TEXAS HEALTH AND HUMAN SERVICES
COMMISSION

Potentially Preventable Readmissions in the Texas Medicaid Population, State Fiscal Year 2012

Public Report

November 2013

Note: **Each hospital can obtain a confidential version of this report, with its own PPR results, through its secure mailbox at www.tmhp.com.**

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TEXAS HEALTH AND HUMAN SERVICES COMMISSION

The purpose of this report is to provide data on the volume and rate of PPRs in each Texas and out-of-state hospital that served Texas Medicaid clients during state fiscal year (SFY) 2012.

House Bill (H.B.) 1218, 81st Legislature, First Called Session 2009, requires the Health and Human Services Commission (HHSC) to identify potentially preventable readmissions (PPRs) in the Medicaid population and then confidentially report the results to each hospital annually. The law also requires each hospital to distribute the information to its care providers. Senate Bill (S.B.) 7, 82nd Legislature, First Called Session 2011, requires HHSC to implement quality-based payments to hospitals on the basis of the results of PPR analysis.

This is the fourth year for which PPR analysis has been performed and reported. Section 2.8 of this document compares the results of SFY 2010, SFY 2011, and SFY 2012. The difference in PPR rates between all three years is virtually unchanged. The SFY 2010 was 3.704, SFY 2011 is 3.678, and SFY 2012 is 3.740.

Section 2 of this report shows that 3.7 percent (Table 2.2.1) of Texas Medicaid inpatient stays in SFY 2012 were followed by at least one PPR within 15 days of discharge. The cost to Medicaid of these PPRs was approximately $111.2 million (Table 2.2.2), or about 3.5 percent of the total Medicaid payments that were made to hospitals. The PPR rate and the percentage of total payments may seem modest in the context of a very large program. The overall rate includes a large volume of obstetric stays, where PPRs were rare (0.8 percent). The non-obstetric pediatric population's PPR rate was 4.1 percent; the non-obstetric adult population's PPR rate was 8.2 percent. Of the clients who were initially admitted for mental illness or substance abuse, 9.1 percent of pediatrics and 11.4 percent of adults were readmitted within 15 days. Many were readmitted again after the 15 days. PPR rates were even higher for some individual All Patient Refined (APR)-Diagnosis Related Group (DRG)s, ranging as high as 19 percent for Other Hepatobiliary, Pancreas & Abdominal Procedures.

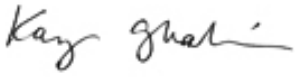
Many people are familiar with Medicare's approach to calculating and reporting readmission rates. HHSC's approach differs to more accurately reflect the needs of the Medicaid population. The HHSC approach considers almost all medical conditions, but it only classifies a readmission as potentially preventable if there is a plausible clinical connection between the initial admission and the readmission. A readmission "window" of 15 days is used, and clients in Medicaid fee-for-service (FFS), Primary Care Case Management (PCCM), and managed care programs are included. The approach uses PPR software that was developed by 3M Health Information Systems.[1] The same approach is being used by other states as mentioned later in this report in more detail in Section 3 and Appendix B.5.

Not all readmissions are preventable. The methodology for calculating PPR rates attempts to control for and exclude readmissions that were likely planned or were otherwise unavoidable. Nationwide, a high level of readmissions may reflect the absence of appropriate care in our health-care system, especially the manner in which patients are transitioned from the hospital to care in the community or in a post-acute facility. The hospital, with its central role in every community's health-care system, can play a valuable role in improving that transition. The range of hospital performance is wide enough to suggest that hospitals can learn from each other on how to reduce PPRs (Table 2.6.1.) If the number of PPRs was reduced by 10 percent, the result would be a savings of approximately $11 million a year to the Medicaid budget and, more importantly, improved health and satisfaction among the clients who are served by HHSC and hospitals serving the Medicaid population.

This analysis was performed for HHSC by the Texas Medicaid & Healthcare Partnership (TMHP).

Statements and opinions are those of the authors and not necessarily those of the Texas Health and Human Services Commission.

HHSC is interested in improving the methodology and making the results more useful to hospitals. At any time, comments and suggestions on this topic are welcomed, and can be emailed to PPR.Report@tmhp.com.



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1 Background and Methodology

House Bill (H.B.) 1218 from the 81st Legislature, Regular Session 2009, requires the Texas Health and Human Services Commission to provide confidential information to each hospital on its performance with regard to potentially preventable readmissions (PPR). This report meets that requirement for state fiscal year (SFY) 2012 (September 1, 2011 through August 31, 2012). There are two versions of this report. The public version provides results at the statewide level and describes the methodology used. The hospital specific version contains a section that includes confidential hospital results only. Each hospital can reference the public report for comparison purposes.

This report, performed at the direction of the Texas legislature, calculates casemix-adjusted rates of potentially preventable readmissions both statewide and for individual hospitals.

A potentially preventable readmission is a readmission (return hospitalization within the specified readmission time interval) that is clinically related to the initial hospital admission. "Clinically related" is defined as a requirement that the underlying reason for readmission be plausibly related to the care rendered during or immediately following a prior hospital admission. A clinically related readmission is one that results from the process of care and treatment during the prior admission (e.g., readmission for a surgical wound infection) or due to a lack of post admission follow-up (lack of follow-up arrangements with a primary care physician) within a specified readmission time interval. A clinically related readmission does not include unrelated events that occurred after the prior admission (broken leg due to trauma).

Section 1 of this report provides the background and methodology for the analysis. Section 1.1 describes the Medicaid fee-for-service (FFS), Primary Care Case Management (PCCM), and managed care organization (MCO) reimbursement models of inpatient hospital care. Section 1.2 describes the study population. The analysis included inpatient stays for which Texas Medicaid was the primary payer (directly through FFS/PCCM or indirectly through MCOs) except for newborns, undocumented aliens and patients who "spent down" to Medicaid eligibility. Newborns were excluded because the 3M PPR analytical tool used for this analysis has not been fully developed for this population. Patients with emergency Medicaid were excluded because Medicaid would have no record of any readmissions that occurred after the patients lost eligibility.

Section 1.3 provides an overview of the various methods of measuring readmissions. In particular, an approach based on identifying specific preventable readmissions is contrasted with the approach used in this PPR report, which is to focus on casemix-adjusted hospital-wide rates of PPRs. The emphasis is on *potentially*— the recognition that readmissions may occur even with optimal care but that high PPR rates across a hospital may indicate problems in quality.

A specific algorithm developed by 3M Health Information Systems was used to measure PPRs in this report. This algorithm is described in Section 1.4. For this report, no modifications were made to the PPR algorithm.

Although the 3M PPR software identifies PPRs, it does not generate hospital-wide rates that can be compared across hospitals. Section 1.5 describes the methodology that TMHP used to compare actual PPR rates with expected PPR results by hospital, where the "expected" rate reflected each hospital's patient mix, or casemix. Casemix is a measure of clinical characteristics using diagnosis code relative weights, sometimes augmented in PPR analysis with information on patient age and/or the presence of a major MH/SA comorbidity. Casemix is critically important if fair comparisons are to be drawn across hospitals or other patient populations.

Section 2 of the report describes results at the statewide level, followed by frequently asked questions in Section 3. Section 4, as noted above, is only included in the confidential reports provided to each hospital. Three appendices provide further detail on results and methodology.

1.1 Medicaid Payment for Inpatient Hospital Services

In SFY 2012 (September 1, 2011, through August 31, 2012), Texas Medicaid paid for approximately one-quarter of all inpatient stays in Texas. Payments to hospitals totaled $3.5 billion, which was approximately 7 percent of the industry's combined inpatient and outpatient revenue.[2]

In SFY 2012, Medicaid paid for 691,843 inpatient stays, representing about 25 percent of total inpatient stays statewide.

This report reflects Texas Medicaid inpatient hospital claims for the fee for service (FFS), Primary Care Case Management (PCCM), and managed care patients; approximately 36 percent of stays were FFS, which means that payments are made directly to the hospital by Texas Medicaid (Table 1.1.1). Another 14 percent of stays were PCCM. These clients had a designated primary care coordinator, typically a physician, who took responsibility for coordinating the client's care. The PCCM was not at financial risk for the services that the client received. Payment for the hospital stay was made directly by the Medicaid program, just as with traditional FFS.

The other 50 percent of stays were for managed care clients. The managed care organizations (MCOs) accepted financial responsibility for the services received by the client and paid the hospital directly. The MCOs are a capitated full risk model. Beginning March 1, 2012 approximately 880,000 people from the PCCM program transitioned into managed care. Table 1.1.1 reflects this transition in comparison to last year's PPR report.

Table 1.1.1 also shows stays and payments by Medicaid Care Category, a categorization intended to reflect the inpatient needs of the Medicaid population as well as the internal organization of a typical hospital. Overall, 34 percent of Medicaid stays were for obstetrics, 29 percent for newborns, 15 percent for clients 17 years of age and younger (excluding newborns and obstetrics) and 21 percent for adults (excluding obstetrics).

In all three delivery methods, Medicaid clients who are 20 years of age and younger can receive an unlimited amount of medically necessary inpatient hospital care. However, there are two benefit limitations that apply to FFS and PCCM adults 21 years of age and over. This includes a $200,000 inpatient cap per year and secondly, a 30 day "spell of illness." "Spell of illness" is generally defined as 30 days of inpatient hospital care after which an interval of at least 60 days out of the hospital must occur before inpatient benefits will once again be covered. In the managed care program, enhanced benefits provide waivers of the $200,000 annual inpatient cap and the 30-day spell of illness limitation for those Medicaid clients 21 years of age and older. [3]

Table 1.1.1

Summary of Medicaid Inpatient Hospital Utilization, SFY 2012

Medicaid Care Category	Stays				Medicaid Payments (in Millions)			
	FFS	PCCM	MCO	Total	FFS	PCCM	MCO	Total
Pediatric								
Respiratory	6,964	5,984	12,895	25,843	$88	$26	$88	$202
Other medical	15,482	6,815	23,815	46,112	$184	$41	$202	$427
Other surgical	5,036	1,592	7,172	13,800	$127	$31	$135	$293
MH/SA	6,660	2,645	10,062	19,367	$37	$11	$46	$94
Subtotal	34,142	17,036	53,944	105,122	$437	$108	$471	$1,016
Adult								
Circulatory	7,018	4,297	5370	16,685	$67	$34	$49	$150
Other medical	37,001	18,832	27,380	83,213	$273	$112	$181	$566
Other surgical	10,254	5,123	7465	22,842	$160	$59	$92	$312
MH/SA	4,731	1,875	14,343	20,949	$16	$6	$49	$71
Subtotal	59,004	30,127	54,558	143,689	$516	$211	$372	$1,099
Obstetrics	77,476	24,576	134,971	237,023	$186	$54	$328	$568
Newborns	76,962	23,305	103,288	203,555	$275	$60	$440	$775
Ungroupable	174	41	2,239	2,454	$10	$2	$25	$38
Total	247,758	95,085	349,000	691,843	$1,425	$435	$1,636	$3,496
Percent of Total	36%	14%	50%	100%	41%	12%	47%	100%

Notes:

1) FFS=fee for service; PCCM=Primary Care Case Management; MCO=managed care organization; MH/SA=mental health/substance abuse
2) Payments exclude payments on Medicare crossover claims and disproportionate share hospital (DSH) payments.
3) Totals in this table may not be identical to other information prepared by HHSC due to differences in service dates, paid dates, dates of analysis, inclusion or exclusion of various claim categories, and other reasons.

1.2 Data Included/Excluded in the Report

This analysis includes the entire Medicaid population, with four exceptions.

- ***Newborns***—The 3M PPR software was not designed for use with this population.[4] Readmissions are rare in the newborn population.
- ***Undocumented Alien Status***—A total of 77,916 stays were excluded because the recipient of care had undocumented alien status; with the exception of emergency Medicaid, this status precludes Medicaid eligibility. If the client was discharged and readmitted, the readmission probably would not have been captured in the Medicaid database.
- ***Dual eligibles***—Stays for clients who were dually eligible for both Medicare and Medicaid were excluded if Medicare was the primary payer for the stay.[5]
- ***Medically needy spend-down*** —Stays for patients who "spend down" to Medicaid eligibility were excluded.

The study includes all Medicaid stays except for newborns, stays for patients with emergency Medicaid, stays for dually eligible patients where Medicare was the primary payer and stays for patients who "spent down" to Medicaid eligibility.

A total of 27,378 stays were also excluded from the analysis due to "categorical exclusion" and "non- event" logic in the PPR software, such as stays when patients discharged themselves against medical advice (Section 1.4). The PPR software was configured to search for initial admissions in an 11-month period and readmissions in a 12-month period in order to allow a one-month run-out period for PPRs. This resulted in the exclusion of 30,343 initial admissions that occurred in August 2012.

All of the results include the FFS, PCCM, and managed care populations. Hospitals were uniquely identified using their Texas Provider Identifier (TPI). Managed care plans only report the hospital's National Provider Identifier (NPI); therefore, each NPI was cross-walked to the appropriate TPI based on data received from the plan (e.g. taxonomy and zip code).

All of the data were subject to extensive validation, including chaining together multiple claims for a single stay, verifying the bill type, examining extreme values of important data fields, and verifying diagnosis and procedure code values. In particular, the accuracy of the PPR software depends on the accuracy of diagnosis related group (DRG) assignments, which in turn depend on the accuracy and completeness of diagnosis and procedure coding. Coding completeness and accuracy were evaluated as described in Appendix Section B.2.4. In general, there were no obvious indications of coding problems that would significantly affect the PPR analysis. The exception was that the coding performed by freestanding psychiatric hospitals appeared to be noticeably less thorough than at general acute care hospitals that provide similar care. As a result, reported PPR performance may be worse for some freestanding psychiatric hospitals than it would be if the coding were more complete. Any coding deficiencies in these hospitals would also make reported PPR performance in the general acute care hospitals better than it otherwise would be for mental health and substance abuse treatment, since statewide norms are applied to both groups of hospitals. As discussed in Appendix Section B.2.4, the magnitude of any discrepancy is unknown but believed to be modest.

Overall, of the 691,843 stays shown in Table 1.1.1, a total of 334,895 stays were excluded from the analytical dataset by design of the study. Another 16,543 stays, or 2.4 percent, were omitted because of issues in the data submitted by health plans or hospitals. As a result, the analytical dataset comprised 340,405 stays shown in Table 2.1.1, each of which was categorized as either an initial admission or as a PPR. Appendix Table B.2.1 shows a reconciliation of claim counts.

1.3 Potentially Preventable Readmissions as an Indicator of Quality

Readmissions to hospitals have long been recognized as a measure of quality of care.[6] Many Medicaid programs and other payers have policies under which they may deny payment for specific readmissions that result from sub-standard care that was provided in the initial admission. Examples include repeat admissions for asthma or admissions for post-operative bleeding. In principle, denial of payment for these specific cases motivates the hospital to bring its care up to standard.

