An Introduction to MPRO

Harolyn Baker, MPH
Director Applied Epidemiology and Evaluation
MISSION & VISION

– **Mission**: Improving quality, safety and efficiency **across** the healthcare continuum.
– **Vision**: To become the nation’s pre-eminent leader in healthcare quality improvement
– **Values**:
  • Integrity
  • Fiscal Responsibility
  • Innovation
  • Teamwork
  • Mission-Driven
  • Quality
  • Diversity
MPRO Services and Clients

- MPRO has provided utilization review, quality assurance, quality improvement, education, process improvement training, physician office EHR assistance, and other consulting services to multiple clients:
  - Federal (Medicare)
  - State (Medicaid and other state government programs)
  - Private healthcare industry (i.e., health plans, hospitals, employers, medical groups, associations, etc.)
Our Partners

• Collaboration with Local, State and National Groups
  – Healthcare trade associations
  – Medical specialty societies
  – Healthcare coalitions
  – Consumer organizations
  – Governmental health agencies
  – Health professional educational institutions
  – Third-party payers
  – Mental Health Authorities
  – Area Agencies on Aging
MEDICARE IN MICHIGAN

1.7 M+ MEDICARE beneficiaries in MICHIGAN

1 in 5

Source: U.S. Census Bureau

HOW MPRO IS MAKING A DIFFERENCE

83 PHYSICIAN PRACTICES PARTICIPATING IN MPRO'S CARDIAC LAN

111% IMPROVEMENT IN CHOLESTEROL TESTING

26% IMPROVEMENT IN SCREENING FOR TOBACCO USE

25% IMPROVEMENT IN ASPIRIN THERAPY

16% IMPROVEMENT IN BLOOD PRESSURE CONTROL

TWO SEPARATE GROUPS OF 24 NURSING HOMES IN MICHIGAN

81% REDUCTION IN PHYSICAL RESTRAINT USE

24% REDUCTION IN PRESSURE ULCERS

REDUCING HOSPITAL READMISSIONS AND ADMISSIONS

1 in 5 Medicare patients are readmitted to the hospital within 30 days of being discharged nationally.

13% REDUCTION IN 30-DAY READMISSIONS ACROSS MICHIGAN

8% REDUCTION IN ADMISSIONS ACROSS MICHIGAN

20% REDUCTION IN READMISSIONS for individuals with medical & behavioral conditions in Oakland, Macomb & Wayne Counties (Q3 2011 compared to Q3 2013)

HISTORY

1984

Founded as the federally designated Peer Review Organization for Michigan

2002

Designated as Michigan Health Care Quality Improvement Organization (QIO)

2014

Joined with the QIOs of WI and MN to form the Lake Superior Quality Innovation Network

This material was prepared by MPRO, the Medicare Quality Improvement Organization for Michigan.
LSQIN’s Quality Improvement Initiatives 2014-2019

1. Better Health
   1. Improving cardiac health & reducing disparities
   2. Reducing disparities in diabetes care
   3. Coordinating prevention through HIT meaningful use

2. Better Care
   1. Reducing care-associated infections
   2. Reducing care-acquired conditions
   3. Coordinating care to reduce readmission and adverse drug events

3. Lower Costs
   1. Improving quality through physician value-based modifier and physician feedback reporting program
   2. Improving quality through value-based payment, inpatient psychiatric facility and ambulatory surgery center quality reporting
Using SAS to Enable Health Care Quality Improvement – Dynamic Data Exchange (DDE)

Elizabeth Waldman, MPH
Healthcare Data Analyst
Work with Providers

- Hospitals
  - 95 Acute Care Hospitals

- Practices/Physicians
  - Disparities and Cardiac Health (DACH): 31 Practices
  - Cardiac Learning and Action Network (LAN): 68 Practices
  - Physician Quality Reporting System (PQRS): 63 Practices
Dynamic Data Exchange (DDE)

• What is DDE?
  – It is a communication protocol that allows SAS and Excel to talk to each other in a client/server fashion.
  – SAS is the client and initiates a conversation with the server, Excel.
  – SAS then asks Excel to do something specific.

• Outdated mode? Better to use the Output Delivery System (ODS)?
# Hospital Value-Based Purchasing Program (HVBP)  
**Interim Impact Report - FY2015**

This *ESTIMATE* of the impact of the FY 2015 VBP program is provided by MPRO as a service to hospitals.

