI definition. This broader definition allowed any number in the fifth digit of the claim, which can be used to indicate a readmission; therefore, we believe the more stringent ICD-9 definition in our main analyses was the best available.
In looking back 3.5 years (relative to 2.5 years), and including visits with no minimum length of stay, an additional 6.7% of the respondents were found to have experienced an AMI, and 4.6% a non-AMI ACS; overall, the total proportion of self-reports confirmed with either AMI or non-AMI ACS claims rose to 60.0% (fewer than 10 visits were excluded from our initial analyses based only on length of stay). The proportion of respondents with self-reported AMI who had no inpatient claims in the previous 3.5 years was 12.3%.

**Discussion**

In this analysis, we examined the congruence of self-reported and claims-identified AMI. Among HRS respondents aged 67 and older who reported experiencing an AMI within the previous two years, only one third had claims-identified AMI; an additional 16% had claims-identified non-AMI ACS (unstable angina or other acute ischemic heart disease). Overall, less than half of those who reported a heart attack had evidence of acute cardiovascular hospitalizations.

There were no associations between any identifiable demographic characteristics and the frequency with which self-reported AMI was verified by Medicare claims. Of the half of respondents whose self-reports were not matched by a claims-identified ACS, another 25% had inpatient admissions for other cardiac diagnoses. Yet, 17% of those who reported experiencing a heart attack had no inpatient visits in the previous 2.5 years.

Among those with claims-identified AMI, only two-thirds (68%) reported experiencing a "heart attack" (91% reported "heart problems"). Older respondents and those with less than a high school education were less likely to self-report AMI. In addition, respondents with at least one ADL limitation, worse memory, or who hadn't received a cardiac stent or percutaneous
coronary vessel imaging (PCI) were less likely to self-report.

The difference across whether respondents' claims indicated PCI suggests a few possible explanations for the discordance we document. First, some proportion of claims-identified AMI may result from borderline diagnoses; these claims may be less likely to be accompanied by PCI. If respondents experienced such an event, they may be correct not to self-report AMI. Alternatively, it is possible that receiving a stent makes the experience more salient. Interestingly, we found no difference in concordance among respondents who had received a more invasive coronary artery bypass graft (CABG). However, better candidates for CABG often have more severe disease; these respondents may have been sicker or older (both associated with higher discordance).

In mortality analyses, self-reported AMI was associated with increased risk of death, regardless of claims-identified events. Even among those with no claims-identified ACS events, self-reported AMI was associated with doubled odds of death, after controlling for age, sex, race, wealth, and education. The highest mortality was found among respondents who had a claims-identified AMI (regardless of self-report status), as well as for those with self-reported AMI that was concordant with a claims-identified ACS.

While one might assume that the highest risk of death would be associated with congruent claims-identified and self-reported AMI, we found that discordant claims/self-reported status carried at least the same risk of death. We postulate that this increased risk could be due, at least in part, to a patient's poor understanding of his or her medical conditions. It is also possible that other factors, perhaps lower socioeconomic status, could result in both poor understanding and worse health outcomes. Our regressions controlled for education and wealth (further including income did not change our findings), but other, more difficult to measure,
aspects of socioeconomic status may also contribute to this relationship.

In previous studies of the concordance between self-reported AMI and medical records, self-reported events were verified at rates ranging from 40% – 75%\textsuperscript{20-25}. When evidence was available, investigators often found other cardiac diagnoses among the false-positives\textsuperscript{21,22}. The study population was likely associated with the accuracy of self-reports; the lowest concordance was found in a study of disabled elderly\textsuperscript{23}, while the highest concordance was documented among members of the general population recruited to participate in research about cardiac health\textsuperscript{20}.

The fact that we found slightly lower congruence than previous studies may be due to a few factors. First, our study cohort is among the oldest of any of these studies; our results indicated that age was the only characteristic that was even marginally related to having a self-report confirmed by Medicare claims. Second, we used a relatively narrow definition of AMI; using the broader ACS definition to confirm self-reports would put our study within the range of previous ones. Third, while HRS includes a wide range of questions, of which a small proportion relate to medical experiences, other studies were often focused exclusively on respondents' previous illnesses, perhaps providing more appropriate cues to assist accurate recall of cardiac events\textsuperscript{26}.

Our study is not without limitations. First, we did not have access to HRS respondents' medical charts, but rather relied on Medicare claims to identify clinical events. We recognize that neither self-report nor claims-identification is a gold standard for documenting clinical events. To the extent that our use of Medicare claims resulted in misclassification of inpatient visits, this may have contributed to the lower congruence we found. However, Medicare claims allow the study of large populations, and as such are often used to study AMI\textsuperscript{6,8,9}. Additionally,
the criteria we used were recently validated. One way to further explore the discordance we document would be to compare both claims-identified and self-reported events to evidence from medical charts. Such an analysis would also allow further investigation of other factors related to concordance, such as whether or not the patient received a PCI.

Second, our analyses are conditional on respondents having survived long enough after their AMI to be interviewed; we were unable to study those who died shortly after an AMI. Yet, this is representative of older, independently living patients, who may present to a physician with a particular condition that needs to be understood in light of medical history.