In recent years, however, hospitals and payers have taken a different approach to improving quality.[7] Instead of focusing on specific events or on specific individuals, the focus is on overall performance. This approach aims for transparency and collaboration between medical providers. Dr. Guy Clifton, a former Houston neurosurgeon and health policy analyst, says quality problems "…are not about bad people but about good people working in bad systems."[8] The goal of quality improvement is also becoming more ambitious; its aim is not only to reduce quality problems, but also to enable quality successes.

PPR analysis focuses not on individual readmissions but on overall rates, with the goal of encouraging excellent care, especially in the transition from the hospital to the community.

Analysis of hospital-wide PPR rates fits very well with this approach. Even the best systems will have some readmissions. This report controls for this fact by taking into account readmissions that are likely beyond the control of providers or are considered part of a normal plan of care. For example, in situations where readmissions are likely included in the plan of care, such as chemotherapy, the PPR software excludes the readmissions entirely. In situations where the readmission is clearly unrelated, the second stay does not count as a PPR. In other situations, for example, pediatric bronchiolitis followed by a similar stay, no attempt is made to identify which specific readmissions could or could not have been prevented. Instead, the hospital-wide PPR rate is reported and compared with an appropriate norm, with the goal of focusing attention on the entire system of care and the improvement of its outcomes. All such comparisons are adjusted for differences in casemix.

The existence of PPRs does not necessarily mean there was bad care. For example, only 2 percent of PPRs were for post-surgical complications (Table 2.3.1) and some of those were presumably unpreventable. Much more commonly, readmissions appear to reflect the absence of excellent care, especially during the transition from inpatient care to care at home or in a post-acute facility. Relatively simple steps can make a real difference. These include scheduling the follow-up appointment before discharge, voice-to-voice transfer of care between the attending physician and the primary care physician, asking the patient to repeat back the discharge instructions, reconciling medication instructions, and placing a follow-up phone call several days after discharge.

For hospitals that are interested in reducing their PPR rates, Box 2.1.1 summarizes the key findings at the statewide level. Individual hospitals will receive specific details at the claim level (refer to Question 17 in Section 3). Overviews of best practices and lessons learned are available from organizations such as the Health Research and Educational Trust, the Institute for Healthcare Improvement, Academy Health, and Medicare and Medicaid quality improvement organizations. In Texas, TMF Health Quality Institute® is leading a Learning and Action Network that aims to reduce all-cause 30-day readmissions by 20 percent over a three year period which will end in 2014 (See Question 15 in Section 3).

1.4 Defining Potentially Preventable Readmissions

PPRs are identified by comparing the APR-DRG for the initial admission with the APR-DRG for the readmission.

The 3M PPR methodology is a computerized algorithm based on claims data submitted by hospitals that identifies readmissions where there is a plausible clinical relationship to the care rendered during or immediately following a prior hospital admission.[9] Of the many ways to define and report readmissions, the simplest approach is to count the number of all readmissions that occur within a given time period. The 3M approach used in this study is more sophisticated because it includes risk adjustment for severity of illness, and it counts only readmissions for which there was a plausible clinical connection between the reason for the initial admission and the reason for the readmission.

To put this approach into operation, every stay was assigned to an All Patient Refined (APR)-Diagnosis Related Group (DRG). There are 314 base APR-DRGs which can be thought of as the reason for admission. Each base APR-DRG has four levels of severity. APR-DRG 139-1, for example, is assigned to a patient who has uncomplicated pneumonia. A patient assigned to APR-DRG 139-2 has both pneumonia and a significant comorbidity such as congestive heart failure. At the extreme, a patient assigned to APR-DRG 139-4 may have pneumonia with multiple organ failure, which requires intensive therapy.

When comparing the reason for admission with the reason for readmission, there are 314 x 314 = 98,596 possible pairs of base APR-DRGs. A 3M panel of clinicians made a judgment about whether each admission/readmission pair represented a PPR. For some pairs, additional factors were considered, including patient age or particular diagnoses and procedures within an APR-DRG. The list of admission/readmission APR-DRG pairs defined as PPRs is available in an appendix to the 3M PPR Classification System Definitions Manual. For each pair that counts as a PPR, the readmission is also classified by the clinical reason. These reasons for the readmission are listed with examples in Table 1.4.1.

Table 1.4.1
Examples of Clinical Reasons for Potentially Preventable Readmission

Readmission Reason	Readmission DRG Example
Example: Initial admission for APR-DRG 141 -- Asthma	
1 Medical readmission—recurrence	APR-DRG 141 -- Asthma
2A Ambulatory care sensitive condition	APR-DRG 139 -- Pneumonia
2B Readmission—chronic problem	APR-DRG 053 -- Seizure
3 Medical readmission—acute problem	APR-DRG 134 -- Pulmonary embolism
6A Mental health readmission after initial admission not MH/SA	APR-DRG 751 -- Depression
6B Substance abuse readmission after initial admission MH/SA	APR-DRG 775 -- Alcohol abuse
Example: Initial admission for APR-DRG 225 -- Appendectomy	
4 Surgical readmission—recurrence	APR-DRG 221 -- Major bowel procedure
5 Surgical readmission—complication	APR-DRG 791 -- OR procedure complication
Example: Initial admission for APR-DRG 775 -- Alcohol Abuse	
6C MH/SA readmit after MH/SA admit	APR-DRG 751 -- Depression

Notes:

1. APR-DRG=All Patient Refined Diagnosis Related Group; MH/SA=mental health/substance abuse.
2. *Source:* 3M Health Information Systems, *Potentially Preventable Readmissions Classification System Definitions Manual* (Wallingford, CT: 3M HIS, October 2010), Appendix M.

The 3M software categorically excludes several types of admissions and readmissions from the PPR analysis. The most common of these in the Medicaid population are admissions for newborns. Other major examples include:

- Admissions for the medical (i.e., non-surgical) treatment of major metastatic cancer, major trauma, human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), and several less common conditions, because readmissions for these conditions was very likely to have been planned or unpreventable.
- Initial admissions for which the discharge status was "left against medical advice."
- Initial admissions during which the patient died.
- Initial admissions that resulted in the patient being transferred to another acute care hospital. (The stay at the receiving hospital may count as an initial admission.)

Only admissions for acute care were considered for analysis. Treatment for sub-acute care, either to an acute care hospital for rehabilitation or convalescence, or to a sub-acute setting such as a nursing facility, were defined as "non-events," that is, neither an initial admission nor a readmission.

Readmissions may be measured within different "windows" of time. The shorter the window is (e.g., seven days) the more likely that a readmission was directly related to the care that the patient received during hospitalization. The longer the window is (e.g., 30 days or longer), the more likely that a readmission may reflect deficiencies in patient compliance, in post-hospital care in the community, or in the patient's baseline health status. The 15-day readmission "window" chosen for this analysis was intended to strike a balance. For the purposes of comparison, Section 2.7 shows readmission patterns over the course of 30 days.

1.5 Calculating PPR Rates[10]

1.5.1 Actual PPR Rate

The actual PPR rate is calculated after excluding the admissions and readmissions listed in Section 1.4. The actual PPR rate is calculated as:

Actual PPR Rate = PPR Chains / Initial Admissions

A PPR chain starts when a PPR occurs within 15 days of the discharge from the initial admission. If there is a second readmission within 15 days of the first readmission, then the chain includes two readmissions. The chain still counts only once in the numerator of the PPR rate. This approach results in a lower PPR rate than it would if every readmission counted in the numerator.

The actual PPR rates reported in this study were likely to be slightly understated for the following reasons:

- ***Benefit limits***—The hospital benefit for adults is subject to the limits described in Section 1.1. If a patient exhausted his or her benefits and was readmitted within 15 days, the readmission would not appear in the analytical dataset. Because it is rare for clients to exhaust their hospital benefits, any understatement of the true PPR rate appears to be minimal.

The actual PPR rate is the number of readmission chains divided by the number of initial admissions, excluding readmissions that are not considered potentially preventable.

- ***Enrollment churn***—Clients gain and lose eligibility to Medicaid more often than is true in the Medicare and commercially insured populations. Patients who lose or gain eligibility in the period between discharge and readmission are not fully represented in the analytical dataset. Because the PPR window is relatively short at 15 days, the change in enrollment also has minimal impact on the observed PPR rate.

1.5.2 Expected PPR Rate

Although the 3M PPR algorithm identifies a hospital stay as a PPR, it does not calculate hospital-specific PPR rates or adjust these rates for differences in patient casemix. In fact, PPR rates vary considerably depending on patient condition, so casemix adjustment is essential in generating fair comparisons across hospitals or any other patient populations. In general, hospitals treating severely ill patients will have higher expected PPR rates. A hospital with a higher PPR rate may simply treat patients who are more likely to be readmitted. Rather than reporting and comparing only actual rates, this report includes actual rates in comparison with expected rates. This step enables more equitable comparisons among hospitals by controlling for the following four clinical characteristics that have been shown to affect PPR rates (refer to Section 2.4):

- ***The reason for the initial admission***—The base APR-DRG indicates the principal reason why the patient was admitted to hospital, e.g., delivery of a baby or pneumonia. In general, patients with pneumonia are much more likely to be readmitted than patients who have delivered a baby.

The expected PPR rate shows how many readmissions a hospital would be expected to have based on its casemix.

- ***The severity of illness***—A patient in a hospital with pneumonia and multiple complications (DRG 139-4) is more likely to be readmitted than a patient with simple pneumonia (DRG 139-1).
- ***Age***—Even for the same base APR-DRG and severity of illness, patients who are 18 years of age and older are usually more likely to be readmitted than pediatric patients.

- ***Mental health/substance abuse (MH/SA) comorbidity***—Readmission is more likely if the patient has a major mental health or substance abuse condition as a secondary diagnosis, even for medical and surgical admissions.

To enable fair comparisons among hospitals, differences in base APR-DRG, severity of illness, patient age, and MH/SA comorbidity were factored into the calculation of the expected PPR rate. For this report, the expected rates were based on the experience of the Texas Medicaid population in SFY 2012.

Hospital performance was then defined as follows (lower values indicate better performance).

PPR Performance Ratio = Actual / Expected Ratio = Actual PPR Rate / Expected PPR Rate

Table 1.5.2.1 shows a simple example of how the casemix adjustment process works. For further information, see the Appendix Section B.6.

Table 1.5.2.1
Example of Calculation of Expected PPR Rate

APR-DRG	Patient Age	MH/SA Comorb.	Initial Admits	Actual PPR Chains	Actual PPR Rate	Statewide PPR Rate	MH/SA Adjustor	Expected PPR Chains	Expected PPR Rate	Actual / Expected
123-4	Pediatric	Yes	100	7	7.0%	4.3%	1.481	6.4	6.4%	1.10
123-4	Pediatric	No	75	4	5.3%	4.3%	0.989	3.2	4.3%	1.25
123-4	Adult	Yes	50	3	6.0%	5.5%	1.141	3.1	6.3%	0.96
123-4	Adult	No	100	10	10.0%	5.5%	0.976	5.4	5.4%	1.86
432-1	Pediatric	Yes	200	12	6.0%	7.8%	1.481	23.1	11.6%	0.52
432-1	Pediatric	No	250	15	6.0%	7.8%	0.989	19.3	7.7%	0.78
432-1	Adult	Yes	150	5	3.3%	9.0%	1.141	15.4	10.3%	0.32
432-1	Adult	No	175	11	6.3%	9.0%	0.976	15.4	8.8%	0.72
All Stays			1,100	67	6.1%			91.2	8.3%	0.73

Explanation

1. A specific hospital has 1,100 initial admissions. For example, there are 100 initial admissions with APR-DRG 123-4, a mental health/substance abuse comorbidity, and pediatric patient age. (The number was made up for this example.)
2. The hospital has a total of 67 potentially preventable readmissions, for an actual PPR rate of 67 / 1,100 = 6.1%.
3. For APR-DRG 123-4, pediatric age group, a statewide PPR rate of 4.3% is assumed for purposes of this example. If a MH/SA comorbidity is present, the MH/SA adjustor is 1.481. In the first line of the table, 100 initial admissions x 0.043 x 1.481 = 6.4 expected PPRs.
4. Given this hospital's casemix, total expected PPRs = 91.2, for an expected PPR rate of 91.2 / 1,100 = 8.3%.
5. The hospital's PPR performance is 6.1% / 8.3% = 0.73, that is, its PPR rate is much lower than expected for a hospital with its casemix.

1.6 Interpretation of Results

The results in this report are the actual data for the entire Texas Medicaid population in SFY 2012. Because the results are not based on sample data, they need not include caveats about statistical significance so long as inferences are drawn only about the Texas Medicaid population in SFY 2012.

Results need to be interpreted carefully for hospitals that have low volumes of Medicaid stays.

The question might be asked whether these results are accurate reflections of broader time frames, especially when results are shown for individual hospitals or other populations of interest that have small volumes of inpatient stays. For example, consider a hospital with 50 initial admissions. If it has two readmission chains, then its PPR rate would be four percent, about the same as the statewide rate. If it has just one additional readmission chain, then its PPR rate would be six percent, noticeably higher than the statewide rate.

Two aspects of our methodology lessen the potentially misleading effects of analyzing relatively small numbers of stays.

- ***Low-volume hospitals***—A hospital was defined as "low volume" if it did not have at least 40 initial admissions, at least five actual readmission chains, and at least five expected readmission chains.[11] Because readmissions are infrequent events for many common conditions, hospitals with as many as 75 or 100 initial admissions were usually defined as low-volume because they had fewer than five expected readmission chains. The results for low-volume hospitals were reported to those hospitals, but were not evaluated for statistical significance and were not included in the discussion of statewide patterns in Section 2.6.
- ***Test of statistical significance***—Although the results were only calculated for SFY 2012, a test of statistical significance (t-statistical) can suggest whether the SFY 2012 results might also apply to a broader time frame. Statistical significance depends on two factors: the number of stays and the difference between actual readmissions and expected readmissions. Intuitively, there would be more confidence that the "true" rate is higher than expected when the actual/expected (A/E) ratio is 1.40 than when the A/E ratio is 1.10. (The "true" rate refers to the rate from some time period broader than SFY 2012, assuming we are using SFY 2012 as a sample from that broader time period.) Similarly, there would be higher confidence in an A/E ratio that is based on 5,000 stays than on an A/E ratio that is based on 100 stays. In Section 2.6, the significance of hospital-specific A/E ratios is tested using the Cochran-Mantel-Haenszel (CMH) test of conditional independence.[12] The CMH statistic is an indicator of the likelihood that the observed A/E ratio differed from 1.00 simply by chance. The number of hospitals where the difference between the A/E ratio and 1.00 is statistically significant will also be shown using the 90 percent confidence level. If a hospital's A/E rate is statistically significant at the 90 percent confidence level, then the likelihood is less than 10 percent that the observed A/E ratio differs from 1.00 simply because of random variation in the data.

2 Statewide Results

2.1 Key Findings

The study comprised 340,405 inpatient stays, or about half of all stays where Texas Medicaid was the primary payer. The study population included fee-for-service, Primary Care Case Management and managed care beneficiaries of all ages, except newborns. The other major exclusion was patients with emergency Medicaid eligibility. See Section 1.2 and Appendix Sections B.1 and B.2 for detail on included and excluded stays.