Value-Based Purchasing (Performance and Improvement) scoring assessment

## Clinical Process of Care

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Hospital Baseline Score*</th>
<th>Hospital Performance Period Score*</th>
<th><strong>Achievement Threshold</strong></th>
<th><strong>Benchmarks</strong></th>
<th>Hospital Achievement</th>
<th>Hospital Improvement</th>
<th>Hospital Best Performance</th>
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<td></td>
<td>0.95918</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Eligible Domains:** 0  
**Clinical Process of Care Score:** N/A - <4 measures

*Hospital Baseline and/or performance scores: Values 0.00 - 1.00, if not eligible, leave blank.*

This estimate provided by MPRO is our "best guess" of the impact of the value based purchasing program on the identified hospital. This does not represent CMS policy nor is this a representation of CMS' calculation under this program. Based on VBP final rule published April 2011.
Dynamic Data Exchange (DDE)

- SAS and Excel must be up and running for DDE to work
- Need to establish a connection between SAS and Excel

```sas
/*Open Excel*/
options noxwait noxsync;
x "'C:\Program Files (x86)\Microsoft Office\Office14\excel.exe'";
filename cmds dde 'EXCEL\SYSTEM';

data test; x=sleep(3); run;
```
Dynamic Data Exchange (DDE)

• Determine which facilities you are running a report for and the number of times the report will need to be run

```sql
/*Creating a distinct list of hsp_id's*/
proc sql;
    select distinct provider_number into: hsp_id_list separated by '*
    from igr_base_combine_b;
    select count(unique provider_number) into: hsp_id_cnt
    from igr_base_combine_b;
quit;
```
Dynamic Data Exchange (DDE)

- Tell SAS how many times to run the report and which facilities to run the report for
  
  ```sas
  %macro reports;
  %do i=1 %to &hsp_id_cnt;
  %let facid = %scan(&hsp_id_list, &i, *);
  %end;
  %mend reports;
  
  proc sql;
  data _null_;
  file cmds;
  put 'open("S:\SARG\10SOW\C.7 Improve Individual Patient Care\VBP\Report_071213\NHCQF Template\Updated\NHCQF_Template_VBP_FY2015.xls")';
  run;
  data test; x=sleep(3); run;
  ```

- Open Excel template
Dynamic Data Exchange (DDE)

- Restrict dataset to one hospital and one measure and then run a proc freq on the variable of interest (score_dec)

```plaintext
/*Restricting the table to one hsp_id*/
data hosp;
    set iqr_base_combine b;
    where provider_number = "&facid";
run;

/*Output for each measure*/
/*ami_7a*/
data hosp_b;
    set hosp;
    where measure_code = "AMI_7a";
run;
proc freq data = hosp_b;
    table score_dec;
run;
```
Dynamic Data Exchange (DDE)

- Tell SAS what and where to put the data in the Excel template

```sas
data _null_;
set hosp_b;
filename file1a dde
"EXCEL|\NHCQF Template_VBP_FY2015.xls FY2015_HVBP r11c3";
file file1a notab;
put score_dec;
run;
```
Dynamic Data Exchange (DDE)

• Save and close the template

```plaintext
/* This will re-save the template with a different file name */
/*save*/
data _null_
file cmds;
put $unquote($str($['[SAVE.AS]'"S:\SARG\10SOW\C.7 Improve Individual Patient Care\VBP\Report_071213\Output\&facid..xls"')]')));
r=%
data test; x=sleep(3); run;
/*close*/
data _null_
file cmds;
put $unquote($str($['[CLOSE]'"S:\SARG\10SOW\C.7 Improve Individual Patient Care\VBP\Report_071213\Output\&facid..xls"')]')));
r=%
data test; x=sleep(3); run;
%end;
%mend;
%reports;
```
Hospital Value-Based Purchasing Program (HVBP)
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<th>Hospital Best Performance</th>
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<td>0.95918</td>
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<td>3</td>
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</tr>
</tbody>
</table>

Eligible Domains: 10
Clinical Process of Care Score: 62.00

*Hospital Baseline and/or performance scores: Values 0.00 - 1.00, if not eligible, leave blank.

