TOOLKIT

To Help Decrease Improper Payments in Medicare Advantage Through the Identification of High-Risk Diagnosis Codes

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What Is the Toolkit?

This toolkit offers Medicare Advantage (MA) organizations information that will enable them to replicate Office of Inspector General's (OIG's) techniques to identify and evaluate high-risk diagnosis codes to ensure proper payments and provide better care for enrollees.

> This toolkit is meant to be a practical, hands-on device that will help MA organizations improve the accuracy of their submitted diagnoses that are at high risk for being miscoded.

The Centers for Medicare & Medicaid Services (CMS) makes monthly payments to MA organizations for each of their enrollees. These payments are based, in part, on the diagnoses that their enrollees receive from their providers. Using a system of risk adjustment, CMS pays MA organizations more for providing benefits to enrollees with diagnoses associated with more intensive use of health care resources relative to healthier enrollees, who would be expected to require fewer health care resources. Accordingly, CMS relies on MA organizations not only to collect diagnosis codes from their providers and submit the associated codes to CMS, but also to implement an effective compliance program to monitor the accuracy of these diagnosis codes. In this respect, MA organizations generally review medical records in order to detect and correct inaccurate diagnosis codes.

We have identified certain diagnosis codes which, when paired with other circumstances, are at a high risk for being miscoded. This toolkit provides additional information about the circumstances under which these diagnosis codes could be miscoded and the actual programming codes that we used in our audits to identify them.

Why Did OIG Create This Toolkit?

We have performed several audits for which our objectives were to determine whether MA organizations submitted certain diagnosis codes—ones that when coupled with other data indicated that the codes were at high risk for being miscoded—to CMS for use in CMS's risk adjustment program in accordance with Federal requirements. Thus far, we have found that overall, approximately 70 percent of those diagnosis codes were not supported in the associated medical records. Moreover, some diagnosis codes were consistently not supported over 90 percent of the time. Although the audited MA organizations usually disagreed with our reports' recommendations and with various aspects of our audit methodologies, those MA organizations generally did not disagree with our determinations regarding these diagnosis codes, and some expressed a genuine interest in submitting corrections to CMS. Other MA organizations—including ones that we have not audited—have asked us to share with them how we decided which diagnosis codes were at high risk for being miscoded.

The purpose of this toolkit is to provide information as to the steps that we followed as well as the data supporting the process that we followed. Our hope is that the users of this toolkit will, at a minimum, use the information to detect and correct inaccurate diagnosis codes in their own systems. To a greater extent, we hope that MA organizations use this toolkit as a starting point to identify other diagnosis codes that are at high risk for being miscoded and take appropriate measures to prevent, detect, and correct such errors. Thus, our goals are to ensure that CMS makes accurate payments to the MA organizations and that the enrollees receive the correct level of care.

What Does This Toolkit Include?

We have compiled the high-risk groups identified in our audits for incorrect diagnosis codes that were consistently submitted to CMS.[1] We have also included explanations that demonstrate why these specific diagnosis codes, when coupled with other data (including procedure codes and prescription drug events (PDEs)), are at high risk for being miscoded. This toolkit contains the Structured Query Language (SQL)—a programming language used in many software programs—that we used in our audits to query CMS's systems. To provide further information as to what we analyzed, we have included all of the codes used in our programming language. The SQL language and codes included in this toolkit relate to the 2019 payment year.[2]

This toolkit enables an MA organization to adapt our actual programming codes in order to query its internal data systems so that it can more accurately identify the enrollees in the various high-risk groups.

To place our work in context, the figure below summarizes the errors that our audits identified for each of high-risk groups included in this toolkit.

Figure: Errors in High-Risk Groups as of November 2023

High-Risk Group	Total	Errors	Error %
Acute stroke	945	908	96%
Acute heart attack	791	751	95%
Embolism	754	593	79%
Lung cancer	391	345	88%
Breast cancer	390	373	96%
Colon cancer	390	368	94%
Prostate cancer	360	322	89%
Potentially mis-keyed diagnosis codes	522	421	81%
Totals	**4,543**	**4,081**	**90%**

[1] Not every high-risk group that we audited had incorrect diagnosis codes that were consistently submitted to CMS. This toolkit includes only those high-risk groups that had high error rates.

[2] Our various audits have spanned the 2013 through 2019 payment years. See our discussion on the next page for an explanation of "payment years."

Detailed information on our audits of the MA program, as well as related information on the high-risk diagnoses codes discussed in this toolkit, can be found at Managed Care | HHS-OIG

Background

Medicare Advantage Program—Risk-Adjusted Payments

Under the MA program, CMS makes advance payments each month to MA organizations. Federal requirements mandate that these payments be based on the anticipated cost of providing Medicare benefits to a given enrollee and, in doing so, also account for variations in the demographic characteristics and health status of each enrollee.[3]

CMS uses two principal components to calculate the risk-adjusted payment that it will make to an MA organization for an enrollee: a base rate that CMS sets using bid amounts received from the MA organization and the risk score for that enrollee. These are described as follows:

- **Base rate:** Before the start of each year, each MA organization submits bids to CMS that reflect the MA organization's estimate of the monthly revenue required to cover an enrollee with an average risk profile.[4] CMS compares each bid to a specific benchmark amount for each geographic area to determine the base rate that an MA organization is paid for each of its enrollees.

- **Risk score:** A risk score is a relative measure that reflects the additional or reduced costs that each enrollee is expected to incur compared with the costs incurred by enrollees on average. CMS calculates risk scores based on an enrollee's health status (discussed below) and demographic characteristics (such as the enrollee's age and gender). This process results in an individualized risk score for each enrollee, which CMS calculates annually.

To determine an enrollee's health status for purposes of calculating the risk score, CMS uses diagnoses that the enrollee receives from acceptable provider types, including certain physicians and hospitals.[5] MA organizations collect the diagnosis codes from providers based on information documented in the medical records and submit these codes to CMS. CMS then maps certain diagnosis codes, on the basis of similar clinical characteristics and severity and cost implications, into Hierarchical Condition Categories (HCCs). Each HCC has a factor (which is a numerical value) assigned to it for use in each enrollee's risk score.

The risk adjustment program is prospective. Specifically, CMS uses the diagnosis codes that the enrollee received for one year (known as the service year) to determine HCCs and calculate risk scores for the following calendar year (known as the payment year). Thus, an enrollee's risk score does not change for the year in which a diagnosis is made. Instead, the risk score changes for the entirety of the year after the diagnosis has been made. Further, the risk score calculation is an additive process: As HCC factors (and, when applicable, disease interaction factors) accumulate, an enrollee's risk score increases, and the monthly risk-adjusted payment to the MA organization also increases. In this way, the risk adjustment program compensates MA

[3] The Social Security Act (the Act) §§ 1853(a)(1)(C) and (a)(3); 42 CFR § 422.308(c).

[4] The Act § 1854(a)(6); 42 CFR § 422.254 *et seq*.

[5] The providers code diagnoses using the International Classification of Diseases (ICD), Clinical Modification (CM), *Official Guidelines for Coding and Reporting* (ICD Coding Guidelines). The ICD is a coding system that is used by physicians and other health care providers to classify and code all diagnoses, symptoms, and procedures.

organizations for the additional risk of providing coverage to enrollees expected to require more health care resources.

CMS multiplies the risk scores by the base rates to calculate the total monthly Medicare payment that an MA organization receives for each enrollee. Thus, if the factors used to determine an enrollee's risk score are incorrect, CMS will make an improper payment to an MA organization. Specifically, if diagnosis codes are incorrect, the HCCs are unvalidated, which causes overstated enrollee risk scores and overpayments from CMS.

Identifying High-Risk Groups of Diagnoses

For each of our audits, we used data mining techniques and discussed certain circumstances with medical professionals in order to identify diagnoses that were at higher risk for being miscoded.

Data Mining Techniques

After an enrollee receives a medical service, the provider of that service generates a claim for payment to the MA organization. Although MA organizations make their own payment arrangements with providers for these services, CMS requires MA organizations to submit copies of all claims to CMS. These claims include services that can be used for risk adjustment purposes (physician, outpatient, and inpatient) as well as claims whose services are not used for risk adjustment purposes (such as home health services, skilled nursing facility services, durable medical equipment, laboratory services, and x-rays, among other services).

We have developed computerized programs to access and analyze these claims data. For example, we identify the services that contain the risk-adjusted diagnoses and how often those diagnoses were submitted throughout the service year. In this regard, we analyze the data to see which diagnoses were submitted to CMS and when. We combine our knowledge of the MA program along with what we glean from our discussions with medical professionals to identify which diagnosis codes to review.

Discussions With Medical Professionals

For our audits, we have discussed various circumstances with medical professionals to ensure that we analyzed the data correctly. For example, CMS has identified 21 diagnosis codes that map to the HCC for Acute Myocardial Infarction. Our discussions with medical professionals revealed that 17 of those 21 diagnosis codes were at higher risk for being miscoded if: (1) they occurred through a face-to-face encounter with a physician, but (2) that same diagnosis did not occur on an inpatient claim within 6 months (before or after) that encounter. For instances of this nature, the medical professionals also explained to us what was likely supported in the medical records and what should have been submitted to CMS. Continuing the example, the medical professionals told us that the medical records likely supported an old myocardial infarction diagnosis (which does not map to an HCC) instead of an acute myocardial infarction diagnosis.

For this toolkit we have compiled the high-risk groups identified in our audits for incorrect diagnosis codes that were consistently submitted to CMS. We have also included explanations that demonstrate why these specific diagnosis codes, when coupled with other data (including procedure codes and PDEs), are at high risk for being miscoded. This toolkit contains the SQL, which is a programming language used in many software programs, that we used in our audits to query CMS's systems. To provide further information as to what we analyzed, we have included all of the codes used in our programming language.

Our goal is to enable an MA organization to adapt our actual programming codes in order to query its internal data systems, so that it can more accurately identify the enrollees in the various high-risk groups.

Data Analytics for High-Risk Groups

We have compiled data on the high-risk groups identified in our audits for incorrect diagnosis codes that were consistently submitted to CMS. For each of these high-risk groups, we are providing the following information:

- We have included explanations that demonstrate why these specific diagnosis codes, when coupled with other data (including procedure codes and PDEs), are at high risk for being miscoded. For example, one high-risk group included individuals who received one lung cancer diagnosis during a service year, but the encounters and the relevant PDE data did not indicate that the individuals received certain types of care and medication.

- Based on discussions with medical professionals, we have also provided in each case the diagnosis code that typically should have been submitted to CMS instead of the incorrect diagnosis code that actually was submitted. Continuing with the lung cancer diagnosis example, a history of lung cancer diagnosis is generally what was supported in the medical records.

- As a further extension of the narrative description, we have identified all the various codes and the names of the codes that we analyzed. For the example of the lung cancer high-risk group, we are providing a list of the codes and names for:

    - the lung cancer diagnoses,

    - the surgical therapy procedures,

    - the radiation treatment procedures, and

    - the chemotherapy drug treatment procedures.

- Finally, we have included the SQL—that programming language mentioned earlier—that we used in our audits to query CMS's systems. Our goal is to enable an MA organization to adapt our SQL codes in order to query its internal data systems, so that it can also identify the enrollees in the various high-risk groups.

1. Acute Stroke High-Risk Group

For the acute stroke high-risk group, we focused on enrollees who received one acute stroke diagnosis (that mapped to the HCC for Ischemic or Unspecified Stroke (HCC 100)) on one physician claim during the service year but did not have an acute stroke diagnosis on a corresponding inpatient or outpatient hospital claim (Table 1.1). In these instances, a diagnosis of history of stroke (which does not map to an HCC) typically should have been used.

Codes Used in Our Analysis

Table 1.1 includes the 94 acute stroke diagnosis codes used in our analysis:

Table 1.1: Acute Stroke Diagnosis Codes

Diagnosis Code	Description
I6300	Cerebral Infarction (CI) due to thrombosis of unspecified precerebral artery
I63011	CI due to thrombosis of right vertebral artery
I63012	CI due to thrombosis of left vertebral artery
I63013	CI due to thrombosis of bilateral vertebral arteries
I63019	CI due to thrombosis of unspecified vertebral artery
I6302	CI due to thrombosis of basilar artery
I63031	CI due to thrombosis of right carotid artery
I63032	CI due to thrombosis of left carotid artery
I63033	CI due to thrombosis of bilateral carotid arteries
I63039	CI due to thrombosis of unspecified carotid artery
I6309	CI due to thrombosis of other precerebral artery
I6310	CI due to embolism of unspecified precerebral artery
I63111	CI due to embolism of right vertebral artery
I63112	CI due to embolism of left vertebral artery
I63113	CI due to embolism of bilateral vertebral arteries
I63119	CI due to embolism of unspecified vertebral artery
I6312	CI due to embolism of basilar artery
I63131	CI due to embolism of right carotid artery
I63132	CI due to embolism of left carotid artery
I63133	CI due to embolism of bilateral carotid arteries
I63139	CI due to embolism of unspecified carotid artery
I6319	CI due to embolism of other precerebral artery
I6320	CI due to unspecified occlusion or stenosis of unspecified precerebral arteries
I63211	CI due to unspecified occlusion or stenosis of right vertebral arteries