Section 2 presents results from the study at the statewide level. See Box 2.1.1 for a list of key findings, which are described in more detail in the remainder of Section 2.

Box 2.1.1
Key Findings About PPR Rates in the Texas Medicaid Population

- Overall, 3.7 percent of admissions were followed by a readmission chain that started within 15 days of discharge. Rates varied widely by care category: 0.8 percent for obstetrics, 4.1 percent for non-obstetric patients under age 18 and 8.2 percent for non-obstetric adults (Table 2.2.1).
- Mental health and substance abuse conditions comprised 9.3 percent of initial admissions but 27.4 percent of PPRs (Table 2.2.1). Bipolar Disorders, Schizophrenia, Major Depression, Cesarean and Vaginal Delivery and Heart failure represented substantial numbers of PPRs (2.4.1).
- Overall, two-thirds of readmissions were to the same hospital and one-third to a different hospital (Table 2.2.1).
- Very few readmissions appeared to reflect clear medical error. About half of the PPRs reflected the recurrence or continuation of the original condition, while another third were for an acute complaint that might be related to the original condition (Table 2.3.1).
- Of the 20 DRGs with the highest numbers of initial admits (see table 2.5.2) Schizophrenia, Heart Failure, and Bipolar disorder were the only ones with PPR rates of 10% or higher. These 3 DRGs were responsible for 20% of the readmission chains in this analysis. (Table 2.4.2).
- Within most DRGs, the PPR rates increase as the patient's severity of illness increases within the base DRG (Table 2.5.1).
- Patients who had medical and surgical conditions were at higher risk for readmission if they also had a major mental health or substance abuse disorder (Table 2.5.2)
- After adjustment for casemix, the range of hospital performance is wide enough to suggest that hospitals can learn from each other how to reduce PPRs (Chart 2.6.1)
- The risk of readmission peaked two to three days after discharge (Chart 2.7.1)

2.2 Overall PPR Results

In SFY 2012, there were 325,665 initial stays within the scope of this analysis (Table 2.2.1). These initial stays were followed by 14,740 PPRs in 12,179 PPR chains.

The overall PPR rate was 3.7 percent (12,179/325,665=.037). About two-thirds of readmissions were to the same hospital from which the patient was originally discharged (Table 2.2.1).

Excluding newborns, the PPR rate in the Medicaid population was 3.7 percent overall, 0.8 percent for obstetrics, 4.1 percent for non-obstetric pediatrics and 8.2 percent for non-obstetric adult stays.

Medicaid payments for PPRs totaled $111.2 million or an estimated $121.3 million for the full 12 months of SFY 2012 after taking into account the exclusion of initial admissions that occurred during August 2012 (Table 2.2.2). About 3.5 percent of all Medicaid payments for hospital care were for PPRs identified in this study.[13] This figure covers only the Medicaid payments that were made to the hospital, not the cost to the hospital, the cost of physician and other associated services, or the cost to the patient.

Table 2.2.1

PPR Rates Overall and by Medicaid Care Category

Medicaid Care Category	Initial Admits	Readmit Chains	Total Readmissions			PPR Rate
			Same Hospital	Other Hospital	All	
Pediatric						
Respiratory	22,501	489	384	148	532	2.2%
Other medical	34,485	1,087	958	307	1,265	3.2%
Other surgical	11,033	476	448	80	528	4.3%
MH/SA	15,135	1,374	980	753	1,733	9.1%
Subtotal	83,154	3,426	2,770	1,288	4,058	4.1%
Adult						
Circulatory	11,136	952	789	358	1,147	8.5%
Other medical	48,879	3,852	3,194	1,606	4,800	7.9%
Other surgical	17,015	1,061	919	302	1,221	6.2%
MH/SA	15,053	1,721	1,147	1161	2,308	11.4%
Subtotal	92,083	7,586	6,049	3,427	9,476	8.2%
Obstetrics	150,428	1,167	1,021	185	1,206	0.8%
Total	325,665	12,179	9,840	4,900	14,740	3.7%

Notes

1) MH/SA = mental health and substance abuse.

2) 325,665 initial stays + 14,740 readmissions = 340,405 stays in the analytical dataset.

3)MH/SA stays = (15,135+15,053)/325,665 * 100 = 9.3 percent of initial admissions (All other calculations were done similarly)

The Texas Medicaid PPR rate of 3.7 percent may seem low, especially in comparison with the widely reported finding that 20 percent of Medicare patients were readmitted within 30 days.[14] Reasons for the difference include the longer readmission window used by Medicare (30 days instead of 15 days), the broader definition of readmission (all-cause for Medicare) and the very different casemixes of the two populations. In particular, almost half of all Texas stays in this analysis are for obstetrics, where the PPR rate was very low (0.8 percent). For the non-obstetric pediatric population, the PPR rate was 4.1 percent; for the non-obstetric adult population, the PPR rate was 8.2 percent (Table 2.2.1). For some DRGs, the PPR rates even approached 20 percent. This will be shown in Table 2.4.3.

Readmissions for people who were initially admitted with mental health or substance abuse diagnoses were particularly notable. About 9.1 percent of pediatric patients and 11.4 percent of adult patients with these conditions were back in the hospital within 15 days (Table 2.1.1). Moreover, patients in these care categories were more likely to have more than one readmission within a chain of readmissions, as shown in Table 2.2.2 Pediatric patients who were initially admitted with mental health or substance abuse diagnoses with at least one readmission had 1.3 readmissions on average; adults who were initially admitted with mental health or substance abuse diagnoses with at least one readmission also had 1.3 readmissions, on average.

Presence of a major mental health or substance abuse condition as a secondary diagnosis also made readmissions more likely for patients who were admitted with medical or surgical conditions, as will be shown in Section 2.5.

Table 2.2.2
Hospital Charges and Medicaid Payments for PPRs

Medicaid Care Category	PPR Chains	PPR Stays	Stays per Chain	Totals for PPR Stays			
				Days	Days / Stay	Hospital Charges (Millions)	Medicaid Payments (Millions)
Pediatric							
Respiratory	489	532	1.1	3,368	6.3	$36.8	$9.3
Other medical	1,087	1,265	1.2	7,580	6.0	$66.6	$20.6
Other surgical	476	528	1.1	3,570	6.8	$32.5	$8.5
MH/SA	1,374	1,733	1.3	21,460	12.4	$34.8	$11.6
Subtotal	3,426	4,058	1.2	35,978	8.9	$170.7	$49.9
Adult							
Circulatory	952	1,147	1.2	6,065	5.3	$51.3	$7.7
Other medical	3,852	4,800	1.2	28,281	5.9	$200.4	$31.2
Other surgical	1,061	1,221	1.2	8,717	7.1	$65.9	$10.0
MH/SA	1,721	2,308	1.3	14,971	6.5	$38.3	$8.3
Subtotal	7,586	9,476	1.2	58,034	6.1	$356.0	$57.3
Obstetrics	1,167	1,206	1.0	3,825	3.2	$25.3	$3.9
Total	12,179	14,740	1.2	97,837	6.6	$552.0	$111.2

Note:
1. Figures on stays, days, charges and payments reflect 11 months of FY 2012 because initial admissions in August 2012 were excluded from the study in order to allow a one-month run-out period for PPRs. Extrapolating the above results to the full 12-month period would yield the following estimates of PPR stays, charges and payments for FY 2012.

Estimated Totals for FY 2012 (12 months)	106,731		$602.2	$121.3

2.3 Reasons for Potentially Preventable Readmissions

Table 2.3.1 categorizes the clinical reasons for readmission. Of the 14,740 total readmissions:

- 23 percent were medical readmissions for the recurrence or continuation of the same condition as the initial admission.
- 32 percent were medical readmissions for a different acute condition that could plausibly have had a clinical association with the initial admission.
- 27 percent were mental health or substance abuse readmissions that followed an initial admission for mental health or substance abuse.
- Only 2 percent of readmissions were for post-surgical complications.

The most common reasons for readmission, in roughly equal proportions, were medical readmissions for the same condition, medical readmissions for other acute conditions, and readmissions for mental illness or substance abuse.

To the extent that medical error can be inferred from the diagnosis and procedure codes submitted by hospitals, these results strongly imply that the main issue in readmissions lies not in errors (e.g., leaving a sponge in a patient) but rather in fully resolving the initial medical complaint and creating an effective transition from the hospital to care in the community or a post-acute facility. The finding echoes result from Florida and elsewhere.

Table 2.3.1
Potentially Preventable Readmissions, Percentage Split by Clinical Reason

Medicaid Care Category	Potentially Preventable Readmissions	1 Medical--recurrence or continuation	2A Medical--ambulatory care sensitive	2B Medical--other chronic condition	3 Medical--other acute condition	4 Surgical--reoccurrence or continuation	5 Surgical--complication	6A MH--index admission not MH/SA	6B SA--index admission not MH/SA	6C MH/SA readmission after initial MH/SA admission
Pediatric										
Respiratory	532	65%	4%	12%	18%	0%	0%	2%	0%	0%
Other medical	1,265	49%	1%	11%	32%	0%	1%	6%	0%	0%
Other surgical	528	4%	2%	7%	58%	17%	10%	1%	0%	0%
MH/SA	1,733	0%	0%	1%	1%	0%	0%	0%	0%	98%
Subtotal	4,058	24%	1%	6%	20%	2%	1%	2%	0%	42%
Adult										
Circulatory	1,147	37%	6%	11%	34%	3%	3%	5%	1%	0%
Other medical	4,800	40%	6%	12%	32%	0%	0%	7%	1%	2%
Other surgical	1,221	7%	4%	9%	58%	8%	11%	3%	1%	0%
MH/SA	2,308	0%	1%	3%	3%	0%	0%	0%	0%	93%
Subtotal	9,476	26%	5%	9%	28%	1%	2%	4%	1%	23%
Obstetrics	1,206	1%	0%	0%	99%	0%	0%	0%	0%	0%
Total	14,740	23%	3%	8%	32%	2%	2%	3%	1%	27%

Note: MH=mental health; SA=substance abuse

2.4 Results by APR-DRG

Tables 2.4.1, 2.4.2 and 2.4.3 show PPR rates by base APR-DRG, sorted in three different orders:

- Declining order by total PPR count
- Declining order by total initial admissions
- Declining order by PPR risk, that is, by which APR-DRGs had the highest PPR rates

These three tables by DRG highlight the issues of readmissions for mental health, substance abuse, and liver disorders.

In each table, the DRG shown is the base DRG, without level of severity (e.g., APR-DRG 139 for pneumonia, not APR-DRG 139-1 for pneumonia, severity 1).

Table 2.4.1, which shows the top DRGs in terms of PPR stays, is most relevant when addressing the question of how to reduce the total number of PPRs. The importance of individual mental health DRGs is evident as these DRGs have both high PPR rates and high PPR volumes. The number of PPRs for obstetric stays, by contrast, is high only because there are so many obstetric admissions. The PPR rates themselves are very low. This table also illustrates the importance of using a PPR measurement methodology that includes conditions that are common in the Medicaid population. The table shows that heart failure and pneumonia do generate many readmissions (as in Medicare) but that mental health DRGs such as bipolar disorders, schizophrenia and major depression are a larger PPR issue.

Table 2.4.1

PPR Rates by APR-DRG: Top 20 APR-DRGs in Terms of Total Potentially Preventable Readmissions

Base DRG	Initial Admits	PPR Chains	PPR Stays	PPR Stays per Chain	PPR Rate
753 Bipolar Disorders	13,770	1,371	1,772	1.3	10.0%
750 Schizophrenia	6,038	824	1,154	1.4	13.6%
751 Maj Depression	6,141	581	730	1.3	9.5%
540 Cesarean Delivery	45,475	651	679	1.0	1.4%
560 Vaginal Delivery	86,284	442	453	1.0	0.5%
194 Heart Failure	2,537	262	347	1.3	10.3%
140 COPD	3,192	283	343	1.2	8.9%
662 Sickle Cell Anemia Crisis	1,830	229	338	1.5	12.5%
720 Septicemia & Disseminated Infections	3,147	251	311	1.2	8.0%
420 Diabetes	2,916	226	301	1.3	7.8%
139 Other Pneumonia	7,925	245	278	1.1	3.1%
460 Renal Failure	1,915	188	237	1.3	9.8%
279 Hepatic Coma & Other Major Liver Disorders	956	170	233	1.4	17.8%
383 Cellulitis & Other Bacterial Skin Infection	5,696	183	210	1.1	3.2%
138 Bronchiolitis & RSV Pneumonia	8402	195	208	1.1	2.3%
053 Seizure	4196	164	204	1.2	3.9%
812 Poisoning of Medicinal Agents	1,845	143	170	1.2	7.8%
280 Alcoholic Liver Disease	767	122	166	1.4	15.9%
254 Other Digestive System Diagnosis	2,057	132	160	1.2	6.4%
463 Kidney & Urinary Tract Infection	4,723	129	159	1.2	2.7%
Top 20	209,812	6,791	8,453	1.2	3.2%
All DRGs	325,665	12,179	14,740	1.2	3.7%
Top 20 as Percent of All	64%	56%	57%		

Notes:

1. The APR-DRG shown is the DRG for the initial admission.

2. COPD=chronic obstructive pulmonary disease; RSV= respiratory syncytial virus

Table 2.4.2 shows the top DRGs by initial admission count. This table is useful for understanding PPR rates for the most common reasons that Medicaid clients are admitted to the hospital. The low obstetric PPR rates are notable. Of the 20 DRGs with the highest numbers of initial admits (see table 2.4.2) Schizophrenia, Heart Failure, and Bipolar disorder were the only ones with PPR rates of 10% or higher. These 3 DRGs were responsible for 20% of the readmission chains in this analysis.