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Using SAS to Enable Health Care Quality Improvement

Data Analysis for Medication Reconciliation Project

Yongmei Qin, MD, MS
Healthcare Data Analyst
Work with Hospitals, Nursing Homes, and communities

- Hospitals
  - 46 Acute Care Hospitals to reduce Healthcare-Associated Infections
- Nursing Homes
  - 320 Nursing Homes to reduce Antipsychotic Use, increase Mobility, and improve Other Quality Measure Scores
- Communities
  - 9 communities to reduce readmission and adverse drug events
Medication Reconciliation Project in Geriatric Patient Center

• Medication Reconciliation Definition: The process of identifying the most accurate list of all medications a patient is taking, including name, dosage, frequency and route, and using this list to provide correct medications for patients

  ➢ Goal: Reduce potential Adverse Drug Event (pADE) and Adverse Drug Event (ADE)
Methodology

- Phone medication reconciliation was conducted by one of the pharmacist
- Eligible patient: patient discharged from the emergency department (ED), observational unit, or inpatient hospital stay
  - Case group: Patients were reached by a medication reconciliation phone call after discharge
  - Control group: Patients not reached by medication reconciliation phone call after discharge
- Utilize CMS Medicare-Fee-For-Service (FFS) Claims data
- Data analysis was performed to evaluate 30-day readmission rate between case and control groups
  - 30-day hospital readmissions
  - 30-day total hospital utilization readmissions
Running Inpatient and Outpatient Medicare Claims Data

```sql
proc sql;
create table abase1 as
select *
    , (substr(bene_clm_num,1,12) in (select medicare from control)) as rosa_control
    , (hse_clm_stus_cd in ('20' '40' '41' '42')) as died
from abase_&mystate..&abase
where "&startdate."d<=hse_clm_thru_dt and
    hse_clm_from_dt="&enddate."d +30
and nch_clm_type_cd in('40' '60' '61')
having rosa_control=1
order by finder_claim_num, hse_clm_thru_dt desc, hse_clm_from_dt desc, died desc, nch_clm_type_cd desc, hcfa_clm_proc_dt desc;
quit;
```

Counts 30 days out from the index admission date to include within 30-day readmissions
Calculating 30-day Readmission Rates

```sas
data readm30;
  set fabase;
  by finder_claim_num descending hse_clm_thru_dt descending fromdt;
  ddate=hse_clm_thru_dt;
  nextadate=lag(fromdt);
  nextddate=lag(ddate);
  nexthsp_id=lag(hsp_id);
  if first.finder_claim_num then do;
    days=.;
    nextadate=.;
    nextddate=.;
    nexthsp_id='        ';
  end;
  if nextadate ne . then days=nextadate-ddate;
  transfer=(days=0);
  adm=(transfer=0);
  readm30=(hse_clm_stus_cd not in('20' '40' '41' '42') and transfer=0 and 0<days<=30);
  format fromdt ddate nextadate nextddate mmddyy10.;
run;
```

Overwrite the lag with a missing value where no previous claim is present

 Defines readmissions where the days between hospital stays is 30 or less
Risk-Standardized Readmission Rate (RSRR)

Lili Deng, MD, MA
Healthcare Data Analyst

Michigan’s Health Care Quality Improvement Organization
Why do we need to do the Risk adjustment?

• How is it possible to evaluate a hospital’s performance on patient outcomes more fairly?
• How is it possible to compare one hospital’s performance on patient outcomes to another more fairly?
• Since one hospital patient population may differ from the total patient population or from another hospital patient population in a number of patient characteristics, comparisons are meaningless without considering disparities of patient mix among hospitals.
• Risk adjustment is a statistical technique that is used to overcome the effect of differences among hospitals so that comparisons of health care quality provided are more fair.
What data does CMS use to calculate the risk-standardized outcome measures?

• The risk-standardized AMI, HF, and PN 30-Day Readmission measures were developed by a team of clinical and statistical experts from Yale University, using a methodology that has been published in peer reviewed literature.