Diagnosis Code	Description
I63212	CI due to unspecified occlusion or stenosis of left vertebral arteries
I63213	CI due to unspecified occlusion or stenosis of bilateral vertebral arteries
I63219	CI due to unspecified occlusion or stenosis of unspecified vertebral arteries
I6322	CI due to unspecified occlusion or stenosis of basilar arteries
I63231	CI due to unspecified occlusion or stenosis of right carotid arteries
I63232	CI due to unspecified occlusion or stenosis of left carotid arteries
I63233	CI due to unspecified occlusion or stenosis of bilateral carotid arteries
I63239	CI due to unspecified occlusion or stenosis of unspecified carotid arteries
I6329	CI due to unspecified occlusion or stenosis of other precerebral arteries
I6330	CI due to thrombosis of unspecified cerebral artery
I63311	CI due to thrombosis of right middle cerebral artery
I63312	CI due to thrombosis of left middle cerebral artery
I63313	CI due to thrombosis of bilateral middle cerebral arteries
I63319	CI due to thrombosis of unspecified middle cerebral artery
I63321	CI due to thrombosis of right anterior cerebral artery
I63322	CI due to thrombosis of left anterior cerebral artery
I63323	CI due to thrombosis of bilateral anterior arteries
I63329	CI due to thrombosis of unspecified anterior cerebral artery
I63331	CI due to thrombosis of right posterior cerebral artery
I63332	CI due to thrombosis of left posterior cerebral artery
I63333	CI to thrombosis of bilateral posterior arteries
I63339	CI due to thrombosis of unspecified posterior cerebral artery
I63341	CI due to thrombosis of right cerebellar artery
I63342	CI due to thrombosis of left cerebellar artery
I63343	CI to thrombosis of bilateral cerebellar arteries
I63349	CI due to thrombosis of unspecified cerebellar artery
I6339	CI due to thrombosis of other cerebral artery
I6340	CI due to embolism of unspecified cerebral artery
I63411	CI due to embolism of right middle cerebral artery
I63412	CI due to embolism of left middle cerebral artery
I63413	CI due to embolism of bilateral middle cerebral arteries
I63419	CI due to embolism of unspecified middle cerebral artery
I63421	CI due to embolism of right anterior cerebral artery
I63422	CI due to embolism of left anterior cerebral artery
I63423	CI due to embolism of bilateral anterior cerebral arteries

Diagnosis Code	Description
I63429	CI due to embolism of unspecified anterior cerebral artery
I63431	CI due to embolism of right posterior cerebral artery
I63432	CI due to embolism of left posterior cerebral artery
I63433	CI due to embolism of bilateral posterior cerebral arteries
I63439	CI due to embolism of unspecified posterior cerebral artery
I63441	CI due to embolism of right cerebellar artery
I63442	CI due to embolism of left cerebellar artery
I63443	CI due to embolism of bilateral cerebellar arteries
I63449	CI due to embolism of unspecified cerebellar artery
I6349	CI due to embolism of other cerebral artery
I6350	CI due to unspecified occlusion or stenosis of unspecified cerebral artery
I63511	CI due to unspecified occlusion or stenosis of right middle cerebral artery
I63512	CI due to unspecified occlusion or stenosis of left middle cerebral artery
I63513	CI due to unspecified occlusion or stenosis of bilateral middle arteries
I63519	CI due to unspecified occlusion or stenosis of unspecified middle cerebral artery
I63521	CI due to unspecified occlusion or stenosis of right anterior cerebral artery
I63522	CI due to unspecified occlusion or stenosis of left anterior cerebral artery
I63523	CI due to unspecified occlusion or stenosis of bilateral anterior arteries
I63529	CI due to unspecified occlusion or stenosis of unspecified anterior cerebral artery
I63531	CI due to unspecified occlusion or stenosis of right posterior cerebral artery
I63532	CI due to unspecified occlusion or stenosis of left posterior cerebral artery
I63533	CI due to unspecified occlusion or stenosis of bilateral posterior arteries
I63539	CI due to unspecified occlusion or stenosis of unspecified posterior cerebral artery
I63541	CI due to unspecified occlusion or stenosis of right cerebellar artery
I63542	CI due to unspecified occlusion or stenosis of left cerebellar artery
I63543	CI due to unspecified occlusion or stenosis of bilateral cerebellar arteries
I63549	CI due to unspecified occlusion or stenosis of unspecified cerebellar artery
I6359	CI due to unspecified occlusion or stenosis of other cerebral artery
I638	Other CI
I639	CI, unspecified
I97810	Intraoperative cerebrovascular infarction during cardiac surgery
I97811	Intraoperative cerebrovascular infarction during other surgery
I97820	Postprocedural cerebrovascular infarction during cardiac surgery
I97821	Postprocedural cerebrovascular infarction during other surgery
I636	CI due to cerebral venous thrombosis, nonpyogenic

Table 1.2 includes two additional diagnosis codes that mapped to the HCC for Ischemic or Unspecified Stroke (HCC 100)); however, we did not consider these codes to be at a high risk for being miscoded. Therefore, enrollees who received either of these diagnoses were excluded from our analysis:

Table 1.2: Excluded Diagnosis Codes for the Acute Stroke High-Risk Group

Diagnosis Code	Description
I6381	Other cerebral infarction due to occlusion or stenosis of small artery
I6389	Other cerebral infarction

SQL Programming Language

Table 1.3 details the SQL programming language used to query CMS's systems in order to identify the acute stroke high-risk diagnosis codes.

Table 1.3: SQL Programming Language for Acute Stroke High-Risk Group

Step 1

We identified enrollees who received an acute stroke diagnosis (Table 1.1) in a physician setting without a corresponding inpatient or outpatient claim.

```
SELECT raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
,COUNT(raps.BENE_SK) AS BENE_LINES /*Counts the number of acute stroke diagnosis codes in an office (physician)
setting.  Limited to one instance in Step #2*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE raps.DGNS_CD /*RAPS diagnosis code field used to match to Acute Stroke Diagnosis Codes Table*/
IN (
SELECT DX_CD /*Represents the diagnosis code field in the Acute Stroke Diagnosis Codes Table*/
FROM CMS_ADM_OIG_OAS_PRD.ACTIVE_STROKE_DX_CODES) /*Acute Stroke Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_PRVDR_TYPE_CD = '20' /*RAPS Provider Type Code "20" represents "physician" claims*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/

/*Subquery to identify and exclude enrollees with an acute stoke diagnosis code in an inpatient or outpatient setting*/

AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
NOT IN
SELECT DISTINCT raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps  /*CMS RAPS data*/

WHERE raps.DGNS_CD /*RAPS diagnosis field used to match to Acute Stroke Diagnosis Codes Table*/
IN (
SELECT DX_CD /*Represents the diagnosis code field in the Acute Stroke Diagnosis Codes Table*/
FROM CMS_ADM_OIG_OAS_PRD. ACTIVE_STROKE_DX_CODES) /*Acute Stroke Diagnosis Codes Table*/
```

```
AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~'' /*"~" indicates the RAPS diagnosis code is not deleted*/
AND  BENE_RAPS_PRVDR_TYPE_CD IN ('01', '02','10') /*RAPS Provider Type Code "01" and "02" represent "inpatient"
claims and provider type code "10" represents "outpatient" claims*/

GROUP BY raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

Step 2

Using the output from Step 1, we then limited our results to those enrollees who had only one instance of an acute stroke diagnosis during the time period of interest and those enrollees whose risk scores were confirmed in CMS's Risk Adjustment System (RAS) as including HCC 100.

```
SELECT raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD.ACUTE_STROKE_ENROLLEES_STEP_1 raps /*Output from Step #1*/
WHERE raps.BENE_LINES < 2 /*Criteria to limit enrollees to those with a single instance of an acute stroke diagnosis code
in an office (physician) setting*/
AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
 IN (

SELECT ras.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RISK_PTC_I_SCRE ras /*CMS RAS data*/

WHERE BENE_PTC_HCC_100_SW ='1' /*Confirms HCC 100 was utilized in the payment risk score*/
AND BENE_FINL_RISK_IND = 'F' /*"F" represents the final RAS record*/
AND BENE_PTC_SCRE_MODEL_SBTYP_CD = 'I02' /*Used subtype code "I02" since all enrollees have this subtype record,
not required for identifying enrollees for review, helps with computing efficiency*/
AND BENE_RISK_SQNC_NUM = '1' /*Used the RAS risk sequence "1" since it represents the RAPS based RAS record*/
AND (CLNDR_CY_NUM = 2019)) /*Specifies the payment year for the HCC confirmation*/
```

Downloadable Information

All of the codes used in this analysis along with the SQL programming language can be found at https://oig.hhs.gov/oas/toolkit/Acute-Stroke-High-Risk-Group.pdf.

2. Acute Myocardial Infarction High-Risk Group

For the acute myocardial infarction high-risk group, we focused on enrollees who received one diagnosis (that mapped to the HCC for Acute Myocardial Infarction (HCC 86)) on only one physician or outpatient claim during the service year but did not have an acute myocardial infarction diagnosis on a corresponding inpatient hospital claim (either within 60 days before or 60 days after the physician or outpatient claim) (Table 2.1). In these instances, a diagnosis indicating a history of myocardial infarction (which does not map to an HCC) typically should have been used.

Codes Used in Our Analysis

Table 2.1 includes the 17 acute myocardial diagnosis codes used in our analysis:

Table 2.1: Acute Myocardial Infarction Diagnosis Codes[6]

Diagnosis Code	Description
I2109	ST elevation myocardial infarction (STEMI) involving other coronary artery of anterior wall
I2111	STEMI involving right coronary artery
I2119	STEMI involving other coronary artery of inferior wall
I2129	STEMI involving other sites
I213	STEMI of unspecified site
I214	Non-ST elevation myocardial infarction (NSTEMI)
I2101	STEMI involving left main coronary artery
I2102	STEMI involving left anterior descending coronary artery
I2121	STEMI involving left circumflex coronary artery
I219	Acute myocardial infarction, unspecified
I220	Subsequent STEMI of anterior wall
I221	Subsequent STEMI of inferior wall
I222	Subsequent NSTEMI
I228	Subsequent STEMI of other sites
I229	Subsequent STEMI of unspecified site
I21A1	Myocardial infarction type 2
I21A9	Other myocardial infarction type

Table 2.2 on the following page includes 4 additional diagnosis codes that mapped to the HCC for Acute Myocardial Infarction (HCC 86) and all 20 diagnosis codes that mapped to the HCC for Unstable Angina and

[6] The term "ST," used in many descriptions in this table, refers to the flat section of an echocardiogram (ECG). When an individual has the most severe type of heart attack, this segment will no longer be flat on the ECG but will appear abnormally elevated.

Other Acute Ischemic Heart Disease (HCC 87). We did not consider these codes to be at a high risk for being miscoded and therefore, enrollees who received any one of these diagnoses were excluded from our analysis:

Table 2.2: Excluded Diagnosis Codes for the Acute Myocardial Infarction High-Risk Group

Diagnosis Code	Description
I200	Unstable angina
I230	Hemopericardium as current complication following acute myocardial infarction
I231	Atrial septal defect as current complication following acute myocardial infarction
I232	Ventricular septal defect as current complication following acute myocardial infarction
I233	Rupture of cardiac wall without hemopericardium as current complication following acute myocardial infarction
I234	Rupture of chordae tendineae as current complication following acute myocardial infarction
I235	Rupture of papillary muscle as current complication following acute myocardial infarction
I236	Thrombosis of atrium, auricular appendage, and ventricle as current complications following acute myocardial infarction
I237	Postinfarction angina
I238	Other current complications following acute myocardial infarction
I240	Acute coronary thrombosis not resulting in myocardial infarction
I241	Dressler's syndrome
I248	Other forms of acute ischemic heart disease
I249	Acute ischemic heart disease, unspecified
I25110	Atherosclerotic heart disease of native coronary artery with unstable angina pectoris
I25700	Atherosclerosis of coronary artery bypass graft(s), unspecified, with unstable angina pectoris
I25710	Atherosclerosis of autologous vein coronary artery bypass graft(s) with unstable angina pectoris
I25720	Atherosclerosis of autologous artery coronary artery bypass graft(s) with unstable angina pectoris
I25730	Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with unstable angina pectoris
I25750	Atherosclerosis of native coronary artery of transplanted heart with unstable angina
I25760	Atherosclerosis of bypass graft of coronary artery of transplanted heart with unstable angina
I25790	Atherosclerosis of other coronary artery bypass graft(s) with unstable angina pectoris
I511	Rupture of chordae tendineae, not elsewhere classified
I512	Rupture of papillary muscle, not elsewhere classified

SQL Programming Language

Table 2.3 details the SQL programming language used to query CMS's systems in order to identify the acute myocardial infarction high-risk diagnosis codes.

Table 2.3: SQL Programming Language for Acute Myocardial Infarction High-Risk Group

Step 1

We identified enrollees who received an acute myocardial infarction diagnosis (Table 2.1) in a physician or outpatient setting without a corresponding inpatient claim.