Table 2.4.2
PPR Rates by APR-DRG: Top 20 APR-DRGs in Terms of Initial Admissions

Base DRG	Initial Admits	PPR Chains	PPR Stays	PPR Stays per Chain	PPR Rate
560 Vaginal Delivery	86,284	442	453	1.0	0.5%
540 Cesarean Delivery	45,475	651	679	1.0	1.4%
753 Bipolar Disorder	13,770	1,371	1,772	1.3	10.0%
138 Bronchiolitis & RSV Pneumonia	8,402	195	208	1.1	2.3%
566 Other Antepartum Diagnosis	8,238	6	6	1.0	0.1%
139 Other Pneumonia	7,925	245	278	1.1	3.1%
751 Major Depression	6,141	581	730	1.3	9.5%
750 Schizophrenia	6,038	824	1,154	1.4	13.6%
383 Cellulitis & Other Bacterial Skin Infection	5,696	183	210	1.1	3.2%
141 Asthma	5,683	89	97	1.1	1.6%
463 Kidney and Urinary Tract Infection	4,723	129	159	1.2	2.7%
053 Seizure	4,196	164	204	1.2	3.9%
541 Vaginal Deliver w/Sterilization and/or D&C	3,967	34	34	1.0	0.9%
249 Non-Bact Gastroenteritis, N & V	3,510	117	132	1.1	3.3%
225 Appendectomy	3250	107	117	1.1	3.3%
140 COPD	3192	283	343	1.2	8.9%
720 Septicemia & Disseminated Infection	3,147	251	311	1.2	8.0%
420 Diabetes	2,916	226	301	1.3	7.8%
113 Infection Of Upper Respiratory Tract	2,700	74	81	1.1	2.7%
194 Heart Failure	2,537	262	347	0.0	10.3%
Top 20	227,790	6,234	7,616	1.2	2.7%
All DRGs	325,665	12,179	14,740	1.2	3.7%
Top 20 as Percent of All	70%	51%	52%		

Notes:

1. The APR-DRG shown is the DRG for the initial admission.
2. RSV=respiratory syncytial virus; D&C=dilatation and curettage; COPD=chronic obstructive pulmonary disease

Table 2.4.3 shows the DRGs that have the highest PPR rates (so long as the DRG met the minimum volume requirements for the number of stays). A hospital would find this table useful for setting flags for readmission risk by DRG. Although the volumes of initial admissions for many of these DRGs were low, patients in these DRGs were clearly at high risk for a PPR. Examples include DRGs that involve the biliary tract, liver, and pancreas. Of special importance would be conditions such as Schizophrenia that have both high numbers of PPR chains and high PPR rates.

Table 2.4.3
PPR Rates by APR-DRG: Top 20 APR-DRGs in Terms Total Potentially Preventable Readmission Rates

Base DRG	Initial Admits	PPR Chains	PPR Stays	PPR Stays per Chain	PPR Rate
264 Other Hepatobiliary & Abdominal Procedures	59	11	12	1.1	18.6%
261 Major Biliary Tract Procedures	49	9	10	1.1	18.4%
279 Hepatic Coma & Other Major Liver Disorders	956	170	233	1.4	17.8%
312 Skin Graft for Connective Tissue Diagnosis	44	7	7	1.0	15.9%
280 Alcoholic Liver Disease	767	122	166	1.4	15.9%
447 Other Kidney & Urinary Procedures	106	15	16	1.1	14.2%
405 Other Procedures for Metabolic Disorder	79	11	13	1.2	13.9%
260 Major Pancreas & Liver Procedures	137	19	25	1.3	13.9%
750 Schizophrenia	6,038	824	1,154	1.4	13.6%
005 Tracheostomy MV 96+ Hrs, w/o Ext Procedure	252	33	42	1.3	13.1%
662 Sickle Cell Anemia Crisis	1,830	229	338	1.5	12.5%
281 Malignancy of Hepatobiliary System	114	14	15	1.1	12.3%
022 Ventricular Shunt Procedures	453	54	62	1.1	11.9%
253 Other & Unspecified Gi Hemorrhage	602	71	84	1.2	11.8%
757 Organic Mental Health Disturbances	187	22	23	1.0	11.8%
242 Major Esophageal Disorders	158	18	21	1.2	11.4%
224 Peritoneal Adhesiolysis	150	17	22	1.3	11.3%
444 Renal Dialysis Access Procedure	266	30	33	1.1	11.3%
169 Major Vascular Procedures	145	16	18	1.1	11.0%
221 Major Small & Large Bowel Procedures	837	90	102	0.0	10.8%
Top 20	13,229	1,782	2,396	1.3	13.5%
All DRGs	325,665	12,179	14,740	1.2	3.7%
Top 20 as Percent of All	4%	15%	16%		

Notes:

1. The APR-DRG shown is the DRG for the initial admission.
2. A DRG is only included in this table if there were at least 40 initial admissions and at least five actual readmission chains.
3. CV=cardiovascular; MV=mechanical ventilation, AMI=acute myocardial infarction

2.5 The Importance of Casemix Adjustment

The tables in Section 2.5 demonstrate the importance of the base DRG in understanding PPR rates. Any comparison of PPR rates, for example between hospitals, managed care plans, or eligibility groups, is fundamentally flawed if it does not adjust for differences in the mix of base DRGs. As described in Section 1.5, adjustments were also made for three other aspects of casemix in comparing subsets of the analytical dataset. In each case, our findings echo those from similar analysis in Florida.[15]

PPR rates are influenced by the level of severity, the patient age and the presence of a major mental health or substance abuse comorbidity.

- ***Severity of illness***—In general, the risk of readmission increases with the severity of illness for any given condition. Table 2.5.1 shows the top 10 base DRGs in terms of total readmissions (from Table 2.4.1.). In most cases, the PPR rates increase as the patient's severity of illness increases within the base DRG. The pattern is especially evident for certain medical DRGs, such as chronic obstructive pulmonary disease (COPD), heart failure, septicemia, and diabetes. A similar pattern was also observed for bipolar disorder.

Table 2.5.1
Initial Admissions and PPR Rates by Level of Severity for the Top 10 Base DRGs in Terms of Total Readmissions

Base DRG		Total	Level of Severity			
			Severity 1	Severity 2	Severity 3	Severity 4
753 Bipolar Disorder	Initial Admits	13,770	7,311	6,176	276	7
	PPR Rate	9.96%	9.53%	10.30%	13.41%	14.29%
750 Schizophrenia	Initial Admits	6,038	2,651	3,153	224	10
	PPR Rate	13.65%	13.58%	13.42%	17.86%	10.00%
751 Major Depression	Initial Admits	6,141	2,765	3,221	152	3
	PPR Rate	9.46%	8.35%	10.31%	11.84%	0.00%
540 Cesarean Delivery	Initial Admits	45,475	30,983	11,145	3,263	84
	PPR Rate	1.43%	1.06%	1.95%	3.19%	2.38%
560 Vaginal Delivery	Initial Admits	86,284	58,943	23,865	3,453	23
	PPR Rate	0.51%	0.43%	0.58%	1.36%	4.35%
194 Heart Failure	Initial Admits	2,537	289	1,233	892	123
	PPR Rate	10.33%	10.73%	9.08%	11.21%	15.45%
140 COPD	Initial Admits	3,192	654	1,665	783	90
	PPR Rate	8.87%	7.34%	8.71%	9.96%	13.33%
662 Sickle Cell Anemia Crisis	Initial Admits	1,830	908	753	156	13
	PPR Rate	12.51%	13.55%	12.35%	8.33%	0.00%
720 Septicemia & Disseminated Infection	Initial Admits	3,147	280	870	1,037	960
	PPR Rate	7.98%	1.79%	4.37%	8.00%	13.02%
420 Diabetes	Initial Admits	2,916	571	1,754	537	54
	PPR Rate	7.75%	5.43%	7.18%	11.73%	11.11%

Note: COPD=chronic obstructive pulmonary disease

- ***Age***—Excluding the obstetrics stays, approximately half of all stays in the present analysis were for clients who were under age 18. Even after controlling for APR-DRG, patients under age 18 tended to be readmitted less often. Chart 2.5.1 shows the pattern for 10 DRGs that were common to both adult and pediatric populations. The pattern holds true in general, although not for every DRG. Because of the large number of pediatric stays, statewide PPR averages for every DRG were calculated separately for the adult and pediatric populations.[16]

- ***Presence of major mental health or substance abuse co-morbidity***—Patients admitted with medical or surgical conditions were more likely to be readmitted if the claim for the initial admission also showed a secondary diagnosis of *major* mental illness or substance abuse.[17] For adults, a readmission was 70 percent more likely; for pediatric patients, it was 90 percent more likely (Table 2.5.2). For example, if the risk of a PPR was 3.00 percent for an adult patient with a specific APR-DRG, then the presence of a major MH/SA comorbidity increased the risk to 3.00 x 1.83 = 5.49 percent.

Table 2.5.2

Adjustment for MH/SA Comorbidity

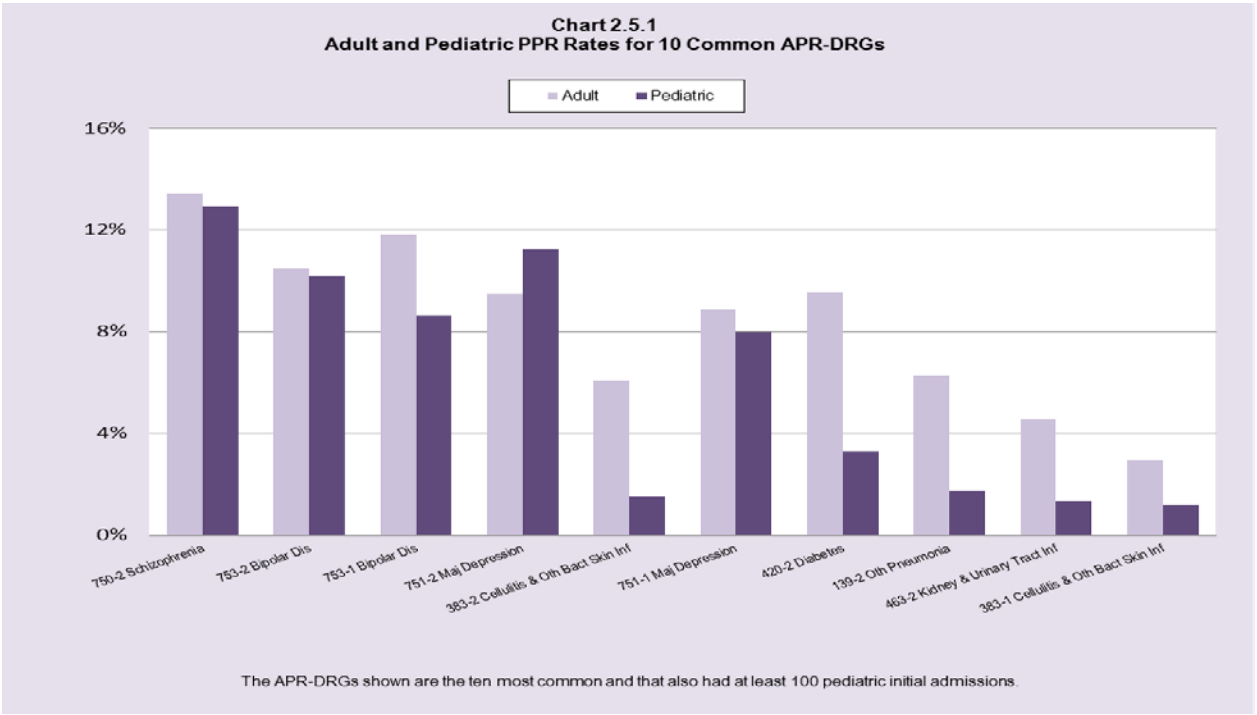
Age Category	MH/SA Comorbidity	Adj. Factor	Odds Ratio
Pediatric	No	0.9611	
Pediatric	Yes	1.8293	1.90
Adult	No	0.9023	
Adult	Yes	1.5309	1.70

Notes:

1. For pediatric patients, for example, PPR rates were calculated for each DRG, then the population was split depending on the presence or absence of a major MH/SA comorbidity. The sub-population with a comorbidity had a PPR rate 82.9% higher than the overall pediatric population while the sub- population without a comorbidity had a PPR rate 3.9% lower than the overall pediatric population. The ratio of 1.829 to 0.961 yields the result that pediatric patients with a major MH/SA comorbidity were 90% more likely to have a PPR than pediatric patients without such a comorbidity, even after taking into account differences in casemix.
2. In calculating expected PPR rates, the adjustment factor is applied only to medical and surgical admissions, not to MH/SA or obstetric admissions.

While these factors are believed to be important for understanding the incidence of PPRs, the possibility should be noted that there are other, unmeasured factors that systematically affect the incidence of a PPR.

Chart 2.5.1
Adult and Pediatric PPR Rates for 10 Common APR-DRGs



The APR-DRGs shown are the ten most common and that also had at least 100 pediatric initial admissions.

2.6 PPR Performance by Hospital

To compare the PPR performance of hospitals, the actual PPR rate and the expected PPR rate for each hospital were calculated, as explained in Section 1.5. Hospitals with low volumes (e.g., fewer than 40 stays) were excluded from the comparison because their PPR rates could be unstable based on the absence or presence of just one or two readmission chains.

Excluding low-volume hospitals, 75 of 222 hospitals had PPR rates about as expected, while 77 hospitals had rates lower/much lower than expected and 70 hospitals had rates higher/much higher than expected.

For each of the 222 hospitals included in the comparison, the ratio of the actual number of PPR chains to the expected number was calculated. If the A/E ratio was less than 1.00, then the hospital's PPR rate was lower than would be expected for a hospital with the same casemix. That is, the result was better than expected.

Table 2.6.1 shows TMHP's interpretation of the calculated results. Of the 222 hospitals with sufficient volume to be considered, 75 had a rate within 10 percent of the expected rate, which was considered "about as expected." Another 77 hospitals had a rate below a threshold of 10 percent, which was lower than expected. There were 70 hospitals with a rate above a threshold of 10 percent, that is, higher than expected. The word "expected" is used in the sense that it reflects the calculation of the Texas overall statewide Medicaid PPR rate in SFY 2012 and then uses that rate as the norm. An alternative approach would be to define a norm that can be achieved by hospitals following best practices and then use that norm as the "expected" value.

In statistical terms, these were the actual results for SFY 2012 and they were not based on a sample. Therefore the results are accurate for every hospital. The test of statistical significance, however, can suggest the probability that the results seen in SFY 2012 might be similar to those from a different period.[18] See also Section 2.8 for a comparison of the results for SFY 2010, SFY 2011 and SFY 2012.