• The 30-Day Readmission measures for AMI, HF, and PN are produced from Medicare claims and VA (Veterans Health Administration) administrative data.
How to calculate RSRR

- All-Cause readmission within a 30-day of discharge (outcome variable)
- The 15,000+ International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) (diagnosis codes, procedure codes, and external cause of injury codes (E-codes)).
- 149 condition categories (CCs)
- Collapsing 149 CCs into 35 MODIFIED CC (MCCs)
- 37 Risk-Adjustment Variables (i.e. age, sex, comorbid diseases, and indicators of patient frailty)

Heart Failure (HF)

```plaintext
DGNS_CD_26 = DGNS_E_CD_1;
DGNS_CD_27 = DGNS_E_CD_2;
DGNS_CD_28 = DGNS_E_CD_3;

ARRAY ICD9CODE{1:28} $ DGNS_CD_1-DGNS_CD_28;
DO I=1 TO 28;
  DIAG=ICD9CODE(I);
  if HF= 0 and I <28 then do;
    IF DIAG IN ('40201' '40211' '40291' '40401' '40403' '40411' '40413' '40491' '40493') OR DIAG='428' THEN HF=1;
  end;
END;
```
How to calculate RSRR
Creating some CC variables

/*The following steps create some CC variables based on ICD9 code*/

ARRAY ICD9P{1:25} $ PRCDR_CD_1-PRCDR_CD_25;
DO J=1 TO 25;
   PROC=ICD9P(J);
   if cabg = 0 and J < 25 then do;
      if PROC in ('3610' '3611' '3612' '3613' '3614' '3615' '3616')
         then CABG = 1;
   end;
END;

ARRAY ICD9CODE{1:28} $ DGNS_CD_1-DGNS_CD_28;
DO I=1 TO 28;
   DIAG=ICD9CODE(I);
   if CABG = 0 and I < 28 then do;
      IF DIAG = 'v4581' then CABG=1;
   end;
   if CC79 = 0 and I < 28 then do;
      IF DIAG in ('42741' '42742' '4275' '5184' '5185' '51881' '51882' '51883' '51884' '51885' '78550' '78551' '7980' '7981' '7982' '7989' '79901' '79902') THEN cc79=1;
   end;
   if cc149 = 0 and I < 28 then do;
      IF DIAG IN ('70710' '70711' '70712' '70713' '70714' '70715' '70719' '7078' '7079') THEN cc149=1;
   end;
END;
How to calculate RSRR
Collapsing 149 CCs into 35 MCCs

******************************************************************************;
* The following step collapses some CC variables based on clinical evaluation for HF. *
* MCC: MODIFIED CC                                                                    *
******************************************************************************;

ARRAY CC{1:149} CC1 - CC149;
ARRAY MCC{1:149} MCC1-MCC149;

DO I=1 TO 149;
    MCC(I)=CC(I);
END;

/* CC8, 9, 10, 11, & 12 collapsed into MCC8 */
MCC8=CC8 OR CC9 OR CC10 OR CC11 OR CC12;
DO I=9 TO 12;
    MCC(I)=0;
END;

.....

/* CC148, & 149 collapsed into MCC149 */
MCC149=CC148 OR CC149;
DO I=149;
    MCC(I)=0;
END;
How to calculate RSRR

35 Risk-Adjustment Variables

DIABETES=MCC15;
DIS_FLUID=MCC22;
IRON_DEFICIENCY=MCC47;
CARDIO_RESPIRATORY=MCC79;
CHF=MCC80;
VASDIS_WCOMP=MCC104;
COPD=MCC108;
PNEUMONIA=MCC111;
RENAL_FAILURE=MCC131;
OTHER_UTD=MCC136;
DECUBITUS_ULCER=MCC148;
OTHER_GI=MCC36;
ACS=MCC81;
VAL_RHE_HEART=MCC86;
ARRHYTHMIAS=MCC92;
ASTHMA=MCC110;
PEPTIC_ULCER=MCC34;
CANCER=MCC8;
DRUG_ALCOHOL=MCC51;
MAJOR_PSYCH=MCC54;
ESRD_DIALYSIS=MCC129;
HEMATOLOGICAL=MCC44;
.
.
.
OTHER_PSYCH=MCC60;
LUNG_FIBROSIS=MCC109;
MALNUTRITION=MCC21;
DEPRESSION=MCC58;
How RSRR is calculated

• The measures estimate hospital-level 30-day all-cause RSRRs for each condition using hierarchical logistic regression models. In brief, the approach simultaneously models two levels of data (patient and hospital) to account for the variance in patient outcomes within and between hospitals.