```
SELECT raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
,COUNT(raps.DGNS_CD) AS BENE_LINES /*Counts the number of acute myocardial infarction diagnosis codes in an office (physician) or outpatient setting.  Limited to one instance in Step #2*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE raps.DGNS_CD /*RAPS diagnosis code field used to match to Acute Myocardial Infarction Diagnosis Codes Table*/
IN ( 'I2109', 'I2111', 'I2119', 'I2129', 'I213', 'I214','I2101', 'I2102', 'I2121', 'I219', 'I220','I221','I222', 'I228',  'I229', 'I21A1',
'I21A9') /* Acute Myocardial Infarction Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31'/*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/
AND (BENE_RAPS_PRVDR_TYPE_CD = '20'/*RAPS Provider Type Code "20" represents "physician" claims*/
OR BENE_RAPS_PRVDR_TYPE_CD = '10') /*RAPS Provider Type Code "10" represents "outpatient" claims*/

/* Subquery to identify and exclude all enrollees with an acute myocardial infarction diagnosis in an inpatient setting*/

AND raps.BENE_SK/*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/  NOT IN
SELECT DISTINCT raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE raps.DGNS_CD /*RAPS diagnosis code field used to match to Acute Myocardial Infarction Diagnosis Codes Table*/
IN ('I2109', 'I2111', 'I2119', 'I2129', 'I213', 'I214','I2101', 'I2102', 'I2121', 'I219', 'I220','I221','I222', 'I228',  'I229', 'I21A1',
'I21A9') /* Acute Myocardial Infarction Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31'/*Specified timeframe*/
AND (BENE_RAPS_PRVDR_TYPE_CD = '01'
OR BENE_RAPS_PRVDR_TYPE_CD = '02'/*RAPS Provider Type Code "01" and "02" represent "inpatient" claims*/)
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/

GROUP BY raps.BENE_SK; /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

Step 2

Using the output from Step 1, we then limited our results to those enrollees who had only one instance of an acute myocardial infarction diagnosis during the time period of interest and those enrollees whose risk scores were confirmed in CMS's Risk Adjustment System (RAS) as including HCC 86.

```
SELECT raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. MYOCARDIAL_INFARCTION_STEP_1 raps /*Output from Step #1*/
WHERE raps.BENE_LINES < 2 /*Criteria to limit enrollees to those with a single instance of an acute myocardial infarction diagnosis code in an office (physician) or outpatient setting*/

AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
IN (
```

```
SELECT ras.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RISK_PTC_I_SCRE ras /*CMS RAS data*/

WHERE (BENE_PTC_HCC_86_SW ='1' /*Confirms HCC 86 was utilized in the payment risk score*/
OR BENE_PTC_HCC_87_SW ='1') /*Confirms HCC 87 was utilized in the payment risk score*/
AND BENE_FINL_RISK_IND = 'F' /*"F" represents the final RAS record*/
AND BENE_PTC_SCRE_MODEL_SBTYP_CD = 'I02'  /*Used subtype code "I02" since all enrollees have this subtype record, not required for identifying enrollees for review, helps with computing efficiency*/
AND BENE_RISK_SQNC_NUM = '1'/*Used the RAS risk sequence "1" since it represents the RAPS based RAS record*/
AND (CLNDR_CY_NUM =2019)) /*Specifies the payment year for the HCC confirmation*/
```

Step 3

Using the output from Step 2, we identified and removed the enrollees who had received one or more diagnoses that also mapped to HCC 86 or 87 that we did not consider to be at a high risk for being miscoded (Table 2.2).

```
SELECT DISTINCT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. MYOCARDIAL_INFARCTION_STEP_2 fdr /*Output from Step #2*/

/*Subquery to identify and remove all enrollees that received diagnosis which maps to HCC 86 or 87 that we did not consider to be at a high risk for being miscoded */

WHERE fdr.BENE_SK NOT IN

SELECT DISTINCT raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE raps.DGNS_CD /*RAPS diagnosis code field used to match to the Excluded Diagnosis Codes for the Acute Myocardial Infarction High-Risk Group Table*/ IN ('I200', 'I230', 'I231', 'I232', 'I233', 'I234','I235', 'I236', 'I237', 'I238', 'I240', 'I241', 'I248','I249', 'I25110', 'I25700', 'I25710', 'I25720', 'I25730','I25750', 'I25760', 'I25790', 'I511', 'I512') /* Excluded Diagnosis Codes for the Acute Myocardial Infarction High-Risk Group Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' ) /*"~" indicates the RAPS diagnosis code is not deleted*/
```

Step 4

Using the output from Step 3, we identified the Risk Adjustment Processing System (RAPS) record that included the acute myocardial infarction diagnosis. We then created a 60-day before-and-after date window using the RAPS "service thru date" field, which identified inpatient stays that occurred in the prior or preceding service year.

```
SELECT raps.*, /*selects the detail RAPS record from the CMS RAPS table*/
ADD_MONTHS (BENE_RAPS_SRVC_THRU_DT,2) AS IP_60_DAYS_FROM_DT, /*Creates a date 60 days after the RAPS Thru Date*/
ADD_MONTHS(BENE_RAPS_SRVC_THRU_DT,-2) AS IP_60_DAYS_BEFORE_DT, /*Creates a date 60 days before the RAPS Thru Date*/
SUM (1) over (rows unbounded preceding) AS AATS_CLM_ID /*Create a unique RAPS record id*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

JOIN CMS_ADM_OIG_OAS_PRD. MYOCARDIAL_INFARCTION_STEP_3 fdr /*Output Enrollee List from Step #3*/
ON fdr.BENE_SK = raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/

WHERE raps.DGNS_CD /*RAPS diagnosis code field used to match to Acute Myocardial Infarction Diagnosis Codes Table*/
IN ('I2109', 'I2111', 'I2119', 'I2129', 'I213', 'I214','I2101', 'I2102', 'I2121', 'I219', 'I220', 'I221','I222', 'I228', 'I229', 'I21A1', 'I21A9') /*Acute Myocardial Infarction Diagnosis Codes Table */

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31'/*Specified timeframe*/
```

```
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/

AND (BENE_RAPS_PRVDR_TYPE_CD = '10' /*RAPS Provider Type Code "10" represents "outpatient" claims*/
OR BENE_RAPS_PRVDR_TYPE_CD = '20') /*RAPS Provider Type Code "20" represents "physician" claims*/
```

Step 5

Using the output from Step 4, we identified and removed the enrollees for whom a physician or outpatient acute myocardial infarction diagnosis had occurred within the 60-day timeframe of an inpatient stay with an acute myocardial infarction diagnosis.

```
SELECT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. MYOCARDIAL_INFARCTION_STEP_4 fdr

/*Subquery to identify and remove all enrollees from the step #4 list that received an acute myocardial infarction diagnosis
from an inpatient stay within the 60-day calcualted timeframe*/

WHERE fdr.BENE_SK NOT IN (

SELECT DISTINCT raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

JOIN CMS_ADM_OIG_OAS_PRD. MYOCARDIAL_INFARCTION_STEP_4 fdr /*Output Enrollee List from Step #4*/
ON raps.BENE_SK = fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/

WHERE (raps.BENE_RAPS_SRVC_THRU_DT BETWEEN fdr.IP_60_DAYS_BEFORE_DT
AND fdr.IP_60_DAYS_FROM_DT) /*Specified calculated 60 day timeframe*/

AND raps.BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/
AND (raps.BENE_RAPS_PRVDR_TYPE_CD = '01'
OR raps.BENE_RAPS_PRVDR_TYPE_CD = '02') /*RAPS Provider Type Code "01" and "02" represent "inpatient"*/

AND raps.DGNS_CD /*RAPS diagnosis code field used to match to Acute Myocardial Infarction Diagnosis Codes Table*/ IN
('I2109', 'I2111', 'I2119', 'I2129', 'I213', 'I214','I2101', 'I2102', 'I2121', 'I219', 'I220', 'I221','I222', 'I228',  'I229', 'I21A1',
'I21A9')); /* Acute Myocardial Infarction Diagnosis Codes Table*/
```

Downloadable Information

- All of the codes used in this analysis along with the SQL programming language can be found at https://oig.hhs.gov/oas/toolkit/Acute-Myocardial-Infarction-High-Risk-Group.pdf.

3. Embolism High-Risk Group

For the embolism high-risk group, we focused on enrollees who received one diagnosis that mapped to either the HCC for Vascular Disease or to the HCC for Vascular Disease With Complications (Embolism HCCs) (HCCs 107 & 108) during the service year but did not have an anticoagulant medication dispensed on their behalf (Table 3.1). An anticoagulant medication is typically used to treat an embolism. In these instances, a diagnosis of history of embolism (an indication that the provider is evaluating a prior acute embolism diagnosis, which does not map to an HCC) typically should have been used.

Codes Used in Our Analysis

Table 3.1 includes the 63 embolism diagnosis codes used in our analysis:

Table 3.1: Embolism Diagnosis Codes

Diagnosis Code	Description
I2692	Saddle embolus of pulmonary artery without acute cor pulmonale
I2699	Other pulmonary embolism without acute cor pulmonale
I82290	Acute embolism and thrombosis of other thoracic veins
I82409	Acute embolism and thrombosis of unspecified deep veins of unspecified lower extremity
I82419	Acute embolism and thrombosis of unspecified femoral vein
I82429	Acute embolism and thrombosis of unspecified iliac vein
I82439	Acute embolism and thrombosis of unspecified popliteal vein
I82449	Acute embolism and thrombosis of unspecified tibial vein
I82499	Acute embolism and thrombosis of other specified deep vein of unspecified lower extremity
I824Y9	Acute embolism and thrombosis of unspecified deep veins of unspecified proximal lower extremity
I824Z9	Acute embolism and thrombosis of unspecified deep veins of unspecified distal lower extremity
I82629	Acute embolism and thrombosis of deep veins of unspecified upper extremity
I82A19	Acute embolism and thrombosis of unspecified axillary vein
I82B19	Acute embolism and thrombosis of unspecified subclavian vein
I82C19	Acute embolism and thrombosis of unspecified internal jugular vein
I2601	Septic pulmonary embolism with acute cor pulmonale
I2602	Saddle embolus of pulmonary artery with acute cor pulmonale
I2609	Other pulmonary embolism with acute cor pulmonale
I82401	Acute embolism and thrombosis of unspecified deep veins of right lower extremity
I82402	Acute embolism and thrombosis of unspecified deep veins of left lower extremity
I82403	Acute embolism and thrombosis of unspecified deep veins of lower extremity, bilateral
I824Y1	Acute embolism and thrombosis of unspecified deep veins of right proximal lower extremity
I824Y2	Acute embolism and thrombosis of unspecified deep veins of left proximal lower extremity
I824Y3	Acute embolism and thrombosis of unspecified deep veins of proximal lower extremity, bilateral
I824Z1	Acute embolism and thrombosis of unspecified deep veins of right distal lower extremity
I824Z2	Acute embolism and thrombosis of unspecified deep veins of left distal lower extremity
I824Z3	Acute embolism and thrombosis of unspecified deep veins of distal lower extremity, bilateral

Diagnosis Code	Description
I82411	Acute embolism and thrombosis of right femoral vein
I82412	Acute embolism and thrombosis of left femoral vein
I82413	Acute embolism and thrombosis of femoral vein, bilateral
I82421	Acute embolism and thrombosis of right iliac vein
I82422	Acute embolism and thrombosis of left iliac vein
I82423	Acute embolism and thrombosis of iliac vein, bilateral
I82431	Acute embolism and thrombosis of right popliteal vein
I82432	Acute embolism and thrombosis of left popliteal vein
I82433	Acute embolism and thrombosis of popliteal vein, bilateral
I82441	Acute embolism and thrombosis of right tibial vein
I82442	Acute embolism and thrombosis of left tibial vein
I82443	Acute embolism and thrombosis of tibial vein, bilateral
I82491	Acute embolism and thrombosis of other specified deep vein of right lower extremity
I82492	Acute embolism and thrombosis of other specified deep vein of left lower extremity
I82493	Acute embolism and thrombosis of other specified deep vein of lower extremity, bilateral
I82621	Acute embolism and thrombosis of deep veins of right upper extremity
I82622	Acute embolism and thrombosis of deep veins of left upper extremity
I82623	Acute embolism and thrombosis of deep veins of upper extremity, bilateral
I82A11	Acute embolism and thrombosis of right axillary vein
I82A12	Acute embolism and thrombosis of left axillary vein
I82A13	Acute embolism and thrombosis of axillary vein, bilateral
I82B11	Acute embolism and thrombosis of right subclavian vein
I82B12	Acute embolism and thrombosis of left subclavian vein
I82B13	Acute embolism and thrombosis of subclavian vein, bilateral
I82C11	Acute embolism and thrombosis of right internal jugular vein
I82C12	Acute embolism and thrombosis of left internal jugular vein
I82C13	Acute embolism and thrombosis of internal jugular vein, bilateral
I7410	Embolism and thrombosis of unspecified parts of aorta
I7411	Embolism and thrombosis of thoracic aorta
I7419	Embolism and thrombosis of other parts of aorta
I742	Embolism and thrombosis of arteries of the upper extremities
I743	Embolism and thrombosis of arteries of the lower extremities
I744	Embolism and thrombosis of arteries of extremities, unspecified
I745	Embolism and thrombosis of iliac artery
I748	Embolism and thrombosis of other arteries
I749	Embolism and thrombosis of unspecified artery

There were 365 additional diagnosis codes that mapped to the Embolism HCCs; however, we did not consider these codes to be at a high risk for being miscoded. Therefore, enrollees who received any one of these diagnoses were excluded from our analysis. The table of 365 diagnosis codes can be downloaded at the link included in the Downloadable Information subsection found later in this section.

There were 812 National Drug Codes (NDCs) pulled from the PDE data used in our analysis. We removed enrollees in Step 3 of the SQL Programming Language who received one or more the drugs associated with these NDCs. The table of 812 NDCs can be downloaded at the link included in the Downloadable Information subsection found later in this section.

SQL Programming Language

Table 3.2 details the SQL programming language used to query CMS's systems in order to identify the embolism high-risk diagnosis codes.

Table 3.2: SQL Programming Language for Embolism High-Risk Group

Step 1

We identified enrollees who received an embolism diagnosis (Table 3.1). Additionally, we removed any enrollees who received one or more diagnoses that also mapped to HCC 107 or 108 that we did not consider to be at a high risk for being miscoded.

```
SELECT   raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
COUNT(raps.DGNS_CD) AS BENE_LINES /*Counts the number of embolism diagnosis codes.  Limited to one instance in Step #2*/

FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE raps.DGNS_CD /*RAPS diagnosis code field used to match to Embolism Diagnosis Codes Table*/ IN ('I2692', 'I2699',
'I82290', 'I82409', 'I82419', 'I82429', 'I82439', 'I82449', 'I82499', 'I824Y9', 'I824Z9', 'I82629', 'I82A19', 'I82B19', 'I82C19',
'I2601', 'I2602', 'I2609', 'I82401', 'I82402', 'I82403', 'I824Y1', 'I824Y2', 'I824Y3', 'I824Z1', 'I824Z2', 'I824Z3', 'I82411', 'I82412',
'I82413', 'I82421', 'I82422', 'I82423', 'I82431', 'I82432', 'I82433', 'I82441', 'I82442', 'I82443', 'I82491', 'I82492', 'I82493',
'I82621', 'I82622',  'I82623', 'I82A11', 'I82A12', 'I82A13', 'I82B11', 'I82B12', 'I82B13', 'I82C11', 'I82C12', 'I82C13', 'I7410',
'I7411', 'I7419', 'I742', 'I743', 'I744', 'I745', 'I748', 'I749') /*Embolism Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/

/*Subquery to identify and remove all enrollees that received a diagnosis that maps to HCC 107 or 108 that we did not
consider to be a high risk for being miscoded*/

AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/ NOT IN (

SELECT  DISTINCT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM  CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE  DGNS_CD /*RAPS diagnosis code field used to match to Embolism Diagnosis Codes Table*/ IN (
SELECT dx.DX_CD /*Represents the diagnosis code field in the Embolism Diagnosis Codes Table*/
FROM CMS_ADM_OIG_OAS_PRD.ACTIVE_PULMONARY_EMBOLISM_EXCLUDED_DX dx)  /*Excluded Diagnosis Codes for the
Embolism High-Risk Group Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~'/*"~" indicates the RAPS diagnosis code is not deleted*/
)
GROUP  BY raps.BENE_SK; /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

Step 2

Using the output from Step 1, we then limited our results to those enrollees who had only one instance of an embolism diagnosis during the time period of interest and those enrollees whose risk scores were confirmed in CMS's RAS as including HCC 107 or 108.