Table 2.6.1
Number of Hospitals by PPR Performance

Ratio of Actual PPRs to Expected PPRs	Interpretation	Hospitals	Stat Sig Diff
Lower than 0.75	Much lower than expected	29	16
0.75 to 0.89	Lower than expected	48	9
0.90 to 1.10	About as expected	75	1
1.11 to 1.25	Higher than expected	30	8
Higher than 1.25	Much higher than expected	40	23
Total		222	57

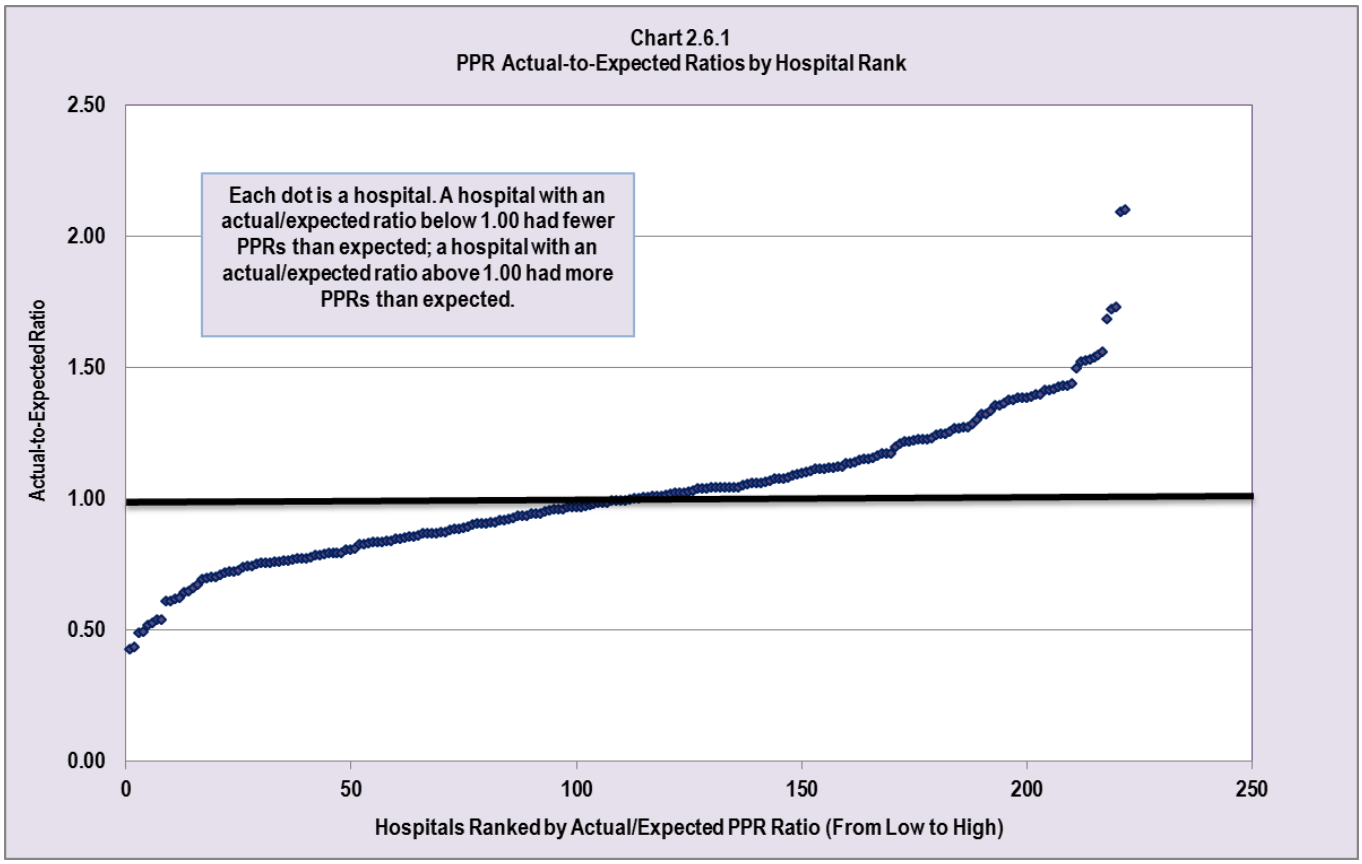
Notes:

1. Low-volume hospitals are excluded. Low-volume hospitals do not meet the criteria of having at least 40 initial admissions; at least five expected readmissions, and at least five actual readmissions.

2. "Stat Sig Diff" shows the number of hospitals where the difference from 1.00 is statistically significant at the 90% confidence level.

For these 222 hospitals, Chart 2.6.1 shows the range of results. The best-performing hospitals had A/E ratios of approximately 0.50 while the worst-performing hospitals had A/E ratios approaching or even exceeding 2.00. The median hospital had an A/E ratio of 1.01. If a broader time period were chosen, it is likely that the range of results would be narrower because of the statistical phenomenon of regression to the mean. (That is, some hospitals at the lower or upper ends of the range simply had a good or bad year in SFY 2012.) However, the range in hospital performance is wide enough to suggest that hospitals can learn from each other how to reduce PPRs.

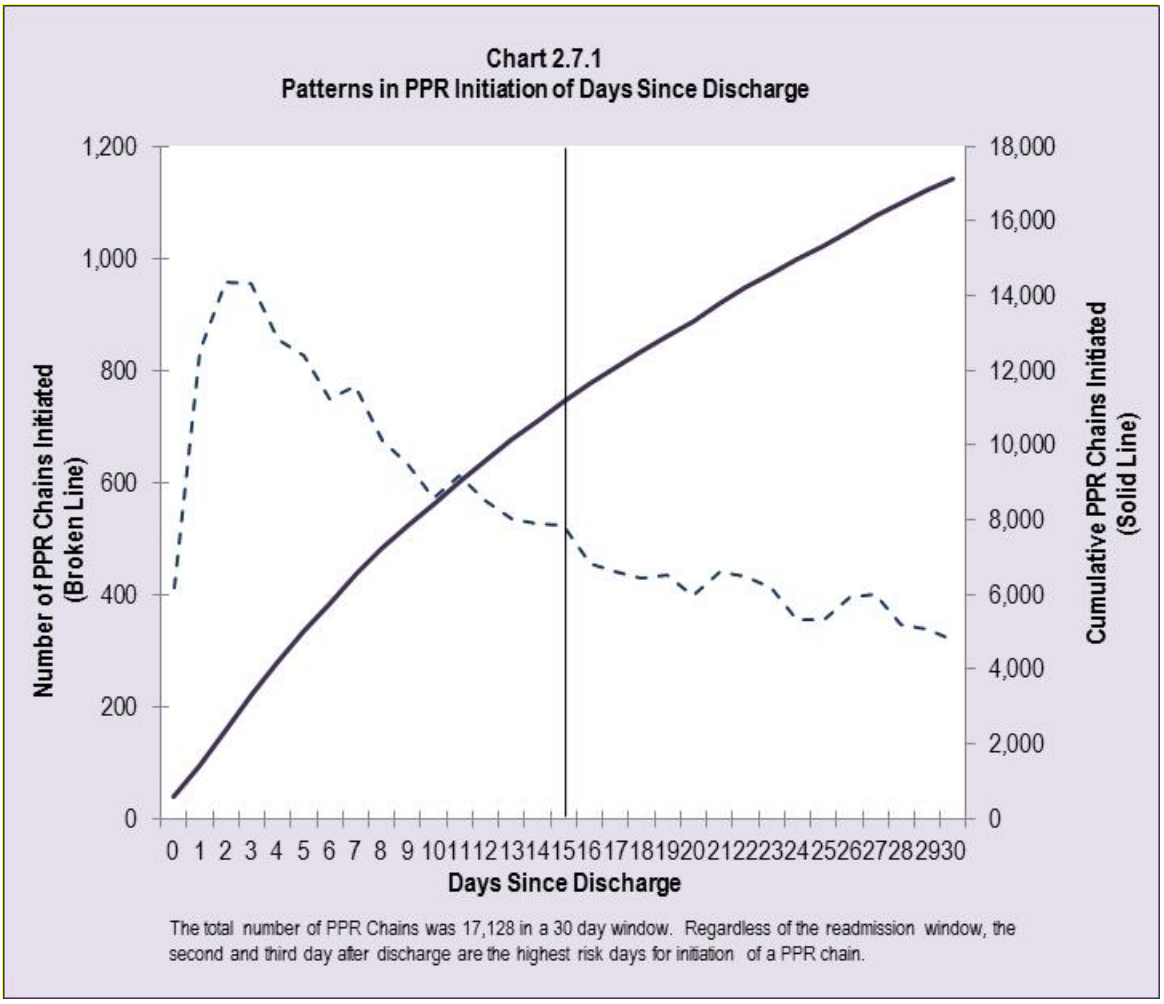
Overall, the study included 635 hospitals (442 in-state hospitals and 193 out-of-state hospitals). Of the 442 Texas hospitals, 222 are included in Table 2.6.1.



2.7 Readmission Patterns by Days from Discharge

The second and third days after discharge are the likely days for readmission.

As noted earlier, readmissions may be measured within different time frames. For this report, a 15-day time frame, or "window," was used. A window of 30 days is also commonly used. If this analysis had been done using a 30-day window, the result would have been a statewide PPR rate of 5.37 percent, as opposed to the 3.7 percent shown in Table 2.2.1. Chart 2.7.1 shows the patterns in PPRs by days since discharge using a 30-day window. The second and third days after discharge are the most likely days for PPRs. The likelihood of readmission then falls sharply after that (the broken line). Of all readmission chains within the 30-day window, about two-thirds start within 15 days (the solid line).



2.8 Comparison between SFY 2010, SFY 2011 and SFY 2012

This is the fourth year in which the Health and Human Services Commission has studied PPRs in the Texas Medicaid population. The same methodology was used for all years with the exception of the version of the 3M APR-DRG software, which is updated every year. Version 30 was used for SFY 2012. This section compares results from the three most recent years. The comparison is useful for understanding which findings have been stable across time and which findings appear to vary across time.

Findings were generally very consistent between fiscal year 2010, fiscal year 2011 and fiscal year 2012 based on a substantial number of stays.

Overall, the impression is of considerable consistency across the three years. Chart 2.8.1 shows that adults had higher PPR rates than pediatric patients, that obstetrics had a very low PPR rate, and that the MH/SA categories had noticeably higher PPR rates than the medical and surgical categories. The overall rate of 3.7 percent in SFY 2012 was the same as the rates of 3.7 percent in both SFY 2010 and SFY 2011.

It should be noted that the comparison in Chart 2.8.1 does not take into account changes in casemix across years. For example, if there were a much higher proportion of obstetric stays (which have low PPR rates) in the first year and a much higher proportion of MH/SA stays (which have high PPR rates) in the second year, then an increase in the overall PPR rate could simply reflect the casemix change. In practice, the impact is likely to be minor when similar populations are compared across a short time span. The PPR rates (rounded to three decimal places) of 3.704 percent in SFY 2010, 3.678 in SFY 2011, and 3.740 in SFY 2012 were virtually unchanged. Between SFY 2009 and SFY 2010, for example, the casemix change accounted for 0.094 percentage points while the "real" change accounted for 0.034 percentage points. See Appendix Section B.6.3 for an explanation of how this result was calculated.

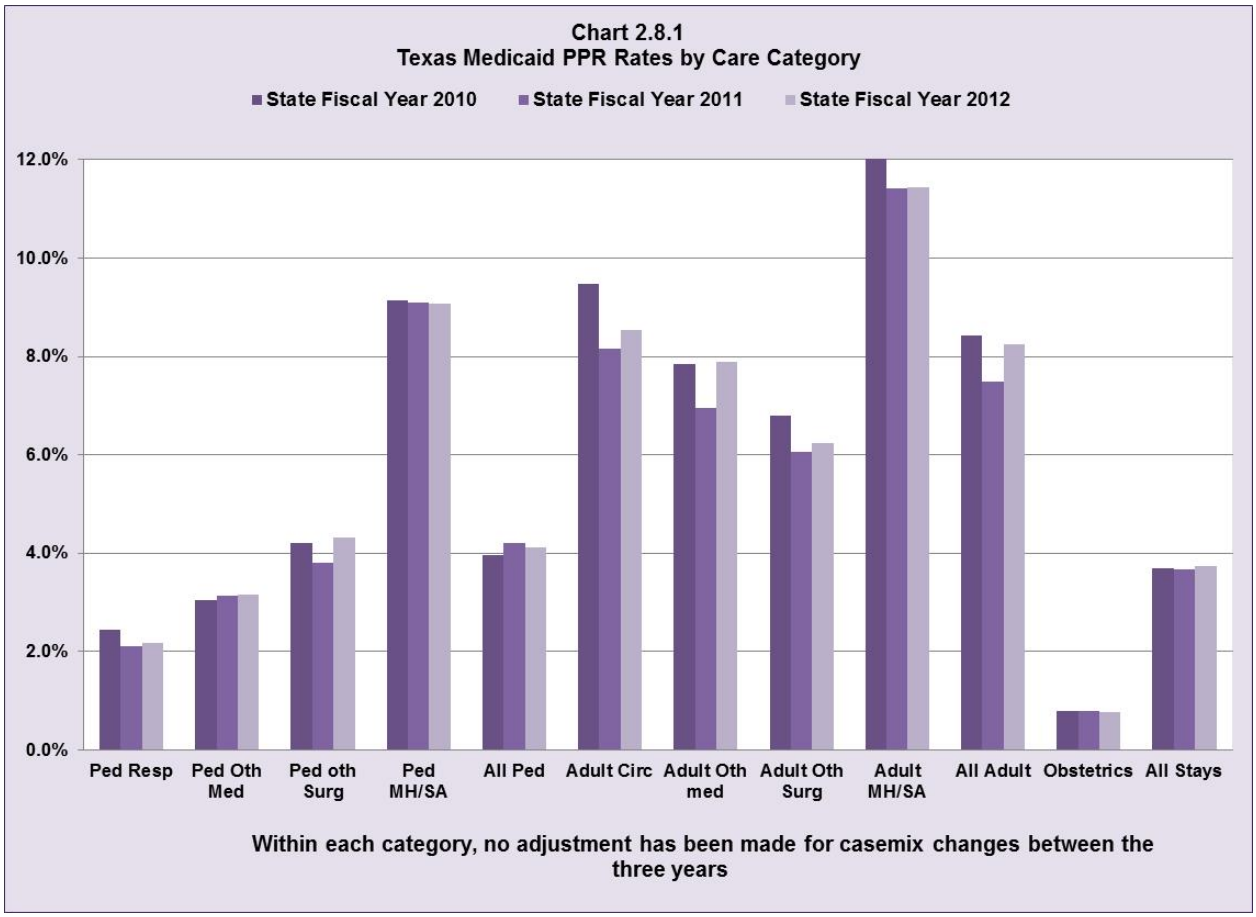


Table 2.8.1 compares the lists of the top 20 base DRGs in terms of total PPR stays. The table shows considerable consistency, both in the rank order of DRGs and in the PPR rates for the specific DRGs. This finding underscores the earlier finding that the risk of PPR varies predictably and importantly with the reason for the original admission. It also underscores the necessity of casemix adjustment in any comparison of PPR rates between different hospitals or populations.

