



Statistical Brief #2

Potentially Preventable Hospital Readmissions Among Medicaid Recipients: New York State, 2007

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Introduction

Hospital readmissions are increasingly viewed as indicative of substandard quality of care, ranging from complications during the hospital stay or immediately afterward, incomplete treatment of the underlying medical problem during the hospitalization, or poor or no outpatient care. In addition to serving as one potential quality of care outcome measure, the Medicare Payment Advisory Commission (MEDPAC) has suggested that hospital readmission rates be linked to hospital reimbursement in the Medicare system. The increasing interest in linking payment to quality of care measures has led a number of states to consider linking hospital readmission rates to reimbursement, and Medicare to consider doing the same nationally.

This brief report summarizes analyses based on New York State Medicaid administrative data for all recipients hospitalized during 2007. The Potentially Preventable Readmission (PPR) software created by 3M™ was used to estimate the number of hospital readmissions that might have been prevented. Since not all readmissions can be prevented, the PPR software uses clinical logic to link initial hospital admissions to subsequent readmissions within a specified time frame in order to identify clinically related readmissions that might have been prevented given appropriate initial inpatient or subsequent outpatient care. A more complete description of the logic used by the PPR software is provided at the end of this report.

This brief addresses several questions. What was the estimated rate of potentially preventable readmissions for Medicaid recipients in 2007? What medical conditions at the initial admission were most frequently associated with subsequent PPRs? What medical conditions were present at readmission for recipients who experienced a PPR, and the Medicaid costs associated with these PPRs? In this brief, an inpatient event was considered managed care if it was an admission for a service included in the managed care benefit package. Carved out services not covered in the benefit package (e.g. a mental health admission for a Supplemental Security Income Medicaid recipient) were considered fee-for-service (FFS). Differences between the FFS and managed care defined in this way, and regional differences are also emphasized.

Findings

Potentially Preventable Readmission Rates

The first step in calculating a PPR rate is to assign an all patient refined diagnostic related group (APR-DRG) to each hospital event and then to exclude all admissions with the following conditions: major metastatic malignancy, other malignancies, trauma, burns, obstetrical, newborns, hospital stays in which the patient “left against medical advice”, and deaths. Once these events were excluded, all events were identified that were followed by at least one clinically related readmission. These are called initial admissions. PPR rates were calculated by dividing the number of initial admissions by the total number of “at risk” inpatient events (all inpatient events that were not excluded according to the above criteria).

HIGHLIGHTS

- A potentially preventable hospital readmission (PPR) is one that is clinically related to the initial admission and might have been prevented by appropriate care, improved discharge planning, or proper outpatient care.
- For Medicaid in 2007, there were 46,115 at risk hospital admissions (those not excluded according to PPR criteria) that were followed within 30 days by at least one PPR.
- In 2007, there were 70,294 PPRs for Medicaid recipients, of which 52,152 (74.2%) were fee-for-service (FFS) readmissions.
- The overall Medicaid PPR rate for 2007 was 9.4 per hundred at risk admissions: 9.8 for (FFS) and 8.4 for managed care.
- The most frequent patient conditions associated with subsequent Medicaid PPRs were alcohol and drug use and mental health. Others were diseases and disorders of the circulatory, respiratory, and digestive systems.
- Total Medicaid PPR expenditures were slightly over \$800 million in 2007, approximately three-fourths of which were FFS PPR expenditures.

¹ The AP-DRG Major Diagnostic Category (MDC) was used, rather than the APR-DRG Major Diagnostic Category, because reimbursement was based on the AP-DRG grouping logic at the time these data were collected.

Table 1 presents the statewide PPR rate by the FFS or managed care status of the recipient at the time of the inpatient event, and comparable rates for the New York City (NYC) and the rest of the state (ROS). The statewide PPR rate was 9.4 per 100 at risk admissions, and the PPR rate for FFS recipients statewide was 9.8 per 100 at risk admissions compared to 8.4 per 100 at risk admissions for managed care. Regionally, the PPR rate was higher in NYC, 9.8 per 100 at risk admissions, compared to the ROS PPR rate of 8.6 per 100 at risk admissions. The highest PPR rate was for NYC FFS recipients, with a rate of 10.7 per 100 at risk admissions.