```
SELECT    raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM      CMS_ADM_OIG_OAS_PRD.ACTIVE_PULMONARY_EMBOLISM_STEP_1 raps /*Output from Step #1*/
WHERE     raps.BENE_LINES < 2 /*Criteria to limit enrollees to those with a single instance of an embolism diagnosis code*/

AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
 IN ( /*The following sub query identifies all enrollees from the Step #1 with HCC 107 or 108*/

SELECT    ras.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM      CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RISK_PTC_I_SCRE ras /*CMS RAS data*/

WHERE   (BENE_PTC_HCC_107_SW ='1' /*Confirms HCC 107 was utilized in the payment risk score*/
OR BENE_PTC_HCC_108_SW ='1') /*Confirms HCC 108 was utilized in the payment risk score*/
AND BENE_FINL_RISK_IND = 'F' /*"F" represents the final RAS record*/
AND BENE_PTC_SCRE_MODEL_SBTYP_CD = 'I02'  /*Used subtype code "I02" since all enrollees have this subtype record, not
required for identifying enrollees for review, helps with computing efficiency*/
AND BENE_RISK_SQNC_NUM = '1'/*Used the RAS risk sequence "1" since it represents the RAPS based RAS record*/
AND (CLNDR_CY_NUM =2019)) ; /*Specifies the payment year for the HCC confirmation*/
```

Step 3

Using the output from Step 2, we identified enrollees who (according to their associated medical records) did not receive any of the embolism drugs (anticoagulant medication) during the time period of interest.

```
select DISTINCT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. ACTIVE_PULMONARY_EMBOLISM_STEP_2 fdr /*Output from Step #2*/

WHERE fdr.BENE_SK NOT IN (/*The following sub query identifies all enrollees with a drug claim for one or more of the
NDC's provided*/

SELECT DISTINCT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. ACTIVE_PULMONARY_EMBOLISM_STEP_2 fdr /*Output from Step #2*/

INNER JOIN  CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM hdr /*CMS Medicare Claim table data*/
ON fdr.BENE_SK = hdr.BENE_SK /*Joins enrollees from the step #2 results to the CMS Part D perscription drug claims*/

INNER JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE lin /*CMS Medicare Claim Line data*/
ON hdr.GEO_BENE_SK = lin.GEO_BENE_SK
AND hdr.CLM_DT_SGNTR_SK = lin.CLM_DT_SGNTR_SK
AND hdr.CLM_TYPE_CD = lin.CLM_TYPE_CD
AND hdr.CLM_NUM_SK = lin.CLM_NUM_SK
AND hdr.CLM_FROM_DT = lin.CLM_FROM_DT /*Joins CMS Medicare Claims to the claim line table (Part D perscription drug
claims to the individual claim lines)*/

INNER JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE_RX rx /*CMS Medicare Claim Line RX table data*/
ON  lin.GEO_BENE_SK = rx.GEO_BENE_SK
AND lin.CLM_DT_SGNTR_SK = rx.CLM_DT_SGNTR_SK
AND lin.CLM_TYPE_CD = rx.CLM_TYPE_CD
AND lin.CLM_NUM_SK = rx.CLM_NUM_SK
AND lin.CLM_LINE_NUM = rx.CLM_LINE_NUM  /*Joins CMS Part D perscription drug claim lines to the individual Part D
speceific claim lines*/
```

```
INNER JOIN CMS_ADM_OIG_OAS_PRD.ACTIVE_PULMONARY_EMBOLISM_PDE_NDC_LIST ndc /*NDCs for Embolism High-Risk Group Table */
ON lin.CLM_LINE_NDC_CD = ndc.NDC_CD /*Joins CMS Part D perscription drug claim line NDC code to the NDCs for Embolism High-Risk Group Table*/

WHERE hdr.CLM_TYPE_CD IN (1,2,4) /*Represents Non-Deleted Part D Drug Claim types*/

AND hdr.clm_thru_dt BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/

AND hdr.clm_finl_actn_ind = 'Y' /*Indicates only Final Action Claims*/
AND rx.CLM_LINE_INGRDNT_CST_AMT >0   /*Identifies non-zero pay claims*/
AND rx.CLM_DRUG_CVRG_STUS_CD='C') ; /*Identifies only covered drug claims*/
```

Downloadable Information

- All of the codes used in this analysis along with the SQL programming language can be found at https://oig.hhs.gov/oas/toolkit/Embolism-High-Risk-Group.pdf.

4. Lung Cancer High-Risk Group

For the lung cancer high-risk group, we focused on enrollees who received one lung cancer diagnosis (that mapped to the HCC for Lung and Other Severe Cancers (HCC 9)) during the service year but did not have surgical therapy, radiation treatments, or chemotherapy drug treatments administered within a 6-month period either before or after the diagnosis (Table 4.1). In these instances, a diagnosis of history of lung cancer (which does not map to an HCC) typically should have been used.

Codes Used in Our Analysis

Table 4.1 includes the 17 lung cancer diagnosis codes used in our analysis:

Table 4.1: Lung Cancer Diagnosis Codes

Diagnosis Code	Description
C33	Malignant neoplasm of trachea
C3400	Malignant neoplasm of unspecified main bronchus
C3401	Malignant neoplasm of right main bronchus
C3402	Malignant neoplasm of left main bronchus
C3410	Malignant neoplasm of upper lobe, unspecified bronchus or lung
C3411	Malignant neoplasm of upper lobe, right bronchus or lung
C3412	Malignant neoplasm of upper lobe, left bronchus or lung
C342	Malignant neoplasm of middle lobe, bronchus or lung
C3430	Malignant neoplasm of lower lobe, unspecified bronchus or lung
C3431	Malignant neoplasm of lower lobe, right bronchus or lung
C3432	Malignant neoplasm of lower lobe, left bronchus or lung
C3480	Malignant neoplasm of overlapping sites of unspecified bronchus and lung
C3481	Malignant neoplasm of overlapping sites of right bronchus and lung
C3482	Malignant neoplasm of overlapping sites of left bronchus and lung
C3490	Malignant neoplasm of unspecified part of unspecified bronchus or lung
C3491	Malignant neoplasm of unspecified part of right bronchus or lung
C3492	Malignant neoplasm of unspecified part of left bronchus or lung

There were 93 additional diagnosis codes that mapped to the Lung and Other Severe Cancers HCCs; however, we did not consider these codes to be at a high risk for being miscoded. Therefore, enrollees who received any one of these diagnoses were excluded from our analysis. The table of 93 diagnosis codes can be downloaded at the link included in the Downloadable Information subsection found later in this section.

We used various Current Procedural Terminology (CPT) codes to further refine our analysis.[7] We identified and removed enrollees who received at least one of the following:

1. Table 4.2 includes 19 chemotherapy drug treatment CPT codes that we identified as common procedure codes associated with an enrollee who received a chemotherapy drug treatment for an active cancer diagnosis.

Table 4.2: Chemotherapy Drug Treatment CPT Codes

CPT Code	Description
96420	Injection of chemotherapy using push technique into an artery
96402	Hormonal anti-neoplastic chemotherapy administration beneath the skin or into muscle
96405	Administration of chemotherapy into growth, 1 – 7
96406	Chemotherapy into a lesion, more than 7 lesions
96409	Infusion of chemotherapy into a vein using push technique
96411	Infusion of different chemotherapy drug or substance into a vein
96413	Infusion of chemotherapy into a vein up to 1 hour
96415	Infusion of chemotherapy into a vein
96401	Administration of non-hormonal anti-neoplastic chemotherapy under skin or into muscle
96417	Infusion of different chemotherapy drug or substance into a vein up to 1 hour
96549	Other chemotherapy procedure
96422	Infusion of chemotherapy into an artery up to 1 hour
96423	Infusion of chemotherapy into artery
96425	Prolonged chemotherapy infusion into artery by portable or implanted pump, more than 8 hours
96440	Chemotherapy administration into chest cavity requiring insertion of catheter
96446	Administration of chemotherapy into abdominal cavity
96450	Chemotherapy administration into spinal canal requiring spinal tap
96542	Injection of chemotherapy via reservoir under skin
96416	Prolonged chemotherapy infusion into a vein by portable or implanted pump more than 8 hours

2. Table 4.3 includes 22 radiation treatment CPT codes that we identified as common procedure codes associated with an enrollee who received radiation treatment for an active cancer diagnosis.

Table 4.3: Radiation Treatment CPT Codes

CPT Code	Description
77762	Application of organ cavity radiation source, intermediate
77402	Delivery of simple radiation treatment
77407	Delivery of intermediate radiation treatment
77412	Radiation treatment delivery, complex

[7] **The five character codes and descriptions included in this document are obtained from Current Procedural Terminology (CPT®), copyright 2023 by the American Medical Association (AMA). CPT is developed by the AMA as a listing of descriptive terms and five character identifying codes and modifiers for reporting medical services and procedures. Any use of CPT outside of this document should refer to the most current version of the Current Procedural Terminology available from AMA. Applicable FARS/DFARS apply.**

CPT Code	Description
77417	Therapeutic radiology port films
77423	Radiation treatment delivery, high energy
77424	Intraoperative single X-ray radiation treatment session
77425	Intraoperative electrons radiation treatment single session
77427	Radiation treatment management, 5 treatments
77401	Radiation treatment delivery, superficial
77761	Simple body cavity radiation source application
77799	Other administration of radiation therapy
77763	Complex body cavity radiation source application
77767	High dose brachytherapy through skin surface, 1 channel or up to 2.0 cm
77768	High dose brachytherapy through skin surface, 2 channels or more than 2.0 cm
77770	High dose radiation therapy, 1 channel
77771	High dose brachytherapy , 2 – 12 channels
77772	High dose brachytherapy, more than 12 channels
77778	Complex application of radiation source
77789	Surface application of radiation
77790	Supervision, handling, loading of radiation
77750	Infusion or instillation of radioelement solution

3. Table 4.4 includes 12 surgical therapy CPT codes that we identified as common procedure codes associated with an enrollee who received surgical therapy for an active lung cancer diagnosis.

Table 4.4: Lung Cancer Surgical CPT Codes

CPT Code	Description
32501	Repair of lung airway and removal of segment of lung
32491	Removal of a lung segment to reduce lung volume
32488	Removal of remaining lung after prior lung surgery
32486	Removal portion of lung tissue and segment of lung airway
32484	Removal of a segment of lung tissue
32482	Removal of two lobes of lung
32480	Removal of lobe of lung
32445	Removal of lung and chest cavity lining
32442	Removal of lung and portion of windpipe cartilage
32440	Removal of lung
32405	Needle biopsy of lung or chest tissue, accessed through the skin
32400	Needle biopsy of lining of lung, accessed through the skin

SQL Programming Language

Table 4.5 details the SQL programming language used to query CMS's systems in order to identify the lung cancer high-risk diagnosis codes.

Table 4.5: SQL Programming Language for Lung Cancer High-Risk Group

Step 1

We identified enrollees who received a lung cancer diagnosis (Table 4.1). Additionally, we removed any enrollees who received one or more diagnoses that also mapped to HCC 9 that we did not consider to be at high risk for being miscoded.

```
SELECT raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
 COUNT(raps.DGNS_CD) AS BENE_LINES /*Counts the number of lung cancer diagnosis codes.  Limited to one instance in Step #2*/
FROM  CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/
WHERE raps.DGNS_CD /*RAPS diagnosis code field used to match to Lung Cancer Diagnosis Codes Table*/ IN ( 'C33',
'C3400', 'C3401', 'C3402', 'C3410','C3411', 'C3412', 'C342', 'C3430', 'C3431', 'C3432', 'C3480', 'C3481', 'C3482', 'C3490',
'C3491', 'C3492')  /*Lung Cancer Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/

/*Subquery to identify and remove all enrollees that received a diagnosis that maps to HCC 9 that we did not consider to be at a high risk for being miscoded*/

AND  raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/ NOT IN (
SELECT DISTINCT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM  CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE  raps.DGNS_CD /*RAPS diagnosis code field used to match to Excluded Diagnosis Codes for the Lung Cancer High-Risk Group Table*/  IN (
SELECT DX_CD

FROM CMS_ADM_OIG_OAS_PRD.LUNG_CANCER_EXCLUDED_DX) /* Excluded Diagnosis Codes for the Lung Cancer High-Risk Group Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*)
GROUP BY raps.BENE_SK; /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

Step 2

Using the output from Step 1, we then limited our results to those enrollees who had only one instance of a lung cancer diagnosis during the time period of interest and those enrollees whose risk scores were confirmed in CMS's RAS as including HCC 9.

```
SELECT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD.LUNG_CANCER_STEP_1 raps /*Output from Step #1*/
WHERE raps.BENE_LINES < 2 /*Criteria to limit enrollees to those with a single instance of a lung cancer diagnosis code*/

AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
IN (
```

```
/*Subquery to identify all enrollees from Step #1 with HCC 9 */

SELECT   ras.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM    CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RISK_PTC_I_SCRE ras /*CMS RAS data*/

WHERE  (BENE_PTC_HCC_9_SW ='1' /*Confirms HCC 9 was utilized in the payment risk score*/
AND BENE_FINL_RISK_IND = 'F' /*"F" represents the final RAS record*/
AND BENE_PTC_SCRE_MODEL_SBTYP_CD = 'I02'  /*Used subtype code "I02" since all enrollees have this subtype record, not
required for identifying enrollees for review, helps with computing efficiency*/
AND BENE_RISK_SQNC_NUM = '1'/*Used the RAS risk sequence "1" since it represents the RAPS based RAS record*/
AND (CLNDR_CY_NUM =2019)) ; /*Specifies the payment year for the HCC confirmation*/
```