• The RSRR were obtained as the ratio of the number of “predicted” to “expected” readmissions, multiplied by the Michigan unadjusted readmission rate for the time period in question.
  - The predicted number of readmissions for each hospital was estimated using the risk model given its own patient mix and with its own hospital-specific intercept.
  - The expected number of readmissions for each hospital was estimated with its own patient mix and the average hospital-specific intercept based on all hospitals in our sample.
How to calculate RSRR

```sas
ODS SELECT PARAMETERESTIMATES;
PROC GLIMMIX DATA=RAW.READM_pre_HF NOCLPRINT MAXLMMUPDATE=100;
CLASS HSP_ID;
ODS OUTPUT PARAMETERESTIMATES=RAW.EST_Pre(KEEP=EFFECT ESTIMATE STDERR);
MODEL readm30(event=last)=AGE_65 MALE CABG DIABETES DIS_FLUID IRON_DEFICIENCY
   CARDIO_RESPIRATORY CHF VASDIS_WCOMP COPD PNEUMONIA
   RENAL_FAILUE OTHER_UTD DECUBITUS_ULCER OTHER_GI ACS
   VAL_RHE_HEART ARRHYTHMIAS ASTHMA PEPTIC_ULCER CANCER
   DRUG_ALCOHOL MAJOR_PSYCH ESRD_DIALYSIS HEMATOLOGICAL
   NEPHRITIS ESLD MCANCER STROKE DEMENTIA CAD_ANGINA
   OTHER_HEART OTHER_PSYCH PARALYSIS_FUNCTDIS
   LUNG_FIBROSIS MALNUTRITION DEPRESSION
   /dist=binary LINK=LOGIT ddfm=bw SOLUTION;
XBETA=_XBETA_;
LINP=_LINP_; 
RANDOM INTERCEPT/SUBJECT=HSP_ID SOLUTION;
RANDOM _RESIDUAL_{
OUTPUT OUT=RADM30_Pre
   PRED(BLUP ILINK)=PREDPROB PRED(NOBLUP ILINK)=EXPPROB;
ID XBETA LINP HSE_UNIQUE_ID HSP_STATE_CODE HF hsp_id finder_claim_num readm30 race_cat age_cat
   MALE los_cat;
NLOPTIONS TECH=NRRIDG;
run;
```
How to calculate RSRR

/*The Michigan unadjusted readmission rate for the time period*/

PROC SQL NOPRINT;
SELECT MEAN(RADM30) INTO: YBAR FROM RADM30;
QUIT;

****************************************************************
* DERIVING RSRR FOR EACH HOSPITAL                              *
****************************************************************

PROC SQL;
CREATE TABLE RSRR AS
SELECT DISTINCT PROVID, MEAN(RADM30) AS OBS,
    MEAN(PREDPROB) AS PRED,
    MEAN(EXPPROB) AS EXP,
    (CALCULATED PRED)/(CALCULATED EXP) AS SRR,
    (CALCULATED SRR)*&YBAR AS RSRR,
    COUNT(PROVID) AS VOLUME
FROM RADM30
GROUP BY PROVID;
QUIT;

<table>
<thead>
<tr>
<th>ID</th>
<th>OBS</th>
<th>PRED</th>
<th>EXP</th>
<th>RSRR</th>
<th>Volume</th>
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</thead>
<tbody>
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</table>
## Measure Specifications from CMS