Finally, HRS is designed to assess overall health status, social and economic conditions. The study has only a few questions specific to cardiac health, and the number of respondents in some specific sub-groups (e.g. claims-identified AMI but no self report) was somewhat small, perhaps limiting the scope and power of some of our analyses. Nevertheless, HRS is one of the few data sources that allows longitudinal follow-up along with a comprehensive study of both demographic and health status factors in conjunction with Medicare-linked claims data.

These results suggest that among older Americans, especially those who are older, sicker, or have worse memory, there may be considerable confusion about cardiac health history. At least a portion of patients are unable to correctly recall having experienced an AMI; these patients may be less likely to adhere to long term medication regimens necessary for secondary prevention.

Our findings also have implications for research into cardiovascular disorders. Given that previous studies have shown claims-identified events more likely to be validated by medical record review than self-reported ones, one could argue that claims-based definitions are superior, and should be the first choice if medical records are unavailable. Yet, even self-
reported AMI without any concordant claims is associated with increased risk of death; therefore, self-reported events are still an important source of information about respondents' health.

Our paper raises some questions that could be fruitful avenues for further research. First, if at least some proportion of AMI patients are unable to correctly recall such a relatively remarkable event, then there may also be fairly widespread confusion regarding other cardiovascular diagnoses, with implications for patients' ability to comply with the long-term medication regimens or lifestyle changes often recommended for secondary prevention.

Secondly, it would be interesting to explore the extent to which patient confusion is associated with factors related to the provider vs. the patient. We demonstrate that some patient factors are related to concordance, but systematic differences in concordance across providers could possibly be a measure of provider quality. Providers may vary in how well they educate their patients.

In conclusion, we found that older Americans, especially those with worse mental or health status, may have substantial difficulty in correctly identifying their own health history. Yet, both self-reported and claims-identified ACS events are important indicators of patient health.

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Conflict of Interest Disclosures: None.

References:


Table 1. Demographics and health characteristics among HRS respondents 67 years and older included in the study cohort

<table>
<thead>
<tr>
<th>Demographics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total # Observations</strong></td>
<td>45,335</td>
</tr>
<tr>
<td><strong>Mean Age</strong></td>
<td>76.7 years</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>41.9%</td>
</tr>
<tr>
<td><strong>African American/Other race</strong></td>
<td>9.1%</td>
</tr>
<tr>
<td><strong>Married</strong></td>
<td>53.6%</td>
</tr>
<tr>
<td><strong>Less than HS education</strong></td>
<td>28.5%</td>
</tr>
<tr>
<td><strong>Above median wealth</strong></td>
<td>54.4%</td>
</tr>
<tr>
<td><strong>Health status</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Self-reported health fair/poor</strong></td>
<td>32.6%</td>
</tr>
<tr>
<td><strong>1+ ADL</strong></td>
<td>16.9%</td>
</tr>
<tr>
<td><strong>Self-reported AMI</strong></td>
<td>3.1%</td>
</tr>
<tr>
<td><strong>Self-reported heart problems</strong></td>
<td>33.1%</td>
</tr>
<tr>
<td><strong>Mental Status</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Self-rated memory fair/poor</strong></td>
<td>29.0%</td>
</tr>
<tr>
<td><strong>Below 25th percentile word recall</strong></td>
<td>19.4%</td>
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<tr>
<td><strong>Moderate/severe cognitive impairment</strong></td>
<td>1.5%</td>
</tr>
</tbody>
</table>

The study population included only those HRS respondents who had agreed to the use of their Medicare claims for research purpose, and had at least 2 years of continuous traditional (fee-for-service) Medicare claims prior to the interview date. Each interview contributed an observation to the analysis. 1+ADL indicates difficulty with at least one of the following activities: eating, dressing, or bathing. Quartile of word recall was determined among the overall (unweighted) population aged 67 or older. Moderate to severe cognitive impairment was determined based on a score of 7 or less on a 35-point overall cognitive score. Only those respondents who reported heart problems were asked about taking heart medications. All percentages calculated with population weights.
Table 2. Comparison of self-reported and claims-identified AMI among HRS respondents