Most recipients who experienced any PPRs had a single PPR: statewide, 66.2% of recipients experiencing any PPRs had one. However, a significant number of recipients experienced multiple PPRs: 17.2% had two, 7.0% had three, and 3.5% had four PPRs. The range for those experiencing any PPRs was up to 45, with 6.1% of recipients experiencing five or more PPRs.

Medical Condition at Initial Admission

We classified the recipient's condition at the initial admission into Major Diagnostic Categories (MDCs)¹ in order to determine the general types of conditions that most frequently led to subsequent hospital readmissions. Table 2 contains the MDC present at the initial admission that was followed by a PPR, the number of hospital events that were followed by a PPR for that MDC (Initial Admissions), the number of hospital events for that MDC that were "at risk" for a subsequent PPR (all hospital events that were not excluded from analysis, as described earlier), and the PPR rate (initial admissions divided by at risk admissions times 100).

Table 2 illustrates that the five MDCs at initial admission most frequently followed by a PPR were associated with alcohol and drug use (MDC 20), mental health conditions (MDC 19), and diseases and disorders of the circulatory (MDC 05), respiratory (MDC 04) and digestive (MDC 06) systems. These five MDCs were also the types of conditions most frequently followed by PPRs for both FFS and managed care recipients. It should be noted that although HIV infection (MDC 24) was not one of the most frequent conditions at initial admission that was followed by a PPR, this condition had one of the highest PPR rates of any MDC (17.3 per 100 at risk admissions statewide, surpassed only by conditions associated with alcohol and drug use at 17.7 per 100 at risk admissions).

The PPR rate was higher for FFS than for managed care recipients (9.8 per 100 compared to 8.4 per hundred). However, there were a number of conditions at initial admission, for example, diseases and disorders of the circulatory system, digestive system, and nervous system, for which managed care recipients had a higher PPR rate. Among the highest PPR rates for both FFS and managed care were conditions related to alcohol and drug use and mental

health, although FFS recipients had higher PPR rates for these conditions than managed care. There was little regional variation in the conditions present at initial admission that were followed by subsequent PPRs. The five conditions at initial admission that were most frequently followed by PPRs statewide were also those most frequently followed by PPRs in the NYC and ROS regions. However, the highest PPR rate associated with any MDC was for alcohol and drug use (MDC 20) for FFS recipients in NYC at 21.2 per 100 at risk admissions.

Medical Condition at Readmission

While the previous section described the medical condition present at the initial admission that was followed by a PPR, an equally important issue is the medical condition for which the recipient was readmitted. According to the PPR logic, this was either a condition that was a continuation of the condition treated at the initial admission that was not completely resolved, or a condition at readmission that was clinically related to the care received during the initial admission.

Table 3 presents the MDCs characterizing the recipient's condition at readmission, and the number of potentially preventable readmissions associated with that MDC statewide and for both FFS and managed care recipients. Statewide, there were 70,294 PPRs for all Medicaid recipients in 2007. FFS recipients accounted for 52,152 readmissions, or 74.2% of all these readmissions, while managed care accounted for only 18,142 readmissions (25.8%). This table also illustrates that there were major differences between FFS and managed care recipients in terms of their conditions at readmission. For FFS recipients, conditions related to alcohol and drug use (MDC 20) and mental health (MDC 19) were the most frequent at readmission (38.9% of all FFS PPRs). However, these same conditions at readmission accounted for a far smaller percentage (19.2%) of all PPRs for managed care recipients.

In addition to alcohol and drug use, diseases and disorders of the circulatory (MDC 05) and digestive (MDC 06) systems were the conditions most frequently present at readmission for managed care recipients (38.8% of all managed care PPRs). There were few regional differences in terms of the conditions present at readmission. In both NYC and ROS, the three most frequent conditions at readmission were related to alcohol and drug use, mental health, and diseases and disorders of the circulatory system. One important difference, however, was that in NYC conditions associated with alcohol and drug use were present at readmission for 23.1% of the FFS PPRs, while these conditions were present at readmission for only 12.0% of the FFS PPRs in the ROS region.