Step 3

Using the output from Step 2, we identified the RAPS record that included the targeted lung cancer diagnosis so that we could do an encounter claim search spanning the 6-months-before-and-after date window using the targeted diagnosis RAPS "service thru date" field in the following step.

```
SELECT   raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
         raps.BENE_RAPS_SRVC_THRU_DT,
         raps.DGNS_CD
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

JOIN CMS_ADM_OIG_OAS_PRD. LUNG_CANCER_STEP_2 fdr /*Output from Step #2*/
ON RAPS.BENE_SK = fdr.BENE_SK /*Join on CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/

WHERE DGNS_CD IN ( 'C33', 'C3400', 'C3401', 'C3402', 'C3410',  'C3411', 'C3412', 'C342', 'C3430',
'C3431', 'C3432', 'C3480', 'C3481', 'C3482', 'C3490', 'C3491', 'C3492') /*Lung Cancer Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/
```

Step 4

Using the output from Step 3, we identified and removed the enrollees for whom there was a Part C encounter claim with one of the corresponding procedure codes related to a lung cancer treatment rendered within 6 months of submission of the targeted lung cancer diagnosis.

```
SELECT distinct fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. LUNG_CANCER_STEP_3 fdr /*Output from Step #3*/

/*Subquery to identify all enrollees to remove from the step #3 output who had a Part C encounter claim that contains a
lung cancer treatment procedure code. /

WHERE  fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/  NOT IN (

SELECT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. LUNG_CANCER_STEP_3  fdr  /*Output from Step #3*/

JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM hdr
ON hdr.BENE_SK = fdr.BENE_SK /*Join enrollees from the step #3 results to the CMS Medicare Part C encounter claims*/

JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE lin
ON hdr.GEO_BENE_SK = lin.GEO_BENE_SK
AND hdr.CLM_DT_SGNTR_SK = lin.CLM_DT_SGNTR_SK
AND hdr.CLM_TYPE_CD = lin.CLM_TYPE_CD
AND hdr.CLM_NUM_SK = lin.CLM_NUM_SK
```

```
AND hdr.CLM_FROM_DT = lin.CLM_FROM_DT /*Joins CMS Medicare Part C encounter claim to the claim line table with the
individual claim lines)*/

WHERE lin.CLM_LINE_THRU_DT BETWEEN fnd.BENE_RAPS_SRVC_THRU_DT-183
AND fnd.BENE_RAPS_SRVC_THRU_DT+183 /* Identifies enrollees with encounter submissions occurring 6 months before
and 6 months after which include a lung cancer treatment procedure code */

AND lin.CLM_LINE_HCPCS_CD IN ('32400', '32405','32440', '32442', '32445', '32480', '32482', '32484', '32486', '32488',
'32491','32501', /*Lung Cancer Surgical CPT Codes*/

'96401', '96402', '96405', '96406', '96409', '96411', '96413', '96415', '96416', '96417', '96420', '96422', '96423', '96425',
'96440', '96446', '96450', '96542', '96549', /*Chemotherapy Drug Treatment CPT Codes*/

'77401', '77402', '77407''77412', '77417''77423', '77424', '77425', '77427', '77750', '77761', '77762', '77763', '77767',
'77768', '77770', '77771', '77772'', 77778', '77789', '77790', '77799') /*Radiation Treatment CPT Codes */

AND hdr.CLM_TYPE_CD > 3900 /*Identifies the encounter claim type codes*/
AND hdr.CLM_FINL_ACTN_IND = 'Y'); /*Indicates a final action encounter claim*/
```

Downloadable Information

- All of the codes used in this analysis along with the SQL programming language can be found at https://oig.hhs.gov/oas/toolkit/Lung-Cancer-High-Risk-Group.pdf.

5. Breast Cancer High-Risk Group

For the breast cancer high-risk group, we focused on enrollees who received one breast cancer diagnosis (that mapped to the HCC for Breast, Prostate, and Other Cancers and Tumors (HCC 12)) during the service year but did not have surgical therapy, radiation treatments, or chemotherapy drug treatments administered within a 6-month period before or after the diagnosis (Table 5.1). In these instances, a diagnosis of history of breast cancer (which does not map to an HCC) typically should have been used.

Codes Used in Our Analysis

Table 5.1 includes the 54 breast cancer diagnosis codes used in our analysis:

Table 5.1: Breast Cancer Diagnosis Codes

Diagnosis Code	Description
C50011	Malignant neoplasm of nipple and areola, right female breast
C50012	Malignant neoplasm of nipple and areola, left female breast
C50019	Malignant neoplasm of nipple and areola, unspecified female breast
C50021	Malignant neoplasm of nipple and areola, right male breast
C50022	Malignant neoplasm of nipple and areola, left male breast
C50029	Malignant neoplasm of nipple and areola, unspecified male breast
C50111	Malignant neoplasm of central portion of right female breast
C50112	Malignant neoplasm of central portion of left female breast
C50119	Malignant neoplasm of central portion of unspecified female breast
C50121	Malignant neoplasm of central portion of right male breast
C50122	Malignant neoplasm of central portion of left male breast
C50129	Malignant neoplasm of central portion of unspecified male breast
C50211	Malignant neoplasm of upper-inner quadrant of right female breast
C50212	Malignant neoplasm of upper-inner quadrant of left female breast
C50219	Malignant neoplasm of upper-inner quadrant of unspecified female breast
C50221	Malignant neoplasm of upper-inner quadrant of right male breast
C50222	Malignant neoplasm of upper-inner quadrant of left male breast
C50229	Malignant neoplasm of upper-inner quadrant of unspecified male breast
C50311	Malignant neoplasm of lower-inner quadrant of right female breast
C50312	Malignant neoplasm of lower-inner quadrant of left female breast
C50319	Malignant neoplasm of lower-inner quadrant of unspecified female breast
C50321	Malignant neoplasm of lower-inner quadrant of right male breast
C50322	Malignant neoplasm of lower-inner quadrant of left male breast
C50329	Malignant neoplasm of lower-inner quadrant of unspecified male breast
C50411	Malignant neoplasm of upper-outer quadrant of right female breast
C50412	Malignant neoplasm of upper-outer quadrant of left female breast
C50419	Malignant neoplasm of upper-outer quadrant of unspecified female breast
C50421	Malignant neoplasm of upper-outer quadrant of right male breast
C50422	Malignant neoplasm of upper-outer quadrant of left male breast

Diagnosis Code	Description
C50429	Malignant neoplasm of upper-outer quadrant of unspecified male breast
C50511	Malignant neoplasm of lower-outer quadrant of right female breast
C50512	Malignant neoplasm of lower-outer quadrant of left female breast
C50519	Malignant neoplasm of lower-outer quadrant of unspecified female breast
C50521	Malignant neoplasm of lower-outer quadrant of right male breast
C50522	Malignant neoplasm of lower-outer quadrant of left male breast
C50529	Malignant neoplasm of lower-outer quadrant of unspecified male breast
C50611	Malignant neoplasm of axillary tail of right female breast
C50612	Malignant neoplasm of axillary tail of left female breast
C50619	Malignant neoplasm of axillary tail of unspecified female breast
C50621	Malignant neoplasm of axillary tail of right male breast
C50622	Malignant neoplasm of axillary tail of left male breast
C50629	Malignant neoplasm of axillary tail of unspecified male breast
C50811	Malignant neoplasm of overlapping sites of right female breast
C50812	Malignant neoplasm of overlapping sites of left female breast
C50819	Malignant neoplasm of overlapping sites of unspecified female breast
C50821	Malignant neoplasm of overlapping sites of right male breast
C50822	Malignant neoplasm of overlapping sites of left male breast
C50829	Malignant neoplasm of overlapping sites of unspecified male breast
C50911	Malignant neoplasm of unspecified site of right female breast
C50912	Malignant neoplasm of unspecified site of left female breast
C50919	Malignant neoplasm of unspecified site of unspecified female breast
C50921	Malignant neoplasm of unspecified site of right male breast
C50922	Malignant neoplasm of unspecified site of left male breast
C50929	Malignant neoplasm of unspecified site of unspecified male breast

There were 217 additional diagnosis codes that mapped to the HCC for Breast, Prostate, and Other Cancers and Tumors; however, we did not consider these codes to be at a high risk for being miscoded. Therefore, enrollees who received any one of these diagnoses were excluded from our analysis. The table of 217 diagnosis codes can be downloaded at the link included in the Downloadable Information subsection found later in this section.

We used various CPT codes to further refine our analysis. We identified and removed enrollees who received at least one of the following:

1. 19 chemotherapy drug treatment CPT codes that we identified as common procedure codes associated with an enrollee who received a chemotherapy drug treatment for an active cancer diagnosis (Table 4.2 in the preceding section).

2. 22 radiation treatment CPT codes that we identified as common procedure codes associated with an enrollee who received radiation treatment for an active cancer diagnosis (Table 4.3 in the preceding section).

3. Table 5.2 includes seven surgical therapy CPT codes (footnote 7) that we identified as common procedure codes associated with an enrollee who received surgical therapy for an active breast cancer diagnosis.

Table 5.2: Breast Cancer Surgical CPT Codes

CPT Code	Description
19301	Partial removal of breast
19302	Partial removal of breast and underarm lymph nodes
19303	Total removal of breast
19304	Removal of tumor and breast tissue, accessed beneath the skin
19305	Removal of breast, lymph nodes, and muscle
19306	Extensive removal of breast, chest muscle, underarm lymph nodes, and breast lymph nodes
19307	Removal of breast and underarm lymph nodes

There were 181 NDCs pulled from the PDE data used in our analysis. We removed enrollees who received one or more of these NDCs on a drug claim. The table of 181 NDCs can be downloaded at the link included in the Downloadable Information subsection found later in this section.

SQL Programming Language

Table 5.3 details the SQL programming language used to query CMS's systems in order to identify the breast cancer high-risk diagnosis codes.

Table 5.3: SQL Programming Language for Breast Cancer High-Risk Group

Step 1

We identified enrollees who received a breast cancer diagnosis (Table 5.1). Additionally, we removed any enrollees who received one or more diagnoses that also mapped to HCC 12 that we did consider to be at a high risk for being miscoded.

```
SELECT    raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
 COUNT(raps.DGNS_CD AS BENE_LINES /*Counts the number of breast cancer diagnosis codes.  Limited to one instance in Step #2*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE DGNS_CD /* RAPS diagnosis cod field used to match to the Breast Cancer Diagnosis Codes Table*/ IN ('C50011',
'C50012', 'C50019', 'C50021', 'C50022', 'C50029', 'C50111', 'C50112', 'C50119', 'C50121', 'C50122', 'C50129', 'C50211',
'C50212', 'C50219', 'C50221', 'C50222', 'C50229', C50311', 'C50312', 'C50319', 'C50321', 'C50322', 'C50329', 'C50411',
'C50412', 'C50419', 'C50421', 'C50422',  'C50429', 'C50511', 'C50512', 'C50519', 'C50521', 'C50522', 'C50529', 'C50611',
'C50612', 'C50619',  'C50621', 'C50622', 'C50629', 'C50811', 'C50812', 'C50819', 'C50821', 'C50822', 'C50829', 'C50911',
'C50912', 'C50919', 'C50921', 'C50922', 'C50929') /*Breast Cancer Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/

/*Subquery to identify and remove all enrollees that received a diagnosis that maps to HCC 12 that we did consider to be at a high risk for being miscoded*/

AND  raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/  NOT IN (
```

```
SELECT DISTINCT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM  CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE  raps.DGNS_CD /*RAPS diagnosis code field used to match to Excluded Diagnosis Codes for the Breast Cancer High-Risk Group Table*/ IN(
SELECT DX_CD

FROM CMS_ADM_OIG_OAS_PRD.BREAST_CANCER_EXCLUDED_DX) /* Excluded Diagnosis Codes for the Breast Cancer High-Risk Group Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*
)
GROUP BY raps.BENE_SK; /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

Step 2

Using the output from Step 1, we then limited our results to those enrollees who had only one instance of a breast cancer diagnosis during the time period of interest and those enrollees whose risk scores were confirmed in CMS's RAS as including HCC 12.

```
SELECT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD.BREAST_CANCER_STEP_1 raps /*Output from Step #1*/

WHERE raps.BENE_LINES < 2 /*Criteria to limit enrollees to those with a single instance of a breast cancer diagnosis code*/

AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
IN (

/*Subquery to identify all enrollees from Step #1 with HCC 12 */

SELECT ras.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RISK_PTC_I_SCRE ras /*CMS RAS data*/

WHERE (BENE_PTC_HCC_12_SW ='1' /*Confirms HCC 12 was utilized in the payment risk score*/
AND BENE_FINL_RISK_IND = 'F' /*"F" represents the final RAS record*/
AND BENE_PTC_SCRE_MODEL_SBTYP_CD = 'I02'  /*Used subtype code "I02" since all enrollees have this subtype record, not required for identifying enrollees for review, helps with computing efficiency*/
AND BENE_RISK_SQNC_NUM = '1'/*Used the RAS risk sequence "1" since it represents the RAPS based RAS record*/
AND (CLNDR_CY_NUM =2019)) ; /*Specifies the payment year for the HCC confirmation*/
```

Step 3

Using the output from Step 2, we identified the RAPS record that included the targeted breast cancer diagnosis so that we could do an encounter claim search spanning the 6-months-before-and-after date window using the targeted diagnosis RAPS "service thru date" field in the following step.