Table 2.8.1

Top 20 Base DRGs by Total PPRs, State Fiscal Years 2010, 2011 vs 2012

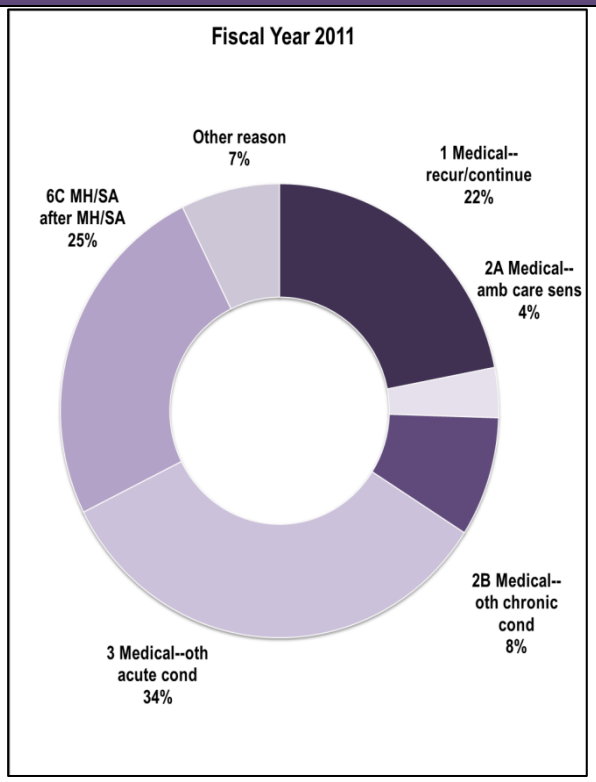
SFY 2010				SFY 2011				SFY 2012			
Base DRG	Initial Admits	PPR Chains	PPR Rate	Base DRG	Initial Admits	PPR Chains	PPR Rate	Base DRG	Initial Admits	PPR Chains	PPR Rate
753 Bipolar Disorders	12,479	1,290	10.3%	753 Bipolar Disorders	13,540	1,370	10.1%	753 Bipolar Disorders	13,770	1,371	10.0%
750 Schizophrenia	4,763	676	14.2%	750 Schizophrenia	5,420	754	13.9%	750 Schizophrenia	6,038	824	13.6%
540 Cesarean Delivery	39,601	612	1.5%	540 Cesarean Delivery	46,521	655	1.4%	751 Maj Depression	6,141	581	9.5%
751 Major Depression	5,029	435	8.6%	751 Major Depression	5,598	490	8.8%	540 Cesarean Delivery	45,475	651	1.4%
560 Vaginal Delivery	89,895	528	0.6%	560 Vaginal Delivery	84,973	457	0.5%	560 Vaginal Delivery	86,284	442	0.5%
194 Heart Failure	2,874	365	12.7%	194 Heart Failure	2,642	313	11.8%	194 Heart Failure	2,537	262	10.3%
140 COPD	3,411	325	9.5%	140 COPD	3,335	321	9.6%	140 COPD	3,192	283	8.9%
139 Other Pneumonia	11,326	312	2.8%	139 Other Pneumonia	8,927	268	3.0%	662 Sickle Cell Anemia Crisis	1,830	229	12.5%
662 Sickle Cell Anemia	1,640	189	11.5%	662 Sickle Cell Anemia	,651	190	11.5%	720 Septicemia & Disseminated Infections	3,147	251	8.0%
420 Diabetes	2,773	215	7.8%	720 Septicemia	2,774	246	8.9%	420 Diabetes	2,916	226	7.8%
138 Bronchiolitis	10,335	277	2.7%	420 Diabetes	2,915	208	7.1%	139 Other Pneumonia	7,925	245	3.1%
720 Septicemia	2,527	205	8.1%	138 Bronchiolitis	9,270	229	2.5%	460 Renal Failure	1,915	188	9.8%
383 Cellulitis	6,407	197	3.1%	053 Seizure	4,150	180	4.3%	279 Hepatic Coma & Other Major Liver Disorders	956	170	17.8%
282 Dis of Pancreas	1,463	143	9.8%	460 Renal Failure	1,679	163	9.7%	383 Cellulitis & Other Bacterial Skin Infection	5,696	183	3.2%
460 Renal Failure	1,453	153	10.5%	279 Hepatic Coma	763	140	18.3%	138 Bronchiolitis & RSV Pneumonia	8402	195	2.3%
053 Seizure	3,984	152	3.8%	383 Cellulitis	6,413	172	2.7%	053 Seizure	4196	164	3.9%
279 Hepatic Coma	763	125	16.4%	282 Dis of Pancreas	1,460	143	9.8%	812 Poisoning of Medicinal Agents	1,845	143	7.8%
141 Asthma	5,934	133	2.2%	280 Alcoholic Liver Disease	770	133	17.3%	280 Alcoholic Liver Disease	767	122	15.9%
280 Alcoholic Liver Disease	717	119	16.6%	249 Non-Bact Gastroent	4,751	162	3.4%	254 Other Digestive System Diagnosis	2,057	132	6.4%
249 Non-Bact Gastront	4,614	135	2.9%	254 Oth Digestive Diagnosis	1,994	144	7.2%	463 Kidney & Urinary Tract Infection	4,723	129	2.7%

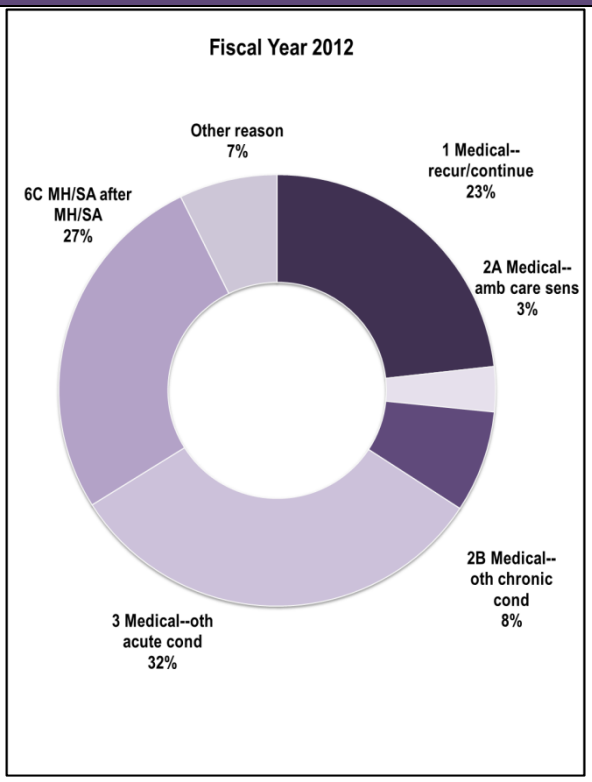
Notes:

1. The APR-DG shown is the DRG for the initial admission.
2. COPD=chronic obstructive pulmonary disease; RSV= respiratory syncytial virus

Chart 2.8.2 also shows notable consistency, this time in terms of the reasons for readmission. In both SFY 2011 and SFY 2012, about 23 percent of PPRs reflected the continuation or recurrence of the same condition (as measured by the base APR-DRG) and about one third were for acute medical conditions that could plausibly be related to the reason for the initial medical admission. About one-quarter of PPRs in each year were MH/SA readmissions after MH/SA initial admissions. The same similarity was seen between SFY 2010 and SFY 2011 (data not shown).

Chart 2.8.2
Reasons for PPRs





Note: See Table 2.3.1 for the full list of PPR reasons for SFY 2012.

Chart 2.8.3 shows the PPR performance in SFY 2011 and SFY 2012 for the top 50 hospitals in terms of Medicaid volume in SFY 2012, which together account for more than half of all admissions in the analytic dataset. "Performance" was measured by the A/E PPR rates, with lower values indicating better performance. The diagonal line on the chart serves as a reference. Each dot on that chart represents a hospital and the closer the dot is to the diagonal line, the more consistent the hospital's PPR performance was between SFY 2011 and SFY 2012.

Consistency in hospital performance can also be measured by the Pearson correlation coefficient, where 0.00 would indicate no correlation between the two years and 1.00 would indicate perfect correlation. For the top 50 hospitals, the correlation coefficient was 0.55, indicating substantial but not overwhelming consistency year to year. For all 222 hospitals, the correlation coefficient was 0.25.[19] The lower figure was not unexpected, because for smaller hospitals a small change in the number of actual PPR stays or expected PPR stays is more likely to shift the A/E ratio more than for larger hospitals. (This phenomenon stems from the statistical law of large numbers.)

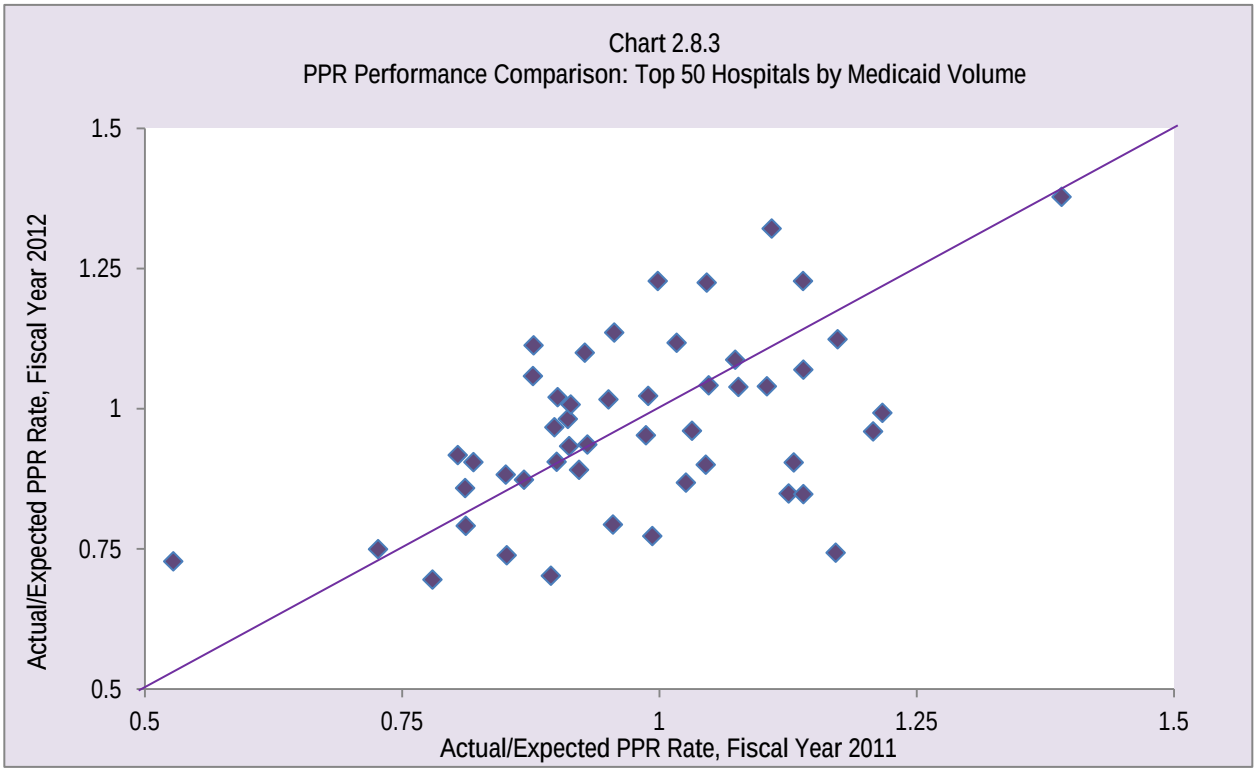
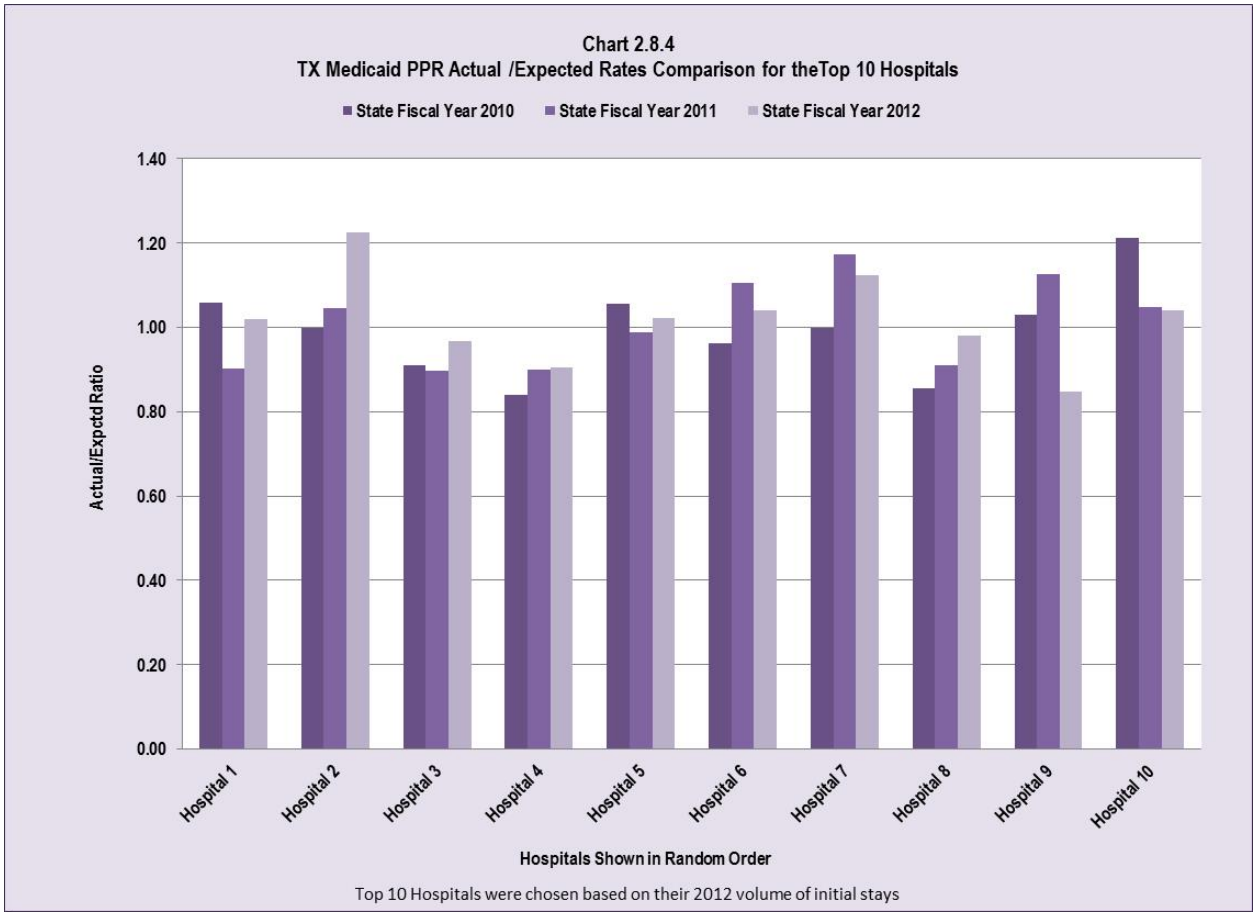


Chart 2.8.4 compares the PPR rates across state fiscal years 2010, 2011, and 2012 for the top 10 hospitals based on the highest volume of initial admissions in state fiscal year 2012.



3 Frequently Asked Questions

1. What counts as a PPR?

A PPR is a readmission that has a plausible clinical connection to the initial admission and could potentially have been prevented. This definition includes not only readmissions for the same conditions and for surgical complications but also readmissions that are sensitive to ambulatory care outside the hospital, including care for mental health and substance abuse conditions. Readmissions do not count as PPRs if they are likely to have been planned (e.g., major metastatic cancer), likely to have been unavoidable (e.g., HIV/AIDS), clearly involved patient compliance issues (e.g., self-discharge against medical advice), or were clearly unrelated (e.g., hip fracture after heart attack). The PPR count includes both readmissions to the same hospital and readmissions to a different hospital.

2. Why were APR-DRGs, and not Medicare MS-DRGs, used to measure casemix?

The Medicare MS-DRG algorithm was designed only for the Medicare population.[20] The APR- DRG algorithm was designed for use with an all-patient population and fits a Medicaid population well. The 3M PPR methodology was designed to be applied to APR-DRGs.