Cost of FFS Potentially Preventable Readmissions

Finally, we were able to determine the Medicaid costs associated with PPRs for FFS recipients. The methodology necessary to calculate the Medicaid costs associated with PPRs for managed care recipients has not been completed. As a result, we estimated the PPR dollars for managed care recipients based on the same level of spending that we observed for FFS recipients. Future work will more accurately describe the total costs associated with PPRs for managed care recipients.

Table 4 indicates that the total cost associated with PPRs for FFS recipients in 2007 was \$599,892,856, an average of \$11,503 per PPR. Over 77% (77.3%) of these total costs were spent for NYC FFS recipients. The cost associated with each PPR was higher in NYC than in the ROS: \$12,910 in NYC compared to \$8,387 in ROS. The total estimated managed care expenditure associated with PPRs in 2007 was \$204,935,247. Adding these estimated managed care costs to the FFS PPR total dollars yielded an estimated \$804,828,102 in total Medicaid PPR expenditures in 2007. A substantial proportion of PPR dollars was spent on a relatively small number of recipients. Statewide, approximately 24% of the total FFS PPR expenditures (just under \$144 million) were spent on 1,831 FFS recipients who experienced 5 or more PPRs.

Data Source and Methods

The data upon which these analyses were performed were extracts of Medicaid claims and encounter records contained in New York State's OHIP Data Mart. Medicaid staff aggregated multiple claims and encounters for a single inpatient hospitalization into a single "event" record that summarized the inpatient stay. The data set contained information for 917,641 inpatient events during 2007. All analyses described in this brief were performed using the Potentially Preventable Readmission software created and distributed by the 3M™ Corporation. The following is a general summary of the logic employed by the software.²

Phase 1: Identify Excluded Admissions and Non-Events

- Assign APR-DRG to each inpatient event.
- Exclude all admissions with the following conditions: major metastatic malignancy, other malignancies, trauma, burns, obstetrical, newborns, other global exclusions, and left against medical advice.
- Identify and exclude "Non-events", such as admission to a non-acute care facility, transfer to hospital for hospice care, etc.

Phase 2: Preliminary Classification of all Remaining Admissions

- For each individual, calculate the number of days between each subsequent admission and prior admission.
- Apply readmission time interval (in the case of these analyses, 30 days).
- Classify remaining admissions into the following groups:
 - > Initial admission: any admission followed by at least one readmission within the specified time interval
 - > Readmission: any admission following an initial admission within the specified time interval
 - > Only admission: an admission for which there is neither a prior initial admission nor a subsequent readmission within the specified time interval
 - > Transfer admission: an admission during which the recipient was transferred to another acute care hospital

Phase 3: Identify PPRs and Determine Final Classification of Admissions

- Determine if any readmission within specified time interval is clinically-related to the initial admission.
- Identify all readmission chains (all initial admissions and all clinically-related readmissions within the specified time interval).
- Re-classify any readmissions and initial admissions that are not clinically related.
- Assign final PPR classification:
 - > Initial admission: an admission followed by at least one clinically-related readmission within the specified time interval
 - > PPR: a readmission within the specified time interval that is clinically-related to the initial admission
 - > Only admission: an admission for which there is neither a prior initial admission nor a subsequent clinically-related readmission within the specified time interval
 - > Transfer admission: an admission during which the recipient was transferred to another acute care hospital

Statistical Briefs are produced by the New York State Department of Health, Office of Health Insurance Programs. If you have any questions or comments, please e-mail us at: omcmeds@health.state.ny.us.

² Potentially Preventable Readmissions Classification System: Methodology Overview 3m™ Health Information Systems.

Table 1. Potentially Preventable Readmission (PPR) Rates per 100 At Risk Admissions by Medicaid Payment Category and Region: New York State, 2007

Medicaid Payment Category	New York City			Rest of the State			New York State		
	Initial Admissions ¹	At Risk Events ²	PPR Rate	Initial Admissions	At Risk Events	PPR Rate	Initial Admissions	At Risk Events	PPR Rate
Fee-for-Service	21,896	205,588	10.7	11,344	132,475	8.6	33,240	338,063	9.8
Managed Care	8,551	104,483	8.2	4,324	49,247	8.8	12,875	153,730	8.4
All Medicaid	30,447	310,071	9.8	15,668	181,722	8.6	46,115	491,793	9.4

¹ Non-excluded admissions followed by at least one clinically related readmission.