```
SELECT raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
        raps.BENE_RAPS_SRVC_THRU_DT,
        raps.DGNS_CD
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

JOIN CMS_ADM_OIG_OAS_PRD. BREAST_CANCER_STEP_2 fdr /*Output  from Step #2*/
ON RAPS.BENE_SK = fdr.BENE_SK /* Join on CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

```
WHERE raps.DGNS_CD IN ( 'C50011', 'C50012', 'C50019', 'C50021', 'C50022', 'C50029', 'C50111', 'C50112', 'C50119',
  'C50121','C50122', 'C50129', 'C50211', 'C50212', 'C50219', 'C50221', 'C50222', 'C50229', C50311', 'C50312', 'C50319',
  'C50321', 'C50322', 'C50329', 'C50411', 'C50412', 'C50419', 'C50421', 'C50422', 'C50429', 'C50511', 'C50512', 'C50519',
  'C50521', 'C50522', 'C50529', 'C50611', 'C50612', 'C50619', 'C50621', 'C50622', 'C50629', 'C50811', 'C50812', 'C50819',
  'C50821', 'C50822', 'C50829', 'C50911', 'C50912', 'C50919', 'C50921', 'C50922', 'C50929')/* Breast Cancer Diagnosis Codes
  Table*/

 AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
 AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/
```

Step 4

Using the output from Step 3, we identified and removed the enrollees for whom there was a Part C encounter claim with one of the corresponding procedure codes related to a breast cancer treatment rendered within 6 months of submission of the targeted breast cancer diagnosis.

```
SELECT distinct fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. BREAST_CANCER_STEP_3 fdr /*Output from Step #3*/

/*Subquery to identify all enrollees to remove from the step #3 output who had a Part C encounter claim that contains a
breast cancer treatment procedure code. /

WHERE  fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/ NOT IN(

SELECT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. BREAST_CANCER_STEP_3  fdr  /*Output from Step #3*/

JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM hdr
ON hdr.BENE_SK = fdr.BENE_SK /*Join enrollees from the step #3 results to the CMS Medicare Part C encounter claims*/

JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE lin
ON hdr.GEO_BENE_SK = lin.GEO_BENE_SK
AND hdr.CLM_DT_SGNTR_SK = lin.CLM_DT_SGNTR_SK
AND hdr.CLM_TYPE_CD = lin.CLM_TYPE_CD
AND hdr.CLM_NUM_SK = lin.CLM_NUM_SK
AND hdr.CLM_FROM_DT = lin.CLM_FROM_DT /*Joins CMS Medicare Part C encounter claim to the claim line table with the
individual claim lines)*/

WHERE lin.CLM_LINE_THRU_DT BETWEEN fnd.BENE_RAPS_SRVC_THRU_DT-183
AND fnd.BENE_RAPS_SRVC_THRU_DT+183 /* Identifies enrollees with encounter submissions occurring 6 months before
and 6 months after which include a breast cancer treatment procedure code */

AND lin.CLM_LINE_HCPCS_CD IN ( /*Identifies all HCPCS/CPT Codes associated with encounter claim*/

'19301', '19302', '19303', '19304', '19305', '19306', '19307', /*Breast Cancer Surgical CPT Codes*/

'96401', '96402', '96405', '96406', '96409', '96411', '96413', '96415', '96416', '96417', '96420', '96422', '96423', '96425',
'96440', '96446', '96450', '96542', '96549', /*Chemotherapy Drug Treatment CPT Codes*/

'77401', '77402', '77407''77412', '77417''77423', '77424', '77425', '77427', '77750', '77761', '77762', '77763', '77767',
'77768', '77770', '77771', '77772', '77778', '77789', '77790', '77799') /*Radiation Treatment CPT Codes */

AND hdr.CLM_TYPE_CD > 3900 /*Identifies the encounter claim type codes*/
AND hdr.CLM_FINL_ACTN_IND = 'Y'); /*Indicates a final action encounter claim*/
```

Step 5

Using the output from Step 4, we identified and removed the enrollees who had received a drug claim for any of the NDCs provided within 6 months (before or after) of the targeted breast cancer diagnosis.

```
select DISTINCT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. BREAST_CANCER_STEP_4 fdr /*Output from Step #4*/

WHERE fdr.BENE_SK NOT IN (

/*Subquery to identify all enrollees with a drug claim for one or more of the NDC's provided*/

SELECT DISTINCT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. BREAST_CANCER_STEP_4 fdr /*Output from Step #4*/

INNER JOIN  CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM hdr /*CMS Medicare Claim table data*/
ON fdr.BENE_SK = hdr.BENE_SK /*Joins enrollees from the step #4 results to the CMS Part D perscription drug claims*/

INNER JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE lin /*CMS Medicare Claim Line data*/
ON hdr.GEO_BENE_SK = lin.GEO_BENE_SK
AND hdr.CLM_DT_SGNTR_SK = lin.CLM_DT_SGNTR_SK
AND hdr.CLM_TYPE_CD = lin.CLM_TYPE_CD
AND hdr.CLM_NUM_SK = lin.CLM_NUM_SK
AND hdr.CLM_FROM_DT = lin.CLM_FROM_DT /*Joins CMS Medicare Claims to the claim line table (Part D perscription drug
claims to the individual claim lines)*/

INNER JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE_RX rx /*CMS Medicare Claim Line RX table data*/
ON  lin.GEO_BENE_SK = rx.GEO_BENE_SK
AND lin.CLM_DT_SGNTR_SK = rx.CLM_DT_SGNTR_SK
AND lin.CLM_TYPE_CD = rx.CLM_TYPE_CD
AND lin.CLM_NUM_SK = rx.CLM_NUM_SK
AND lin.CLM_LINE_NUM = rx.CLM_LINE_NUM  /*Joins CMS Part D perscription drug claim lines to the individual Part D
speceific claim lines*/

INNER JOIN CMS_ADM_OIG_OAS_PRD.BREAST_CANCER_PDE_NDC_LIST ndc  /*NDCs for Breast Cancer High-Risk Group
Table*/
ON lin.CLM_LINE_NDC_CD = ndc.NDC_CD /*Joins CMS Part D perscription drug claim line NDC code to the NDCs for Breast
Cancer High-Risk Group Table*/

WHERE hdr.CLM_TYPE_CD IN (1,2,4) /*Represents Non-Deleted Part D Drug Claim types*/

AND hdr.CLM_THRU_DT BETWEEN fdr.BENE_RAPS_SRVC_THRU_DT-183 AND fdr.BENE_RAPS_SRVC_THRU_DT+183
/*Specified six month before and after timeframe*/

AND hdr.clm_finl_actn_ind = 'Y' /*Indicates only Final Action Claims*/
AND rx.CLM_LINE_INGRDNT_CST_AMT >0  /*Identifies non-zero pay claims*/
AND rx.CLM_DRUG_CVRG_STUS_CD='C') ; /*Identifies only covered drug claims*/
```

Downloadable Information

- All of the codes used in this analysis along with the SQL programming language can be found at https://oig.hhs.gov/oas/toolkit/Breast-Cancer-High-Risk-Group.pdf.

6. Colon Cancer High-Risk Group

For the colon cancer high-risk group, we focused on enrollees who received one colon cancer diagnosis (that mapped to the HCC for Colorectal, Bladder, and Other Cancers (HCC 11)) during the service year but did not have surgical therapy, radiation treatments, or chemotherapy drug treatments administered within a 6-month period before or after the diagnosis (Table 6.1). In these instances, a diagnosis of history of colon cancer (which does not map to an HCC) typically should have been used.

Codes Used in Our Analysis

Table 6.1 includes the 10 colon cancer diagnosis codes used in our analysis:

Table 6.1: Colon Cancer Diagnosis Codes

Diagnosis Code	Description
C180	Malignant neoplasm of cecum
C181	Malignant neoplasm of appendix
C182	Malignant neoplasm of ascending colon
C183	Malignant neoplasm of hepatic flexure
C184	Malignant neoplasm of transverse colon
C185	Malignant neoplasm of splenic flexure
C186	Malignant neoplasm of descending colon
C187	Malignant neoplasm of sigmoid colon
C188	Malignant neoplasm of overlapping sites of colon
C189	Malignant neoplasm of colon, unspecified

There were 123 additional diagnosis codes that mapped to the HCC for Colorectal, Bladder, and Other Cancers; however, we did not consider these codes to be at a high risk for being miscoded. Therefore, enrollees who received any one of these diagnoses were excluded from our analysis. The table of 123 diagnosis codes can be downloaded at the link included in the Downloadable Information subsection found later in this section.

We used various CPT codes to further refine our analysis. We identified and removed enrollees who received at least one of the following:

1. 19 chemotherapy drug treatment CPT codes that we identified as common procedure codes associated with an enrollee who received a chemotherapy drug treatment for an active cancer diagnosis (Table 4.2 in a preceding section).

2. 22 radiation treatment CPT codes that we identified as common procedure codes associated with an enrollee who received radiation treatment for an active cancer diagnosis (Table 4.3 in a preceding section).

3. Table 6.2 includes 31 surgical therapy CPT codes (footnote 7) that we identified as common procedure codes associated with an enrollee who received surgical therapy for an active colon cancer diagnosis.

Table 6.2: Colon Cancer Surgical CPT Codes

CPT Code	Description
44187	Creation of small bowel opening using an endoscope, non-tube
44140	Partial removal of large bowel
44141	Partial removal of large bowel with creation of opening to the skin
44143	Partial removal of large bowel with creation of opening
44144	Partial removal of large bowel with creation of small or large bowel opening
44145	Partial removal of large bowel and reattachment to rectum
44146	Partial removal of large bowel and reattachment to rectum and creation of large bowel opening
44147	Partial removal of large bowel, abdominal and transanal approach
44150	Removal of large bowel with attachment of small bowel to rectum or creation of small bowel opening
44151	Removal of large bowel with creation of small bowel opening
44155	Removal of large bowel and rectum and creation of opening from end of small bowel to skin through abdomen
44156	Removal of large bowel and rectum with creation of small bowel opening
44157	Removal of large bowel and rectum with attachment of small bowel to anus
44158	Removal of large bowel and rectum with attachment of small bowel to anus and creation of small bowel reservoir
44139	Release of large bowel from spleen and abdominal wall
44206	Partial removal of large bowel with creation of opening using an endoscope
44227	Closure of large or small bowel opening using an endoscope
44213	Partial release of large bowel and partial removal of large bowel using an endoscope
44212	Removal of large bowel and rectum with creation of small bowel opening using an endoscope
44211	Removal of large bowel and rectum with attachment of small bowel to anus and creation of small bowel opening using an endoscope
44210	Removal of large bowel with attachment of small bowel to rectum or creation of small bowel opening using an endoscope
44160	Partial removal of small and large bowel with attachment of small and large bowel
44207	Partial removal of large bowel and reattachment to rectum using an endoscope
44186	Creation of small bowel opening using an endoscope
44205	Partial removal of small and large bowel with attachment of small and large bowel using an endoscope
44204	Partial removal of large bowel using an endoscope
44203	Partial removal of small bowel using an endoscope, each additional resection and connection
44202	Partial removal and reconnection of small bowel using an endoscope
44188	Creation of large bowel opening using an endoscope
44238	Bowel procedure using an endoscope
44208	Partial removal of large bowel and reattachment to rectum and creation of opening from large bowel to skin using an endoscope

SQL Programming Language

Table 6.3 details the SQL programming language used to query CMS's systems in order to identify the colon cancer high-risk diagnosis codes.

Table 6.3: SQL Programming Language for Colon Cancer High-Risk Group

Step 1

We identified enrollees who received a colon cancer diagnosis (Table 6.1). Additionally, we removed any enrollees who received one or more diagnoses that also mapped to HCC 11 that we did not consider to be at a high risk for being miscoded.

```
SELECT raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
 COUNT(raps.DGNS_CD) AS BENE_LINES /*Counts the number of colon cancer diagnosis codes.  Limited to one instance in Step #2*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE raps.DGNS_CD /*RAPS diagnosis code field used to match to Colon Cancer Diagnosis Codes Table*/ IN ( 'C180', 'C181', 'C182', 'C183', 'C184', 'C185', 'C186', 'C187', 'C188', 'C189') /*Colon Cancer Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/

/*Subquery to identify and remove all enrollees that received a diagnosis that maps to HCC 11 that we did not consider to be at a high risk for being miscoded*/

AND  raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/ NOT IN (

SELECT DISTINCT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM  CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE  raps.DGNS_CD /*RAPS diagnosis code field used to match to Excluded Diagnosis Codes for the Colon Cancer High-Risk Group Table*/ IN (

SELECT DX_CD
FROM CMS_ADM_OIG_OAS_PRD.COLON_CANCER_EXCLUDED_DX) /*Excluded Diagnosis Codes for the Colon Cancer High-Risk GroupTable*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*
)
GROUP BY raps.BENE_SK; /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

Step 2

Using the output from Step 1, we then limited our results to those enrollees who had only one instance of a colon cancer diagnosis during the time period of interest and those enrollees whose risk scores were confirmed in CMS's RAS as including HCC 11.