**HF Cohort Codes**

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<thead>
<tr>
<th>ICD-9-CM</th>
<th>Description</th>
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<tbody>
<tr>
<td>402.01</td>
<td>Malignant hypertensive heart disease with congestive heart failure (CHF)</td>
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<td>402.11</td>
<td>Benign hypertensive heart disease with CHF</td>
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<tr>
<td>402.91</td>
<td>Hypertensive heart disease with CHF</td>
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<tr>
<td>404.01</td>
<td>Malignant hypertensive heart and renal disease with CHF</td>
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<tr>
<td>404.03</td>
<td>Malignant hypertensive heart and renal disease with CHF &amp; renal failure (RF)</td>
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<tr>
<td>404.11</td>
<td>Benign hypertensive heart and renal disease with CHF</td>
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<td>404.13</td>
<td>Benign hypertensive heart and renal disease with CHF &amp; RF</td>
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<td>404.91</td>
<td>Unspecified hypertensive heart and renal disease with CHF</td>
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<tr>
<td>404.93</td>
<td>Hypertension and non-specified heart and renal disease with CHF &amp; RF</td>
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<tr>
<td>428.0</td>
<td>Congestive heart failure, unspecified</td>
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<tr>
<td>428.1</td>
<td>Left heart failure</td>
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<td>428.20</td>
<td>Systolic heart failure, unspecified</td>
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<td>428.21</td>
<td>Systolic heart failure, acute</td>
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<td>Systolic heart failure, chronic</td>
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<tr>
<td>428.23</td>
<td>Systolic heart failure, acute or chronic</td>
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<tr>
<td>428.30</td>
<td>Diastolic heart failure, unspecified</td>
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<tr>
<td>428.31</td>
<td>Diastolic heart failure, acute</td>
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<tr>
<td>428.32</td>
<td>Diastolic heart failure, chronic</td>
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<td>428.33</td>
<td>Diastolic heart failure, acute or chronic</td>
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<td>428.40</td>
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<td>428.41</td>
<td>Combined systolic and diastolic heart failure, acute</td>
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<td>428.42</td>
<td>Combined systolic and diastolic heart failure, chronic</td>
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<tr>
<td>428.43</td>
<td>Combined systolic and diastolic heart failure, acute or chronic</td>
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<tr>
<td>428.9</td>
<td>Heart failure, unspecified</td>
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</table>
### Measure Specifications from CMS

<table>
<thead>
<tr>
<th>Risk Variables</th>
<th>Variable</th>
<th>Code(s)</th>
<th>AMI</th>
<th>HF</th>
<th>Pneumonia</th>
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<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td>Age-65 (years above 65, continuous)</td>
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<td>Male</td>
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<td><strong>Cardiovascular</strong></td>
<td>History of PTCA</td>
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<td>History of CABG</td>
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<td>Congestive heart failure</td>
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<td>Acute coronary syndrome</td>
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<td>Angina pectoris/old myocardial infarction</td>
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<td>Coronary atherosclerosis/other chronic ischemic heart disease</td>
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<td>Valvular and rheumatic heart disease</td>
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<td>Arrhythmias</td>
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<td>Vascular or circulatory disease</td>
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<td>Cardio-respiratory failure and shock</td>
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<td>Other and unspecified heart disease</td>
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<td>Anterior myocardial infarction</td>
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<td>Other location of myocardial infarction</td>
<td>ICD-9-CM 410.20-410.69</td>
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**Note:** The code(s) and condition(s) listed above are used by CMS for calculating risk scores and identifying cases for quality improvement programs.
Measure Specifications from CMS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Code(s)</th>
<th>AMI</th>
<th>Condition(s)</th>
<th>Pneumonia</th>
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<tbody>
<tr>
<td>Comorbidities</td>
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<tr>
<td>Metastatic cancer and acute leukemia</td>
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<td>Lung, upper digestive tract, and other severe cancers</td>
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<tr>
<td>Lymphatic, head and neck, brain, and other major cancers;</td>
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<td>- breast, prostate, colorectal and other cancers and tumor</td>
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<td>Cancer</td>
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<td>Diabetes and DM complications</td>
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<td>Protein-calorie malnutrition</td>
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<td>Disorders of fluid/electrolyte/acid-base</td>
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<td>Iron deficiency and other/unspecified anemias and blood disease</td>
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<td>Dementia and senility</td>
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<td>COPD</td>
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<td>Pneumonia</td>
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<td>End-stage renal disease or dialysis</td>
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<td>Renal failure</td>
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<td>Other urinary tract disorders</td>
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<td>Decubitus ulcer or chronic skin ulcer</td>
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<td>Drug/alcohol abuse/dependence/psychosis</td>
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<td>Major psychiatric disorders</td>
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## Measure Specifications from CMS

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<th>Variable</th>
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<td>Vertebral fractures</td>
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<tr>
<td>Other injuries</td>
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Source


2. Frequently Asked Questions (FAQs): CMS 30-Day Risk-Standardized Readmission Measures for Acute Myocardial Infarction (AMI), Heart Failure (HF), and Pneumonia