² All admissions that were not excluded according to defined PPR criteria.

Table 2. Potentially Preventable Readmission (PPR) Rates per 100 At Risk Admissions by Major Diagnostic Category at Initial Admission and Medicaid Payment Status: New York State, 2007

Major Diagnostic Category at Admission	Fee-for-Service			Managed Care			All Medicaid		
	Initial Admissions ¹	At Risk Events ²	PPR Rate	Initial Admissions	At Risk Events	PPR Rate	Initial Admissions	At Risk Events	PPR Rate
20-Alcohol/Drug Use / Alcohol/Drug Induced Organic Mental Disorders	5,976	33,169	18.0	1,247	7,713	16.2	7,223	40,882	17.7
19-Mental Diseases / Disorders	5,953	41,024	14.5	922	7,887	11.7	6,875	48,911	14.1
05-Diseases / Circulatory System Disorders	4,535	57,939	7.8	2,237	22,144	10.1	6,772	80,083	8.5
04-Diseases / Respiratory System Disorders	3,023	36,753	8.2	1,442	21,027	6.9	4,465	57,780	7.7
06-Diseases / Digestive System Disorders	2,141	29,816	7.2	1,362	17,372	7.8	3,503	47,188	7.4
01-Diseases / Nervous System Disorders	1,596	21,779	7.3	865	9,390	9.2	2,461	31,169	7.9
24-Human Immunodeficiency Virus Infections	1,482	8,610	17.2	214	1,179	18.2	1,696	9,789	17.3
11-Diseases / Kidney Disorders / Urinary	1,348	17,872	7.5	537	6,451	8.3	1,885	24,323	7.7
10-Endocrine, Nutritional / Metabolic Diseases	1,151	14,998	7.7	740	8,953	8.3	1,891	23,951	7.9
18-Infectious / Parasitic Diseases, Systemic or Unspecified Sites	1,100	10,884	10.1	304	3,741	8.1	1,404	14,625	9.6
08-Diseases / Musculoskeletal System Disorders / Connective Tissue	1,008	19,153	5.3	563	9,231	6.1	1,571	28,384	5.5
07-Diseases / Disorders of the Hepatobiliary System / Pancreas	962	9,103	10.6	639	5,531	11.6	1,601	14,634	10.9
09-Diseases / Disorders of the Skin, Subcutaneous Tissue / Breast	844	11,276	7.5	417	6,660	6.3	1,261	17,936	7.0
16-Diseases / Disorders of Blood, Blood Forming Organs / Immunological Disorders	765	5,041	15.2	389	3,050	12.8	1,154	8,091	14.3
21-Poisonings, Toxic Effects, Other Injuries / Other Complications of Treatment	725	5,929	12.2	372	3,869	9.6	1,097	9,798	11.2
03-Ear, Nose, Mouth, Throat / Craniofacial Diseases	272	5,598	4.9	207	5,408	3.8	479	11,006	4.4
13-Diseases / Female Reproductive System Disorders	174	3,764	4.6	249	5,734	4.3	423	9,498	4.5
15-Newborns / Other Neonates with Conditions Originating in Perinatal Period	62	980	6.3	87	5,696	1.5	149	6,676	2.2
12-Diseases / Disorders of the Male Reproductive System	58	1,284	4.5	32	683	4.7	90	1,967	4.6
Pre MDC or Multiple MDC, Not Assigned to MDC	46	1,396	3.3	32	882	3.6	78	2,278	3.4
23-Rehabilitation, Aftercare, Other Factors Influencing Health Status	10	1,450	0.7	8	806	1.0	18	2,256	0.8
14-Pregnancy, Childbirth / the Puerperium	8	166	4.8	5	268	1.9	13	434	3.0
02-Diseases / Disorders of the Eye	1	41	2.4	3	22	13.6	4	63	6.3
17-Lymphatic, Hematopoietic, Other Malignancies, Chemotherapy / Radiotherapy	0	5	0.0	1	5	20.0	1	10	10.0
25-Multiple Significant Trauma	0	33	0.0	1	28	3.6	1	61	1.6
All Major Diagnostic Categories	33,240	338,063	9.8	12,875	153,730	8.4	46,115	491,793	9.4

¹ Non-excluded admissions followed by at least one clinically related readmission.