3. Is this the same approach that Medicare has taken? What is the difference?

The two approaches and the context in which they are applied are quite different, as summarized in Table 3.1. The four main reasons why this approach was chosen were:

- The Texas Legislature specifically required the use of a measure that focuses on "potentially preventable" readmissions, as opposed to readmissions from all causes.
- The PPR methodology used for this report is applicable across multiple conditions, whereas the Medicare method focuses on one condition at a time and has been developed for only three conditions: heart attack, heart failure, and pneumonia.

Table 3.1
Principal Differences Between Medicare and Texas Medicaid Approaches to Measuring Readmissions

	Medicare	Texas Medicaid
Population	Fee-for-service Medicare	Fee for service and managed care Medicaid, all ages except newborns
Readmission window	30 days	15 days
Results based on	July 1, 2009-June 30, 2012	September 2011-August 2012 (SFY 2012)
Conditions included	Heart attack, heart failure, pneumonia	All (with minor exceptions)
Readmissions included	All causes	Only those with a plausible clinical connection to the initial admission
Methodology	Multivariate regression	Categorical
Methodology developed by	Yale University researchers for the Centers for Medicare and Medicaid Services (CMS)	3M Health Information Systems
Adjustments for casemix	Age, gender, comorbidities at time of initial admission, medical history within the past year	Base APR-DRG, APR-DRG severity of illness, presence of a major MH/SA comorbidity, age
Availability of results	Hospital-specific data available at www.medicare.gov/hospitalcompare/	Hospital-specific data provided confidentially only to each hospital

Note: For more information about the Medicare methodology, go to www.medicare.gov/hospitalcompare/ and www.qualitynet.org. See in particular Yale New Haven Health Services Corporation/Center for Outcomes Research & Evaluation, Fiscal Year 2013 Hospital Readmissions Reduction Program: Measure Methodology Report, Report to the Centers for Medicare & Medicaid Services (New Haven, CT, June 18, 2012), available at www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1228772412995. Accessed November 5, 2013.

- The Medicare methodology was designed for a Medicare population in terms of the conditions studied, the casemix adjustors applied, and the nature of the data used. The three conditions for which the Medicare methodology was developed are not the most important conditions for a Medicaid population.
- The PPR methodology provides individual hospitals with specific stay-level results that are more useful and easier for non-statisticians to understand than the Medicare methodology.

4. How does coding on the claim form (UB-04 or X12N 837I) affect casemix measurement and PPR results?

PPRs are identified by comparing the base APR-DRG for the initial stay with the base APR-DRG for the readmission. The risk of readmission, and therefore the hospital's performance in comparison with the statewide average, also depends on the APR-DRG severity of illness assigned to each stay. The assignment of both the base APR-DRG and the severity of illness depend on the number, nature, and interaction of ICD-9-CM diagnoses and procedures coded by the hospital on the claim. (There is no single list of complications and comorbidities, as there is under Medicare.) Hospitals are therefore advised to code each claim thoroughly so that the APR-DRG assignment is as accurate as possible. Hospitals are not required to list the DRG on the claim as the APR-DRG assignment is done by TMHP as part of the PPR analysis.

Refer to Appendix Section B.2.4 for a discussion of coding completeness in the analytical dataset. A review of the claims data used for this analysis found no obvious issues in coding completeness, except that specialty psychiatric hospitals may not be as thorough in assigning diagnosis and procedure codes as general hospitals serving similar patients.

5. What steps were taken to adjust for differences in casemix among hospitals?

The likelihood of readmission is influenced by the reason for the initial admission, the severity of the patient's condition, the presence or absence of a major mental health or substance abuse comorbidity, and the patient's age (18 and under or 18 years of age and older). Comparisons of subsets of the analytical dataset (e.g., across hospitals) were adjusted for these differences in casemix. Refer to Section 1.5 and Appendix B.6.

6. My hospital provides only pediatric services. How can our PPR rate be compared with that of other hospitals?

One reason why the 3M PPR methodology was used was because of the large volume of pediatric, obstetric and young adult inpatient stays in the Texas Medicaid population. APR-DRGs, which were developed by 3M and the National Association of Children's Hospitals and related institutions, are a highly valid measure of pediatric casemix. The PPR methodology also adjusts for statewide differences in PPR rates between clients 18 and under and adults.

7. Are the results statistically significant?

Results are based on the complete data for SFY 2012, not on a sampling methodology. There is no question of statistical significance so long as inferences are made only about the Texas Medicaid population in SFY 2012. In a different time period, the results might be different, especially if a hospital had a small volume of stays in SFY 2012. To assess the likelihood of this, a categorical statistic called the Cochran-Mantel-Haenszel (CMH) statistic was used. Refer to Section 1.5 and Appendix Section B.6.

8. **Why was a multivariate regression analysis not used? Medicare follows this approach.**

   Both categorical analysis (this approach) and multivariate regression analysis (the Medicare approach) are valid ways to analyze readmissions. A categorical approach is considered by many to be more accessible to people not trained in statistics, enabling a broader understanding and acceptance of the information. This understanding helps hospitals reduce their readmission rates.

9. **How were hospitals identified in the analysis?**

   Hospitals were identified by their Texas Provider Identifier (TPI) number, which is submitted by hospitals on FFS and PCCM claims that are paid directly by the TMHP on behalf of HHSC. (In some cases, two TPIs for the same hospital were consolidated into a single TPI for purposes of this analysis, for example if the hospital received a new TPI part-way through SFY 2012) Managed care encounters show the hospital's National Provider Identifier (NPI) rather than the Texas TPI. Each managed care encounter was mapped to the appropriate TPI, using data fields such as the NPI, taxonomy, type of bill and zip code.

10. **Can my hospital appeal the finding of individual readmissions being potentially preventable?**

    No. In the approach taken here, what matters is a hospital's overall rate of PPRs, not any particular readmission. This approach recognizes that some readmissions will occur, and focuses instead on the hospital's casemix-adjusted PPR rate in comparison with an appropriate norm.

11. **Why should my hospital be blamed if a readmission results from the fact that the patient or the physician in the community did not comply with the follow-up instructions?**

    The purpose of the analysis is not to assign blame but rather to inform hospitals about possible quality issues stemming either from inpatient care or from the transfer of care from the hospital to the community. As a primary component in the health-care system of each community, hospitals can help reduce readmission rates and improve quality throughout the continuum of care.

12. **Why is the number of Medicaid stays reported in Section 2 different from the number of Medicaid stays in my hospital's database?**

    There are several possible reasons. Most importantly, several types of patients and stays were categorically excluded from the report, for reasons discussed in Sections 1.2 and 1.4. The largest of these categories were newborns, undocumented aliens, and stays in August 2012 that were not part of a readmission chain that began in the September-July period. In addition, a small number of cases had to be excluded because of data issues. The Excel PPR report being provided to each hospital shows the specific claims that were included and excluded from analysis for each hospital. On a statewide basis, the reasons for excluding claims are discussed in Section 1.2 and Appendix Sections B.1 and B.2.

13. **What are the consequences of having a high PPR rate? Will payment be affected?**

    A high PPR rate is an indication of opportunities to improve the quality of patient care, and in particular, the management of the discharge process and the transition to caregivers in the community. A hospital's PPR rate affected payments starting May 1st 2013 as required by S.B. 7, 82nd Legislature, Special Session.

14. **Will the Office of Inspector General or other agencies investigate hospitals based on these results?**

    Various state and federal agencies oversee the quality of care provided by hospitals, physicians and other providers. TMHP is not aware of specific oversight efforts planned as a result of this analysis.

15. What can a hospital do to reduce its PPR rate?

Many organizations and individual hospitals are working on this question. Some useful resources include:

- Health Research and Educational Trust, *Health Care Leader Action Guide to Reduce Avoidable Readmissions* (Chicago: HRET, 2010), available at www.hret.org/care/projects/guide-to-reduce-readmissions.shtml.
- Jenny Minott, *Reducing Hospital Readmissions* (Washington, DC: AcademyHealth, 2008), available at www.academyhealth.org/files/publications/Reducing_Hospital_Readmissions.pdf
- The Institute for Healthcare Improvement has done several reports surveying the literature on reducing readmissions, especially in the adult medical/surgical population. More information is available at www.ihi.org.
- In Texas, the TMF Health Quality Institute is leading a Learning and Action Network that aims to reduce avoidable all cause 30-day readmissions by 20 percent over the next two years. For more information visit http://texasqio.tmf.org/Networks/Readmissions.aspx.

16. Will these results for my hospital be reported publicly?

Hospital reports are confidential for one year after the report has been released.

17. How can I get my hospital's report?

The reports will be available to the providers when they log into their account on the www.tmhp.com homepage under an active link called "View PPR Provider Reports." Only users with authorization to view the R&S reports will have access to view the PPR reports. You may also contact your hospital's administrative office to get the appropriate permission levels to view the reports. You may also send an email to PPR.Report@tmhp.com for more information.

18. What information is contained in the confidential hospital reports?

Section 4 of the hospital specific report, which is not included in the public version of this PPR report, includes hospital-specific data in the same format as Tables 2.2.1, 2.3.1, and 2.4.1. In addition, each hospital will receive an Excel file that includes detailed information on the claims and encounters that were included and excluded from the analysis.

19. Is there support or training on how to understand these reports and use them for improvement?

Additional information can be found at the following link:
http://www.tmhp.com/Pages/Medicaid/Hospital_PPR.aspx

Because the same methodology has been used in this year's report as in the previous three years, these materials remain applicable.

20. Who developed the PPR methodology? Who else uses it?

The specific PPR methodology used in this analysis was developed by 3M Health Information Systems. It has also been used by other health care organizations, including the Florida Agency for Health Care Administration (www.floridahealthfinder.gov), the Utah Department of Health (www.health.utah.gov), the Maryland Health Services Cost Review Commission, the New York Medicaid program, and the Medicare Payment Advisory Commission.

21. I disagree that seizure should be considered a PPR when the patient was initially admitted for asthma. How do I make my point?

An advantage of the PPR methodology is its transparency, which enables clinicians to understand in detail what circumstances do and do not count as a PPR. In particular, Appendix M of the 3M *PPR Classification System Definitions Manual* lists the admission/readmission APR-DRGs pairs that are considered to be PPRs. 3M Health Information Systems welcomes suggestions to refine the methodology. These may be sent to Gregg Perfetto at gmperfetto@mmm.com.

22. What else can I do to get my questions answered?

The PPR methodology itself is well-described in the 3M *PPR Classification System Definitions Manual*, available to Texas hospitals by contacting Gregg Perfetto at gmperfetto@mmm.com. Questions about the methodology and results in this report may be directed to the Texas Medicaid and Healthcare Partnership at PPR.Report@tmhp.com.

23. Are there plans for additional analysis or reporting in future years?

Yes. The PPR analysis will be repeated annually, as directed by the Health and Human Services Commission and mandated by HB 1218, 81st Legislature, Regular Session and in accordance with Texas Administrative Code Rule §354.1445.

Appendix A: Terminology[21]

Actual to Expected (A/E) Ratio
The ratio of the actual number of PPR chains compared to the expected number of PPR chains, where the expected number depends on the base APR-DRG, the severity of illness, the patient age, and the presence or absence of a major mental health or substance abuse comorbidity. See Appendix Section B.6.2.

Actual PPR Rate
The actual PPR rate is the number of readmission chains divided by the number of initial admissions, excluding readmissions that are not considered potentially preventable. See Section 1.5.1 and Appendix Section B.5.

APR-DRG
An algorithm that assigns an inpatient stay to a diagnosis related group (DRG) based on diagnoses, procedures, and other clinical information on the claim. The All Patient Refined DRG algorithm is proprietary to 3M Health Information Systems and was designed for use with all types of patients. It is in the format 123-4, where the first three digits indicate the base DRG (generally, the reason for admission) and the fourth digit indicates the severity of illness. See Appendix Section B.3.

Casemix
The casemix refers to a mix of patients that were treated during the reporting time period, with "higher" casemix referring to sicker patients who require more hospital resources. Casemix is measured using APR-DRG relative weights, sometimes augmented in PPR analysis with information on patient age and/or the presence of a major MH/SA comorbidity.

Clinically Related
"Clinically related" is defined as a requirement that the underlying reason for readmission be plausibly related to the care rendered during or immediately following a prior hospital admission. A clinically related readmission may have resulted from the process of care and treatment during the prior admission (e.g. readmission for a surgical wound infection) or from a lack of post admission follow-up (lack of follow-up arrangements with a primary care physician) rather than from unrelated events that occurred after the prior admission (broken leg due to trauma) within a specified readmission time interval.

Cochran-Mantel-Haenszel Test
The Cochran-Mantel-Haenszel Test is a test of conditional independence that is applicable in categorical data analysis and that is used to indicate the likelihood that a hospital's A/E ratio differed from 1.00 simply due to random variation. See Appendix Section B.6.5.

Comorbidity
Comorbidity is defined either as the presence of one or more disorders or diseases in addition to a primary disease or disorder or as the effect of such additional disorders or diseases.

Expected PPR Rate
The expected rates were based on the PPR experience of all Texas Medicaid patients in SFY 2012. Four important characteristics that are strongly correlated with the incidence of PPRs were taken into account. See Section 1.5.2 and Appendix Section B.6.2.

Fee-for-Service (FFS)
Fee-for-service Medicaid is a health-care delivery model under which Medicaid clients may receive care from any enrolled provider, and providers are paid directly by the Medicaid program.

State Fiscal Year (SFY)
The Texas state fiscal year is September through August.

Health and Human Services Commission (HHSC)
The Texas Health and Human Services Commission is the agency that administers the Texas Medicaid program.

Initial Admission
For purposes of this analysis, an initial admission is either an admission followed by one or more PPRs or an admission that was not followed by a PPR. Note that this definition differs slightly from that given in the 3M *PPR Classification System Definitions Manual.*

Indirect Rate Standardization
An analytic technique, borrowed from epidemiology, for comparing rates in two or more sub-populations in a way that adjusts for the differences between the sub-populations. For example, in Appendix Section B.2.4.3 the technique is used to compare the number of diagnosis and procedure codes that are billed by freestanding psychiatric hospitals and general hospitals for mental health stays.

Major Mental Health/Substance Abuse (MH/SA) Comorbidity
MH/SA Comorbidities are a list of 218 ICD-9-CM secondary diagnoses that are defined by 3M as indicating a major mental health or substance abuse comorbidity. Examples include schizophrenia, depression, bipolar disease, and alcohol or substance abuse withdrawal or dependence. See Appendix K of the 3M *PPR Classification System Definitions Manual.*

Managed Care Organization (MCO)
A managed care organization is an umbrella term for health plans that provide health care in return for a predetermined monthly fee. Care is typically coordinated through a defined network of physicians and hospitals.

Medicaid Care Category
A Medicaid Care Category is based on age and APR-DRG. The categorization was developed by TMHP to reflect both the policy portfolios of a typical Medicaid agency and the internal organization of a typical hospital. See Appendix Section B.4.