```
SELECT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD.COLON_CANCER_STEP_1 raps /*Output from Step #1*/

WHERE raps.BENE_LINES < 2 /*Criteria to limit enrollees to those with a single instance of a colon cancer diagnosis code*/

AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

```
IN (

/*Subquery to identify all enrollees from the Step #1 with HCC 11 */

SELECT   ras.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM    CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RISK_PTC_I_SCRE ras /*CMS RAS data*/

WHERE  (BENE_PTC_HCC_11_SW ='1' /*Confirms HCC 11 was utilized in the payment risk score*/
AND BENE_FINL_RISK_IND = 'F' /*"F" represents the final RAS record*/
AND BENE_PTC_SCRE_MODEL_SBTYP_CD = 'I02'  /*Used subtype code "I02" since all enrollees have this subtype record, not required for identifying enrollees for review, helps with computing efficiency*/
AND BENE_RISK_SQNC_NUM = '1'/*Used the RAS risk sequence "1" since it represents the RAPS based RAS record*/
AND (CLNDR_CY_NUM =2019)) ; /*Specifies the payment year for the HCC confirmation*/
```

Step 3

Using the output from Step 2, we identified the RAPS record that included the targeted colon cancer diagnosis so that we could do an encounter claim search spanning the 6-months-before-and-after date window using the targeted diagnosis RAPS "service thru date" field in the following step.

```
SELECT   raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
         raps.BENE_RAPS_SRVC_THRU_DT,
         raps.DGNS_CD
FROM    CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

JOIN CMS_ADM_OIG_OAS_PRD. COLON_CANCER_STEP_2 fdr /*Output from Step #2*/
ON RAPS.BENE_SK = fdr.BENE_SK /* Join on CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/

WHERE  DGNS_CD IN ('C180', 'C181', 'C182', 'C183', 'C184', 'C185', 'C186', 'C187', 'C188', 'C189') /* Colon Cancer Diagnosis Codes Table*/

AND      BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND      BENE_RAPS_DGNS_DLT_SW = '~' ; /*"~" indicates the RAPS diagnosis code is not deleted*/
```

Step 4

Using the output from Step 3, we identified and removed the enrollees for whom there was a Part C encounter claim with one of the corresponding procedure codes related to a colon cancer treatment rendered within 6 months of submission of the targeted colon cancer diagnosis.

```
SELECT distinct fdr.BENE_SK
FROM CMS_ADM_OIG_OAS_PRD. COLON_CANCER_STEP_3 fdr /*Output from Step #3*/

 /*Subquery to identify all enrollees to remove from the step #3 output who had a Part C encounter claim that contains a colon cancer treatment procedure code. /

WHERE  fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/  NOT IN (

SELECT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. COLON_CANCER_STEP_3  fdr  /*Output from Step #3*/

JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM hdr
ON hdr.BENE_SK = fdr.BENE_SK /*Join enrollees from the step #3 results to the CMS Medicare Part C encounter claims*/

JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE lin
ON hdr.GEO_BENE_SK = lin.GEO_BENE_SK
AND hdr.CLM_DT_SGNTR_SK = lin.CLM_DT_SGNTR_SK
```

```
AND hdr.CLM_TYPE_CD = lin.CLM_TYPE_CD
AND hdr.CLM_NUM_SK = lin.CLM_NUM_SK
AND hdr.CLM_FROM_DT = lin.CLM_FROM_DT /*Joins CMS Medicare Part C encounter claim to the claim line table with the individual claim lines)*/

WHERE lin.CLM_LINE_THRU_DT BETWEEN fnd.BENE_RAPS_SRVC_THRU_DT-183
AND fnd.BENE_RAPS_SRVC_THRU_DT+183 /* Identifies enrollees with encounter submissions occurring 6 months before and 6 months after which include a colon cancer treatment procedure code */

AND lin.CLM_LINE_HCPCS_CD IN ('44139', '44140', '44141', '44143', '44144', '44145', '44146', '44147', '44150', '44151',
'44155', '44156', '44157', '44158', '44160', '44186', '44187','44188', '44202', '44203', '44204', '44205', '44206', '44207',
'44208', '44210', '44211', '44212', '44213', '44227' ,'44238' /*Colon Cancer Surgical CPT Codes*/

'96401', '96402', '96405', '96406', '96409', '96411', '96413', '96415', '96416', '96417', '96420', '96422', '96423', '96425',
'96440', '96446', '96450', '96542', '96549', /*Chemotherapy Drug Treatment CPT Codes*/

'77401', '77402', '77407', '77412', '77417', '77423', '77424', '77425', '77427', '77750', '77761', '77762', '77763', '77767',
'77768', '77770', '77771', '77772', '77778', '77789', '77790', '77799') /*Radiation Treatment CPT Codes */

AND hdr.CLM_TYPE_CD > 3900 /*Identifies the encounter claim type codes*/
AND hdr.CLM_FINL_ACTN_IND = 'Y'); /*Indicates a final action encounter claim*/
```

Downloadable Information

- All of the codes used in this analysis along with the SQL programming language can be found at https://oig.hhs.gov/oas/toolkit/Colon-Cancer-High-Risk-Group.pdf.

7. Prostate Cancer High-Risk Group

For the prostate cancer high-risk group, we focused on enrollees who were 74 years old or younger and received one prostate cancer diagnosis (that mapped to the HCC for Breast, Prostate, and Other Cancers and Tumors HCC 12)) during the service year but did not have surgical therapy, radiation treatments, or chemotherapy drug treatments administered within a 6-month period before or after the diagnosis (Table 7.1). In these instances, a diagnosis of history of prostate cancer (which does not map to an HCC) typically should have been used.

Codes Used in Our Analysis

Table 7.1 includes the single prostate cancer diagnosis code used in our analysis:

Table 7.1: Prostate Cancer Diagnosis Code

Diagnosis Code	Description
C61	Malignant neoplasm of prostate

There were 270 additional diagnosis codes that mapped to the HCC for Breast, Prostate, and Other Cancers and Tumors; however, we did not consider these codes to be at a high risk for being miscoded. Therefore, enrollees who received any one of these diagnoses were excluded from our analysis. The table of 270 diagnosis codes can be downloaded at the link included in the Downloadable Information subsection found later in this section.

We used various CPT codes to further refine our analysis. We identified and removed enrollees who received at least one of the following:

1. 19 chemotherapy drug treatment CPT codes that we identified as common procedure codes associated with an enrollee who received a chemotherapy drug treatment for an active cancer diagnosis (Table 4.2 in a preceding section).

2. 22 radiation treatment CPT codes that we identified as common procedure codes associated with an enrollee who received radiation treatment for an active cancer diagnosis (Table 4.3 in a preceding section).

3. Table 7.2 on the following page includes 10 surgical therapy CPT codes (footnote 7) that we identified as common procedure codes associated with an enrollee who received surgical therapy for an active prostate cancer diagnosis.

Table 7.2: Prostate Cancer Surgical CPT Codes

CPT Code	Description
55866	Surgical removal of prostate and surrounding lymph nodes using an endoscope
55845	Removal of prostate gland and surrounding lymph nodes on both sides of the pelvis through abdominal incision
55842	Removal of prostate gland and lymph node biopsy through abdominal incision
55840	Removal of prostate gland
55831	Partial removal of the prostate gland
55821	Partial removal of prostate (suprapubic)
55815	Removal of prostate gland through incision between scrotum and anus and removal of surrounding lymph nodes on both sides of the pelvis
55812	Removal of prostate gland with lymph node biopsy through incision between scrotum and anus
55810	Removal of prostate gland, glands for sperm movement, and sperm duct
55801	Partial removal of prostate gland through incision between scrotum and anus

There were 119 NDCs pulled from the PDE data used in our analysis. We removed enrollees who received one or more of these NDCs on a drug claim. The table of 119 NDCs can be downloaded at the link included in the Downloadable Information subsection found later in this section.

SQL Programming Language

Table 7.3 details the SQL programming language used to query CMS's systems in order to identify the prostate cancer high-risk diagnosis codes.

Table 7.3: SQL Programming Language for Prostate Cancer High-Risk Group

Step 1

We identified enrollees who received a prostate cancer diagnosis (Table 7.1). Additionally, we removed any enrollees who received one or more diagnoses that also mapped to HCC 12 that we did not consider to be at a high risk for being miscoded.

```
SELECT    raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
 COUNT(raps.DGNS_CD AS BENE_LINES /*Counts the number of prostate cancer diagnosis codes.  Limited to one instance in Step #2*/

FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE DGNS_CD /* RAPS diagnosis cod field used to match to Prostate Cancer Diagnosis Codes Table*/ IN (
'C61') /*Prostate Cancer Diagnosis Codes Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/

/*Subquery to identify and remove all enrollees that received a diagnosis that maps to HCC 12 that we did not consider to be at a high risk for being miscoded*/

AND  raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/  NOT IN (
```

```
SELECT DISTINCT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM  CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE  raps.DGNS_CD /*RAPS diagnosis code field used to match to Excluded Diagnosis Codes for the Prostate Cancer
High-Risk Group Table*/ IN (
SELECT DX_CD

FROM CMS_ADM_OIG_OAS_PRD.PROSTATE_CANCER_EXCLUDED_DX)  /* Excluded Diagnosis Codes for the Prostate Cancer
High-Risk Group Table*/

AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*
)
GROUP BY raps.BENE_SK; /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

Step 2

Using the output from Step 1, we then limited our results to those enrollees who had only one instance of a prostate cancer diagnosis during the time period of interest and those enrollees whose risk scores were confirmed in CMS's RAS as including HCC 12.

```
SELECT raps.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD.PROSTATE_CANCER_STEP_1 raps /*Output from Step #1*/

WHERE raps.BENE_LINES < 2 /*Criteria to limit enrollees to those with a single instance of a prostate cancer diagnosis
code*/

AND raps.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
IN (

/*Subquery to identify all enrollees from Step #1 with HCC 12 */

SELECT ras.BENE_SK  /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RISK_PTC_I_SCRE ras /*CMS RAS data*/

WHERE (BENE_PTC_HCC_12_SW ='1' /*Confirms HCC 12 was utilized in the payment risk score*/
AND BENE_FINL_RISK_IND = 'F' /*"F" represents the final RAS record*/
AND BENE_PTC_SCRE_MODEL_SBTYP_CD = 'I02'  /*Used subtype code "I02" since all enrollees have this subtype record, not
required for identifying enrollees for review, helps with computing efficiency*/
AND BENE_RISK_SQNC_NUM = '1'/*Used the RAS risk sequence "1" since it represents the RAPS based RAS record*/
AND (CLNDR_CY_NUM =2019))  /*Specifies the payment year for the HCC confirmation*/
AND BENE_PTC_SCRE_AGE_BRKT_NUM IN ('7074', '6569', '6064', '5559', '4554', '3544')) /*Specifies men
 under the age of 74*/
```

Step 3

Using the output from Step 2, we identified the RAPS record that included the targeted prostate cancer diagnosis so that we could do an encounter claim search spanning the 6-months-before-and-after date window using the targeted diagnosis RAPS "service thru date" field in the following step.

```
SELECT raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
          raps.BENE_RAPS_SRVC_THRU_DT,
          raps.DGNS_CD
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

JOIN CMS_ADM_OIG_OAS_PRD. PROSTATE_CANCER_STEP_2 fdr /*Output  from Step #2*/
ON RAPS.BENE_SK = fdr.BENE_SK /* Join on CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
```

```
WHERE  raps.DGNS_CD IN
('C61') /* Prostate Cancer Diagnosis Codes Table*/

 AND BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
 AND BENE_RAPS_DGNS_DLT_SW = '~' /*"~" indicates the RAPS diagnosis code is not deleted*/
```

Step 4

Using the output from Step 3, we identified and removed the enrollees for whom there was a Part C encounter claim with one of the corresponding procedure codes related to a prostate cancer treatment rendered within 6 months of submission of the targeted prostate cancer diagnosis.

```
SELECT distinct fdr.BENE_SK
FROM CMS_ADM_OIG_OAS_PRD. PROSTATE_CANCER_STEP_3 fdr /*Output from Step #3*/

/*Subquery to identify all enrollees to remove from the step #3 output who had a Part C encounter claim that contains a prostate cancer treatment procedure code. /

WHERE fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/  NOT IN (

SELECT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. PROSTATE_CANCER_STEP_3  fdr  /*Output from Step #3*/

JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM hdr
ON hdr.BENE_SK = fdr.BENE_SK /*Join enrollees from the step #3 results to the CMS Medicare Part C encounter claims*/


JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE lin
ON hdr.GEO_BENE_SK = lin.GEO_BENE_SK
AND hdr.CLM_DT_SGNTR_SK = lin.CLM_DT_SGNTR_SK
AND hdr.CLM_TYPE_CD = lin.CLM_TYPE_CD
AND hdr.CLM_NUM_SK = lin.CLM_NUM_SK
AND hdr.CLM_FROM_DT = lin.CLM_FROM_DT /*Joins CMS Medicare Part C encounter claim to the claim line table with the individual claim lines)*/

WHERE lin.CLM_LINE_THRU_DT BETWEEN fnd.BENE_RAPS_SRVC_THRU_DT-183
AND fnd.BENE_RAPS_SRVC_THRU_DT+183 /* Identifies enrollees with encounter submissions occurring 6 months before and 6 months after which include a prostate cancer treatment procedure code  */

AND lin.CLM_LINE_HCPCS_CD IN ( /*Identifies all HCPCS/CPT Codes associated with encounter claim*/

'55801', '55810', '55812', '55815', '55821', '55831', '55840', '55842', '55845', '55866' /*Prostate Cancer Surgical CPT Codes*/

'96401', '96402', '96405', '96406', '96409', '96411', '96413', '96415', '96416', '96417', '96420', '96422', '96423', '96425',
'96440', '96446', '96450', '96542', '96549', /*Chemotherapy Drug Treatment CPT Codes*/

'77401', '77402', '77407', '77412', '77417', '77423', '77424', '77425', '77427', '77750', '77761', '77762', '77763', '77767',
'77768', '77770', '77771', '77772', '77778', '77789', '77790', '77799') /*Radiation Treatment CPT Codes */

AND hdr.CLM_TYPE_CD > 3900 /*Identifies the encounter claim type codes*/
AND hdr.CLM_FINL_ACTN_IND = 'Y'); /*Indicates a final action encounter claim*/
```

Step 5

Using the output from Step 4 we identified and removed the enrollees who had received a drug claim for any of the NDCs provided within 6 months (before and after) of the targeted prostate cancer diagnosis.