² All admissions that were not excluded according to defined PPR criteria.

Table 3. Potentially Preventable Readmissions (PPR) by Major Diagnostic Category and Medicaid Payment Category: New York State, 2007

Major Diagnostic Category at Readmission	Fee-for-Service PPRs		Managed Care PPRs		All Medicaid PPRs	
	N	%	N	%	N	%
20-Alcohol/Drug Use / Alcohol/Drug Induced Organic Mental Disorders	10,250	19.7	2,007	11.1	12,257	17.4
19-Mental Diseases / Disorders	10,008	19.2	1,461	8.1	11,469	16.3
05-Diseases / Disorders of the Circulatory System	6,427	12.3	2,989	16.5	9,416	13.4
04-Diseases / Disorders of the Respiratory System	4,710	9.0	1,984	10.9	6,694	9.5
06-Diseases / Disorders of the Digestive System	3,036	5.8	2,034	11.2	5,070	7.2
24-Human Immunodeficiency Virus Infections	2,467	4.7	371	2.0	2,838	4.0
18-Infectious / Parasitic Diseases, Systemic or Unspecified Sites	2,309	4.4	774	4.3	3,083	4.4
01-Diseases / Disorders of the Nervous System	2,129	4.1	1,194	6.6	3,323	4.7
10-Endocrine, Nutritional / Metabolic Diseases / Disorders	1,905	3.7	1,041	5.7	2,946	4.2
11-Diseases / Disorders of the Kidney / Urinary Tract	1,892	3.6	688	3.8	2,580	3.7
16-Diseases/Blood Disorders, Blood Forming Organs	1,855	3.6	644	3.5	2,499	3.6
07-Diseases / Disorders of the Hepatobiliary System / Pancreas	1,386	2.7	804	4.4	2,190	3.1
21-Poisonings, Toxic Effects, Other Injuries / Other Complications of Treatment	1,324	2.5	657	3.6	1,981	2.8
09-Diseases / Skin Disorders, Subcutaneous Tissue / Breast	1,052	2.0	484	2.7	1,536	2.2
08-Diseases / Musculoskeletal System Disorders/Connective Tissue	905	1.7	585	3.2	1,490	2.1
03-Ear, Nose, Mouth, Throat / Craniofacial Diseases / Disorders	272	0.5	198	1.1	470	0.7
13-Diseases / Female Reproductive System Disorders	76	0.1	91	0.5	167	0.2
Pre MDC or Multiple MDC, Not Assigned to MDC	61	0.1	48	0.3	109	0.2
12-Diseases / Male Reproductive System Disorders	47	0.1	30	0.2	77	0.1
23-Rehabilitation, Aftercare, Other Factors Influencing Health Status	22	0.0	19	0.1	41	0.1
15-Newborns / Neonates with Conditions Originating in the Perinatal Period	17	0.0	34	0.2	51	0.1
02-Diseases / Disorders of the Eye	2	0.0	2	0.0	4	0.0
14-Pregnancy, Childbirth / the Puerperium	0	0.0	3	0.0	3	0.0
All Major Diagnostic Categories	52,152	100.0	18,142	100.0	70,294	100.0

Table 4. Total and Average Costs Associated with Potentially Preventable Readmissions (PPR) by Region and Medicaid Payment Category: New York State, 2007

Medicaid Payment Category	New York City			Rest of the State			New York State		
	Total PPR Cost	%	Average Cost per PPR	Total PPR Cost	%	Average Cost per PPR	Total PPR Cost	%	Average Cost per PPR
Fee-for-Service	\$463,812,773	77.3	\$12,910	\$136,080,082	22.7	\$8,387.06	\$599,892,855	100.0	\$11,503
Managed Care*	\$154,604,258	75.4	\$12,800	\$50,330,989	24.6	\$8,299.97	\$204,935,247	100.0	\$11,296
All Medicaid	\$618,417,031	76.8	\$12,882	\$186,411,071	23.2	\$8,363.37	\$804,828,102	100.0	\$11,449

*Managed Care dollars are estimated based on FFS costs.