<table>
<thead>
<tr>
<th>Total (N)</th>
<th>Self-reported AMI</th>
<th>Claims-identified AMI</th>
<th>Claims-identified ACS (includes AMI)</th>
<th>Of these, what percent had:</th>
<th>Of these, what percent reported:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent of Respondents</td>
<td>Claims-identified AMI</td>
<td>Claims-identified AMI</td>
<td>Percent of Respondents</td>
<td>“Heart Attack”</td>
</tr>
<tr>
<td>Overall</td>
<td>45,335</td>
<td>3.1%</td>
<td>32.3%</td>
<td>48.7%</td>
<td>1.4%</td>
</tr>
<tr>
<td>&lt;=75 years old</td>
<td>22,154</td>
<td>2.8%</td>
<td>35.3%</td>
<td>51.0%</td>
<td>1.2%</td>
</tr>
<tr>
<td>&gt;75 years old</td>
<td>23,181</td>
<td>3.4%</td>
<td>30.0%</td>
<td>47.0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Male</td>
<td>18,943</td>
<td>3.9%</td>
<td>34.4%</td>
<td>50.2%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Female</td>
<td>26,392</td>
<td>2.5%</td>
<td>30.0%</td>
<td>47.1%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Caucasian</td>
<td>39,269</td>
<td>3.2%</td>
<td>32.4%</td>
<td>48.8%</td>
<td>1.4%</td>
</tr>
<tr>
<td>African American/ Other</td>
<td>6,066</td>
<td>2.3%</td>
<td>31.0%</td>
<td>47.9%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Not Married</td>
<td>20,528</td>
<td>3.2%</td>
<td>32.6%</td>
<td>49.6%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Married</td>
<td>24,780</td>
<td>3.0%</td>
<td>32.1%</td>
<td>47.8%</td>
<td>1.3%</td>
</tr>
<tr>
<td>&lt; High School</td>
<td>14,080</td>
<td>4.1%</td>
<td>29.0%</td>
<td>47.0%</td>
<td>1.8%</td>
</tr>
<tr>
<td>High School or greater</td>
<td>31,253</td>
<td>2.7%</td>
<td>34.3%</td>
<td>49.8%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Below median wealth</td>
<td>22,207</td>
<td>3.7%</td>
<td>30.0%</td>
<td>49.0%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Above median wealth</td>
<td>23,128</td>
<td>2.6%</td>
<td>35.0%</td>
<td>48.5%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

All statistics are calculated accounting for population weights and complex survey design. Claims-identified ACS includes both AMI and non-AMI ACS. AMI is defined by MedPAR claims indicating a visit with a length of stay of at least 3 days, and ICD-9 diagnosis codes of 410.01, 410.11, 410.21, 410.31, 410.41, 410.51, 410.61, 410.71, 410.81, or 410.91 in the primary or secondary position. Acute Coronary Syndrome (ACS) is defined by MedPAR claims indicating a visit with LOS at least 3 days, and ICD-9 diagnosis codes of 410, 411, or 413 in any position. When selecting respondents based on claims-identified AMI (the right side of the table), only events between interview waves (for those interviewed in two consecutive waves) or less than 730 days (2 years) before the interview date were counted. All respondents who reported “heart problems” were subsequently asked about heart attacks. When validating self-reported AMI (left half of the table), events within 910 days (2.5 years) were included. Each interview wave per respondent contributes one observation.
Figure Legends:

Figure 1. Claims-identified inpatient visit history among HRS respondents with self-reported AMI. Data based on retrospective analysis of MedPAR claims from 1433 HRS respondents who reported a experiencing a “heart attack,” from 1996 - 2008. For each respondent, all claims from the previous 910 days (2.5 years) were assessed. AMI was defined by an ICD-9 code of 410.X1 in the first or second position on an inpatient claim for a visit with LOS>3 days, while non-AMI ACS (Acute Coronary Syndrome) was defined by ICD-9 codes of 411 or 413 in any position on an inpatient claim for a visit with LOS>3 days. All other classifications were based on either the primary or secondary diagnosis, without any LOS restrictions. Respondents with multiple visits were assigned exclusively to one of the categories, with priority based first on clinical relevance (AMI before ACS, and cardiac before non-cardiac diagnoses), and then on the overall frequency with which the diagnoses appeared on all claims (e.g. Heart Failure appeared more often than Other IHD).

Figure 2. Percent of respondents with a claims-identified AMI who also reported an AMI, by health, mental status, and documented clinical treatment. * p < 0.05; ** p < 0.01; *** p < 0.001. Fair/poor health and memory are self-rated by respondents. 1+ADL indicates respondent reported difficult with at least one of the following tasks: bathing, eating, or dressing. Moderate to Severe cognitive impairment indicates score 0-7 in a 35 point summary cognitive score. Clinical treatment assessed from all MedPAR claims dated since the previous interview (for those interviewed in two consecutive waves) or in the previous 730 days.
Figure 3. Unadjusted and adjusted odds of one-year mortality associated with self-reported AMI and claims-identified AMI or ACS events. Estimated odds ratios from a logistic regression of one-year mortality on category of self-reported and/or claims-identified cardiac events, with those who neither self-reported nor had a claims-identified event serving as the reference group. Adjusted estimates reflect controlling for age, gender, race, education, and wealth.
Figure 1

- Had AMI: 35.8%
- No inpatient visits: 16.4%
- Other non-cardiac: 5.7%
- UTI: 1.1%
- Pneumonia: 0.9%
- Other cardiac: 3.8%
- Dysrhythmia: 5.2%
- Other IHD: 7.9%
- Heart Failure: 9.9%
- Non-AMI ACS: 13.3%
Figure 3
Comparison of Self-Reported and Medicare Claims-Identified Acute Myocardial Infarction
Laura C. Yasaitis, Lisa F. Berkman and Amitabh Chandra

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