```
select DISTINCT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. PROSTATE_CANCER_STEP_4 fdr /*Output from Step #4*/

WHERE fdr.BENE_SK NOT IN ( /*The following sub query identifies all enrollees with a drug claim for one or more of the
NDC's provided*/

SELECT DISTINCT fdr.BENE_SK /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
FROM CMS_ADM_OIG_OAS_PRD. PROSTATE_CANCER_STEP_4 fdr /*Output from Step #4*/

INNER JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM hdr /*CMS Medicare Claim table data*/
ON fdr.BENE_SK = hdr.BENE_SK /*Joins enrollees from the step #4 results to the CMS Part D perscription drug claims*/

INNER JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE lin /*CMS Medicare Claim Line data*/
ON hdr.GEO_BENE_SK = lin.GEO_BENE_SK
AND hdr.CLM_DT_SGNTR_SK = lin.CLM_DT_SGNTR_SK
AND hdr.CLM_TYPE_CD = lin.CLM_TYPE_CD
AND hdr.CLM_NUM_SK = lin.CLM_NUM_SK
AND hdr.CLM_FROM_DT = lin.CLM_FROM_DT /*Joins CMS Medicare Claims to the claim line table (Part D perscription drug
claims to the individual claim lines)*/

INNER JOIN CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_CLM_LINE_RX rx /*CMS Medicare Claim Line RX table data*/
ON lin.GEO_BENE_SK = rx.GEO_BENE_SK
AND lin.CLM_DT_SGNTR_SK = rx.CLM_DT_SGNTR_SK
AND lin.CLM_TYPE_CD = rx.CLM_TYPE_CD
AND lin.CLM_NUM_SK = rx.CLM_NUM_SK
AND lin.CLM_LINE_NUM = rx.CLM_LINE_NUM  /*Joins CMS Part D perscription drug claim lines to the individual Part D
speceific claim lines*/

INNER JOIN CMS_ADM_OIG_OAS_PRD.PROSTATE_CANCER_PDE_NDC_LIST ndc  /*NDCs for Prostate Cancer High-Risk
Group Table*/
ON lin.CLM_LINE_NDC_CD = ndc.NDC_CD /*Joins CMS Part D perscription drug claim line NDC code to the NDCs for Prostate
Cancer High-Risk Group Table*/

WHERE hdr.CLM_TYPE_CD IN (1,2,4) /*Represents Non-Deleted Part D Drug Claim types*/

AND hdr.CLM_THRU_DT BETWEEN fdr.BENE_RAPS_SRVC_THRU_DT-183 AND fdr.BENE_RAPS_SRVC_THRU_DT+183
/*Specified six month before or after timeframe*/

AND hdr.clm_finl_actn_ind = 'Y' /*Indicates only Final Action Claims*/
AND rx.CLM_LINE_INGRDNT_CST_AMT >0 /*Identifies non-zero pay claims*/
AND rx.CLM_DRUG_CVRG_STUS_CD='C') ; /*Identifies only covered drug claims*/
```

Downloadable Information

- All of the codes used in this analysis along with the SQL programming language can be found at https://oig.hhs.gov/oas/toolkit/Prostate-Cancer-High-Risk-Group.pdf.

8. Potentially Mis-Keyed Diagnosis Codes High-Risk Group

For the high-risk group involving potentially mis-keyed diagnosis codes, we focused on enrollees who received multiple diagnoses for a condition but received only one—potentially mis-keyed—diagnosis for an unrelated condition (which mapped to a possibly unvalidated HCC). For example, ICD-10 diagnosis code I720 (which maps to the HCC for Vascular Disease) could be transposed as diagnosis code I270 (which maps to the HCC for Congestive Heart Failure and in this example would be unvalidated). Using an analytical tool that we developed, we identified 3,780 scenarios in which diagnosis codes could have been mis-keyed because numbers were transposed or because other data-entry errors occurred that could have resulted in the assignment of an unvalidated HCC.

Codes Used in Our Analysis

The table of 3,780 potentially mis-keyed diagnosis code pairs can be downloaded at the link included in the Downloadable Information subsection found later in this section.

SQL Programming Language

Table 8.1 details the SQL programming language used to query CMS's systems in order to identify the potentially mis-keyed diagnosis codes.

Table 8.1: SQL Programming Language for Potentially Mis-Keyed Diagnosis Codes High-Risk Group

Step 1

We Identified non-deleted RAPS records for all enrollees with a diagnosis code listed in the payment year 2019 RAPS Version 22 (V22) HCC mapping file published by CMS.

```
SELECT   raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
raps.BENE_RAPS_SRVC_FROM_DT,
raps.BENE_RAPS_SRVC_THRU_DT, /*RAPS Diagnosis Code Service Dates*/
raps.CNTRCT_NUM, /*RAPS Submitter Contract Number*/
raps.BENE_RAPS_SRVC_THRU_DT(FORMAT 'YYYY')(CHAR(4)) AS THRU_YEAR, /*Capture RAPS Service Thru Year*/
raps.DGNS_CD, /*RAPS diagnosis code field used to match to CMS Diagnosis Code Mapping Table*/
dx.V22 /*HCC from the CMS Diagnosis Code Mapping Table*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

JOIN CMS_ADM_OIG_OAS_PRD.RSK_ADJ_DX_PY19_RAPS_OP_PHYSN_HCC_MAPPING dx
on raps.DGNS_CD = dx.DX_CD /*CMS Diagnosis Code Mapping Table*/

WHERE raps.BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31'   /*Specified timeframe*/
AND raps.BENE_RAPS_DGNS_DLT_SW = '~'; /*"~" indicates the RAPS diagnosis code is not deleted*/
```

Step 2

Using the output from Step 1, we created a distinct list of potentially incorrect diagnosis codes by matching the diagnosis codes from Step 1 to the Office of Inspector General (OIG) Mis-Keyed Diagnosis Codes Table.

```
SELECT raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
raps.CNTRCT_NUM, /*RAPS Submitter Contract Number*/
raps.DGNS_CD, /*RAPS diagnosis code used to match to OIG Mis-Keyed Diagnosis Codes Table*/
        fnd.FLIPPED_HCC_VAL, /*Potential Incorrect Diagnosis Code Value from OIG Mis-Keyed Diagnosis Codes Table*/
```

```
        COUNT (DGNS_CD) as CNT_FLIPPED_DX /*Count of occurrence of potentially incorrect diagnosis submissions from
        the OIG Mis-keyed Diagnosis Codes Table*/

    FROM CMS_ADM_OIG_OAS_PRD. FLIPPED_DGNS_STEP_1 raps /*Output from Step #1*/

    JOIN CMS_ADM_OIG_OAS_PRD.DASH_PY19_FD_FLIPPED_DX_CD fnd
    ON fnd.FLIPPED_DIAG = raps.DGNS_CD /*The OIG Mis-Keyed Diagnosis Codes Table contains potential incorrect mis-keyed
    diagnosis codes and the HCC Value; and the coorsponding correct diagnosis and HCC value*/

    WHERE raps.BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31' /*Specified timeframe*/
    AND raps.BENE_RAPS_DGNS_DLT_SW = '~'; /*"~" indicates the RAPS diagnosis code is not deleted*/

    GROUP BY BENE_SK,CNTRCT_NUM, DGNS_CD, FLIPPED_HCC_VAL; /*Group records to create distinct list of potentially mis-
    keyed diagnosis codes*/
```

Step 3

Using the output from Step 2, we identified all enrollees with only one instance of the possible mis-keyed diagnosis code.

```
SELECT fnd.* /* Pull the entire record from Step #2*/
FROM CMS_ADM_OIG_OAS_PRD. FLIPPED_DGNS_STEP_2 fnd /*Output from Step #1*/

WHERE CNT_FLIPPED_DX = 1; /*Limits the results to a single instance of a potenially incorrect diagnosis*/
```

Step 4

Using the output from Step 1, we grouped all the RAPS records that mapped to an HCC by enrollee, contract number, and HCC. We also counted the number of diagnosis codes that mapped to an HCC.

```
SELECT BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
CNTRCT_NUM, /*RAPS Submitter Contract Number*/
V22, /*HCC from the CMS Diagnosis Code Mapping Table*/
COUNT (V22) AS CNT_BENE_HCC /*Represent diagnosis submission count by HCC*/
FROM CMS_ADM_OIG_OAS_PRD. FLIPPED_DGNS_STEP_1 /*Output from Step #1*/

GROUP BY BENE_SK, CNTRCT_NUM, V22; /*Group RAPS records to create distinct list enrollee HCC with a diagnosis
submission count*/
```

Step 5

Using the output from Step 4, we identified enrollees with only one instance of a diagnosis code that mapped to an HCC.

```
SELECT fnd .* /* Pull the entire record from Step #4*/
FROM CMS_ADM_OIG_OAS_PRD. FLIPPED_DGNS_STEP_1 fnd /*Output from Step #4*/
WHERE CNT_BENE_HCC = 1; /*Limits the results to a single instance of a potenially incorrect diagnosis*/
```

Step 6

Using the outputs from Step 3 and Step 4, we joined the two tables on the enrollee identification number and HCC to identify potentially incorrect diagnosis codes that were used to support the HCC.

```
SELECT t2.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
t2.CNTRCT_NUM, /*RAPS Submitter Contract Number*/
t1.DGNS_CD, /*RAPS potentially incorrect diagnosis*/
t2.V22 /*RAPS potentially incorrect diagnosis HCC (V22)*/
FROM CMS_ADM_OIG_OAS_PRD. FLIPPED_DGNS_STEP_3 t1 /*Output from Step #3*/
```

```
JOIN CMS_ADM_OIG_OAS_PRD. FLIPPED_DGNS_STEP_5 t2 /*Output from Step #5*/
ON t1.BENE_SK = t2.BENE_SK /*Join on enrollee identifier*/
and t1.FLIPPED_HCC_VAL = t2.V22 ; /*Join on mis-keyed diagnosis HCC and single diagnosis HCC*/
```

Step 7

Using all RAPS data, we prepared an enrollee summary by grouping the information by the enrollee, contract number, diagnosis code, and the count of diagnosis code submissions.

```
SELECT raps.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
raps.CNTRCT_NUM, /*RAPS Submitter Contract Number*/
raps.DGNS_CD, /*RAPS potentially incorrect diagnosis*/
COUNT(raps.DGNS_CD) AS BENE_DX_CNT /*Represent diagnosis submission count by enrollee*/
FROM CMS_VDM_VIEW_MDCR_PRD.V2_MDCR_BENE_RAPS_MAO_DGNS raps /*CMS RAPS data*/

WHERE raps.BENE_RAPS_SRVC_THRU_DT BETWEEN '2018-01-01' AND '2018-12-31'   /*Specified timeframe*/
AND raps.BENE_RAPS_DGNS_DLT_SW = '~'; /*"~" indicates the RAPS diagnosis code is not deleted*/

GROUP BY raps.BENE_SK, raps.CNTRCT_NUM, raps.DGNS_CD ; /*Group RAPS records to create distinct list of enrollees by
contract and diagnosis*/
```

Step 8

Using the output from Step 7, we identified enrollees with more than one instance of a diagnosis code submission.

```
SELECT  BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
CNTRCT_NUM, /*RAPS Submitter Contract Number*/
DGNS_CD, /*RAPS potentially incorrect diagnosis*/
BENE_DX_CNT /*Represent diagnosis submission count by enrollee*/
FROM CMS_ADM_OIG_OAS_PRD.FLIPPED_DGNS_STEP_7 /*Output from Step #5*/
WHERE BENE_DX_CNT > 1 ; /*Diagnosis submission count greater than one*/
```

Step 9

Using the outputs from Step 6 and Step 8 and the OIG Mis-Keyed Diagnosis Codes Table, we identified enrollees with multiple instances of what appeared to be the correct diagnosis and HCC and a single instance of what appeared to be the potentially incorrect diagnosis or HCC.

```
SELECT t6.BENE_SK, /*CMS enrollee unique identifier, replace with HIC, MBI or plan identifier*/
t6.CNTRCT_NUM, /*RAPS Submitter Contract Number*/
fnd.DIAG_CORRECT, /*Mis-Keyed Diagnosis Codes Table correct diagnosis match to step #8 output*/
fnd.HCC_CORRECT_DX_VAL, /* Mis-Keyed Diagnosis Codes Table correct diagnosis HCC value*/
t8.BENE_DX_CNT, /*Count of correct diagnosis from Step 8 output*/
fnd.FLIPPED_DIAG, /* Mis-Keyed Diagnosis Codes Table incorrect diagnosis match to step #6 output*/
fnd.FLIPPED_HCC_VAL, /* Mis-Keyed Diagnosis Codes Table incorrect diagnosis HCC value*/
'2019' AS PMT_YR /*Identifies payment year*/
FROM CMS_ADM_OIG_OAS_PRD. FLIPPED_DGNS_STEP_6 t6 /*Output from Step #6, contains enrollee list of potentially
incorrect diagnosis*/

JOIN CMS_ADM_OIG_OAS_PRD.DASH_PY18_FD_FLIPPED_DX_CD fnd /*OIG Mis-Keyed Diagnosis Codes Table*/
ON (t6.V22 = fnd.FLIPPED_HCC_VAL /*OIG Mis-Keyed Diagnosis Codes Table potentially incorrect diagnosis HCC */
AND t6.DGNS_CD = fnd.FLIPPED_DIAG) /*OIG Mis-Keyed Diagnosis Codes Table potentially incorrect diagnosis*/

JOIN CMS_ADM_OIG_OAS_PRD. FLIPPED_DGNS_STEP_8 t8 /*Output from Step 8, contains enrollee list of what appears to
be the correct diagnosis*/
ON ( t6.BENE_SK = t8.BENE_SK
AND fnd.DIAG_CORRECT = t8.DGNS_CD)
```

Downloadable Information

- All of the codes used in this analysis along with the SQL programming language can be found at https://oig.hhs.gov/oas/toolkit/Potentially-Mis-Keyed-Diagnosis-Codes-High-Risk-Group.pdf.

Notice

Note that OIG is providing this toolkit, including the associated SQL programming code, to assist users in analyzing large datasets of MA claims data to identify individuals who received diagnosis codes that are at a high risk of being miscoded. This toolkit was prepared as a technical resource and is not intended to, and does not, create any rights, privileges, or benefits, substantive or procedural, enforceable by a party against the United States; its agencies or instrumentalities; its officers or employees; or any other person. The toolkit is provided in "as-is" condition, and OIG and its employees, agents, and staff disclaim any express or implied representation, warranty, or guarantee, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. In particular, no representation is made that the information included in the toolkit, or any data the toolkit produces, is error free. The toolkit is not intended to be used to determine compliance with any laws, regulations, or other guidance. In no event shall OIG or its employees, agents, or staff be liable for any claim, damages, or liability, whether in an action of contract, tort or otherwise, and including direct, indirect, incidental, special, exemplary, or consequential damages, however caused, and on any theory of liability, arising in any way out of the use of this toolkit or its associated code, even if advised of the possibility of such damage. Compatibility of the toolkit with any user systems is not guaranteed, and any manipulation or alteration of the code is to the sole responsibility of the user.