Minimum Volume Test
In this analysis, groups of stays (e.g., at a particular hospital) were considered low-volume if any of the following three conditions were not met: (1) at least 40 initial admissions; (2) at least five actual PPR chains; and (3) at least five expected PPR chains. See Appendix Section B.6.4.

Medicaid Management Information System (MMIS)
The Medicaid Management Information System is the computer system used to adjudicate Texas Medicaid claims.

Medicare Severity Diagnosis Related Group (MS-DRG)
The Medicare Severity (MS) Diagnosis Related Group is an algorithm that assigns an inpatient stay to a diagnosis related group (DRG) based on diagnoses, procedures, and other clinical information on the claim. The MSDRG algorithm is used by the Medicare program to group Medicare patients. It is a three digit format and does not reflect a fourth digit for severity of illness.

Newborn
For the purposes of this analysis, newborns were defined as all babies that were 0 to 7 days old on the date of admission, as well as a subset of babies' age 8 to 14 days old who had a low birth weight and who may still have complications originating in the prenatal period.

National Provider Identifier (NPI)
The National Provider Identifier is a unique identifier that is assigned by the federal government to hospitals and other providers. It is included on managed care encounters that are submitted by managed care plans to HHSC. It was mapped to the appropriate TPI for the purposes of this analysis. See Appendix Section B.2.3.2.

Patient Control Number (PCN)
The PCN is the unique Medicaid client identifier that is used in this report.

Primary Care Case Management (PCCM)
Primary Care Case Management clients choose a primary care provider (PCP) who acts as their medical home. The PCP is responsible for managing their care and, in some states, acting as a gatekeeper to specialty services. Payments for hospital and other services that are received by the client are made directly by TMHP on behalf of HHSC.

Pediatric
For purposes of this analysis, "pediatric" was defined as clients less than 18 years. Different definitions may be used for other purposes within the Medicaid program.

Potentially Preventable Readmission (PPR)
A potentially preventable readmission is a readmission (return hospitalization within the specified readmission time interval) that is clinically related (as defined above) to the initial hospital admission.

PPR Exclusion
An excluded admission is an admission that is excluded from consideration as either an initial admission or a readmission. For example, patients who have a discharge status that indicates that they left against medical advice would be excluded. See Appendix Section B.5.4.

PPR Non-Event
A "non-event" is an admission to a non-acute care facility (e.g., a nursing facility) or an admission to an acute care hospital for sub-acute care (e.g., convalescence). Non-events are ignored by the PPR assignment logic. See Appendix Section B.5.4.

Readmission
A readmission is a return hospitalization to an acute care hospital that follows a prior admission from an acute care hospital. Intervening admissions to non-acute care facilities (e.g., a skilled nursing facility) are not considered readmissions and do not affect the designation of an admission as a readmission.

Readmission Chain
A readmission chain is a sequence of PPRs that are all clinically related (as defined above) to the initial admission. A readmission chain may contain an initial admission and only one PPR, which is the most common situation, or it may contain multiple PPRs following the initial admission.

Readmission Time Interval
The readmission time interval is the time period within which a second admission to the hospital may be considered a readmission. This report used a readmission time interval of 15 days that was chosen by HHSC.

Severity of Illness
The severity of illness is the extent of physiologic decompensation or organ system loss of function. For each base APR-DRG, it is indicated by an ordinal ranking from 1 to 4.

Texas Medicaid & Healthcare Partnership (TMHP)
The Texas Medicaid & Healthcare Partnership (TMHP), a coalition of contractors headed by Xerox Government Healthcare Solutions, carries out the Medicaid FFS and PCCM claims administrator duties for the state of Texas, under contract with the Texas Health and Human Services Commission.

Texas Provider Identifier (TPI)
The Texas Provider Identifier is a unique identifier that is assigned by the Texas Medicaid program to hospitals and other providers. The TPI was the identifier used to uniquely identify hospitals for the purposes of this analysis. See Appendix Section B.2.3.1.

Appendix B: Methodology

Note: This appendix provides additional information on the methodology used in this report to supplement Section 1.

B.1 Data Sources

The analysis combined FFS, PCCM claims, and managed care encounters.

The criteria for selecting stays were as follows:

- Inpatient hospital claims and encounters
- Date of inpatient admission was SFY 2012 (September 1, 2011 to August 31, 2012)
- Claim or encounters was paid by February 28, 2013
- Paid claims and encounters only
- Final adjusted claims only
- In state and out-of-state hospitals
- Excluded Medicare crossover claims (where Medicaid is the secondary payer behind Medicare)
- Excluded claims for patients who "spent down" their Medicaid eligibility.[22]

The FFS and PCCM claims were from the 2012 Claims Data File (CDF), created by TMHP annually. The CDF reflects well established procedures for validating, organizing, and presenting the data. The dataset of managed care encounters was created especially for this analysis from the Texas Medicaid encounters data warehouse.

Once the FFS, PCCM, and managed care datasets were created, the data was validated and the "analytical dataset" was created that has been used for this report.

B.2 Data Validation

For purposes of studying readmissions, four aspects of data quality are paramount.

- A one-to-one correspondence between an inpatient stay and a record in the analytical dataset
- Unique client identifier
- Unique hospital identifier
- Adequate diagnosis and procedure coding (which affect adjustment for casemix)

Table B.2.1 shows a reconciliation of record counts, starting from the datasets received and ending with the analytical dataset. Out of an initial total of 701,399 records received, 9,556 were excluded because they did not uniquely represent a hospital inpatient stay. Another 334,895 records were intentionally excluded by the design of the study (e.g., because they were for newborns or undocumented aliens). Of the remaining 356,948 records, another 16,543 records, or 2.4 percent, were excluded due to various data issues. The analytical dataset used for the PPR analysis comprised 340,405 stays.

Table B.2.1
Reconciliation of Record Counts

Adjustment	Adjustment Category	Ref.	FFS/PCCM Claims	Encounter Claims	Total Claims
Records received		B.1	342,993	358,406	701,399
Not inpatient bill type	Not unique inpatient stay	B.2.1.1	0	0	0
Informational claim only	Not unique inpatient stay	B.2.1.1	38	0	38
Duplicate claim	Not unique inpatient stay	B.2.1.2	75	6,835	6,910
Consolidated within claim chains	Not unique inpatient stay	B.2.1.3	37	2,571	2,608
Incomplete stay	Data issue	B.2.1.4	413	0	413
Undocumented aliens	Study design	B.2.2.2	77,916	0	77,916
Unreliable discharge status—particular MCOs	Data issue	B.2.5.1	0	14,263	14,263
Unreliable discharge status—other	Data issue	B.2.5.1	0	425	425
APR-DRG grouping errors	Data issue	B.3.3	122	1202	1324
Newborns	Study design	B.5.1	100,260	98,998	199,258
August 2011, not a readmission	Study design	B.5.2	5,619	24,724	30,343
PPR grouping errors	Data issue	B.5.3	40	78	118
PPR exclusions and non-events	Study design	B.5.4	17,295	10,083	27,378
Analytical dataset			141,178	199,227	340,405
Subtotal—not unique inpatient stay			*150*	*9,406*	*9,556*
Subtotal—study design			*201,090*	*133,805*	*334,895*
Subtotal—data issue			*575*	*15,968*	*16,543*

Notes:

1. Claims could be excluded from the analytical dataset for more than one reason. Record counts for each exclusion reason therefore would differ depending on the order in which the validation steps were performed.
2. 701,399 records received minus 9,556 records that did not represent a unique inpatient stay equals 691,843 stays as shown in Table 1.1.1.
3. The count of records excluded from August 2012 reflects a 15-day PPR window. See Section A.5.2.

B.2.1 Defining Complete Hospital Stays

The goal was to ensure a one-to-one match between an inpatient hospital stay and a record in the analytical dataset.

B.2.1.1 Validating Type of Bill

The type of bill (TOB) is a three-digit field that is submitted by the hospital to the payer.[23] A value of 111, for example, is a single admit-through-discharge claim at a hospital for inpatient care. All received values of TOB were examined. A total of 38 claims were excluded, all because the hospital submitted the claim as "information only" and did not request Medicaid payment.

B.2.1.2 Apparent Duplicate Claims/Encounters

Seventy five FFS and PCCM claims and 6,835 managed care encounters were excluded because they appeared to be duplicates of other records in the dataset. Exact duplicates were defined as showing identical values for patient, hospital, admission date, discharge date, discharge status, TOB, and billed charges. Potential duplicates were defined as showing identical values for all of the above criteria except billed charges. The existence of duplicate records does not necessarily imply duplicate payments to hospitals, but it does mean that the duplicated records need to be excluded from the analytical dataset in order to prevent double-counting.

B.2.1.3 Claim Chaining

Hospitals may submit more than one claim for a single inpatient stay, for three reasons:

- ***Adjustments***—An earlier claim may be corrected ("adjusted") by a later claim. In this case, the claims processing system includes the original claim, a reversal of the original claim, and the new adjusted claim. The criteria used to select the dataset specified that only the final adjusted claim should be included (Section B.1).
- ***Interim claims***—A hospital may submit an interim claim (indicated by bill frequency 2 or 3 and discharge status 30) while a patient remains in the hospital. When the patient is discharged, the hospital submits a final claim with bill frequency 4 and the appropriate discharge status. (Bill frequency is the third digit in the bill type field.)
- ***Late charges***—A hospital may submit a supplementary claim for late charges without adjusting the original claim. A claim for late charges shows bill frequency 5. This can be confusing because the claims processing system then contains two valid claims for the same patient with the same dates of service.

TMHP examined all of the situations in which there were claims with overlapping dates of service for the same patient in the same hospital. Claims that showed a one-day difference (e.g., one claim with last date of service Monday and another claim with first date of service Tuesday) were also examined. In situations where there was a one-day difference, TMHP relied on the admit date, TOB, and discharge status to determine whether the claim represented a single stay or an initial admission followed by a readmission.

"Claim chaining" is the process of combining multiple claims for a single stay into a single record in the analytical dataset. It applies to both interim claims and late charges, and it can reveal anomalies with adjusted claims. When all claims are billed as expected, claim chaining can be done systematically using a simple algorithm. Anomalies do occur, however, including internal inconsistencies (e.g., the bill frequency indicates an interim claim but the discharge status shows the patient was discharged home) and situations in which there appear to be missing claims in the chain.

The CDF used for this report had already been processed through claim chaining while the managed care encounter file had not. Both files were checked for potential claim-chaining situations and then the claim-chaining algorithm was applied. Situations that were not handled by the algorithm were reviewed on an individual basis. In most cases, an examination of the admit dates, bill types, discharge statuses, dates of service, diagnoses, and other data allowed determination of the claim status with a high degree of confidence.

B.2.1.4 Incomplete Stay

A total of 413 claims were excluded because the claims did not clearly show the discharge date (Table B.2.1). These incomplete stays can occur because the client was still a patient when the CDF was created, or because of billing errors by the hospital.

B.2.1.5 Claims with Low Charges

Hospital care is very expensive. On average, Texas hospitals charge $7,500 for a day of inpatient care.[24] Therefore, all of the claims that included charges under $500 a day were examined to look for anomalies in total charges or in the length of stay. TMHP's concern was that the claim might not represent a complete inpatient stay or that the length of stay might have been wrong.

This validation step was performed after the above steps. No situations were found where the claim should have been excluded because of an obvious anomaly. Most of the claims with low charges were for psychiatric care, and average charges per day were usually close to the $500 threshold.

B.2.2 Unique Identification of Patients

B.2.2.1 Patient Identifier

Patients were uniquely identified using their Texas Medicaid client identification number (PCN), which is required from hospitals on both FFS/PCCM claims and managed care encounters. In general, the quality of this data field was excellent. There were some claims where a newborn baby had the same client number as the mother, but these situations did not affect the record counts because all newborns were excluded from the analytical dataset. The identification of PPRs was performed using the patient identifier, hospital identifier, and dates of service as key fields. If a patient changed managed care plans, or moved between the FFS, PCCM, or managed care sectors, then the PPR count reflected the patient's Medicaid eligibility during the initial stay.

B.2.2.2 Undocumented Aliens

Medicaid pays for inpatient care received by undocumented aliens in certain emergency circumstances. These claims were excluded from the analysis because the patients were not eligible for Medicaid on a continuing basis. Therefore, any readmissions likely would not have been processed in the MMIS. There were 77,916 FFS/PCCM claims excluded for this reason (Table B.2.1).

B.2.3 Unique Identification of Hospitals

B.2.3.1 Fee for Service

In the CDF of FFS and PCCM stays, hospitals are uniquely identified by the Texas Provider Identifier (TPI) in the MMIS. Each TPI comprises of a seven-digit base ID and a two-digit suffix. For example, 1234567-01 might be a hospital's TPI for the hospital itself while 1234567-02 might be the ambulatory

surgical center at the same hospital. It is not uncommon for a single hospital to have multiple TPIs. The CDF consistently shows the appropriate TPI for inpatient hospital care, in large part because the TPI is considered in calculating payment on FFS and PCCM claims. Each TPI is associated with a provider name and a provider specialty, e.g., "hospital, non-profit, acute, 1-50 beds."

B.2.3.2 Managed Care

The managed care plans do not use the TPI in claims adjudication and do not transmit it to the Texas Medicaid data warehouse. Instead, they transmit the National Provider Identifier (NPI). For the purposes of this report, the NPI was mapped to a TPI based on the NPI and supplementary data received from the MCO, such as type of bill, provider taxonomy code, tax ID, provider address, and benefit code.

B.2.4 Diagnosis and Procedure Coding

B.2.4.1 Importance of Coding

Rates of readmission depend not only on the reason for the initial admission but also on the severity of the patient's condition during the initial admission. To be fair in comparing hospitals, it is therefore necessary to have accurate data on the patient's clinical condition. This was measured using All Patient Refined Diagnosis Related Groups (APR-DRGs), as discussed in Section B.3. APR-DRGs depend critically on the diagnosis and procedure codes listed by the hospital on the claim and then stored in the payer's claims processing system. Diagnosis and procedure coding on claims is never perfect, but it is essential to check these data fields for major issues that could invalidate comparisons among hospitals.

B.2.4.2 Valid Values

ICD-9-CM diagnosis and procedure code values can take different formats. For example, diagnosis codes can be three, four, or five digits, including leading or trailing zeroes, with a decimal place implied after three digits for most codes but after four digits for "E" codes. Similar potential for confusion exists with the procedure codes. The data as received had multiple formats, which were standardized for analysis. In particular, almost all of the claims had procedure codes that were listed with a leading zero, so that a four-digit procedure code was received as five digits.

Other anomalies can arise when a hospital submits a diagnosis code or procedure code that is not valid for the date of discharge. These anomalies typically arise near October 1 of each year, which is the nationwide revision date for the ICD-9-CM code set. In cases where it was obvious what the appropriate code should have been, the code value was adjusted, usually by adding or deleting a fifth digit to a diagnosis code.

B.2.4.3 Coding Completeness

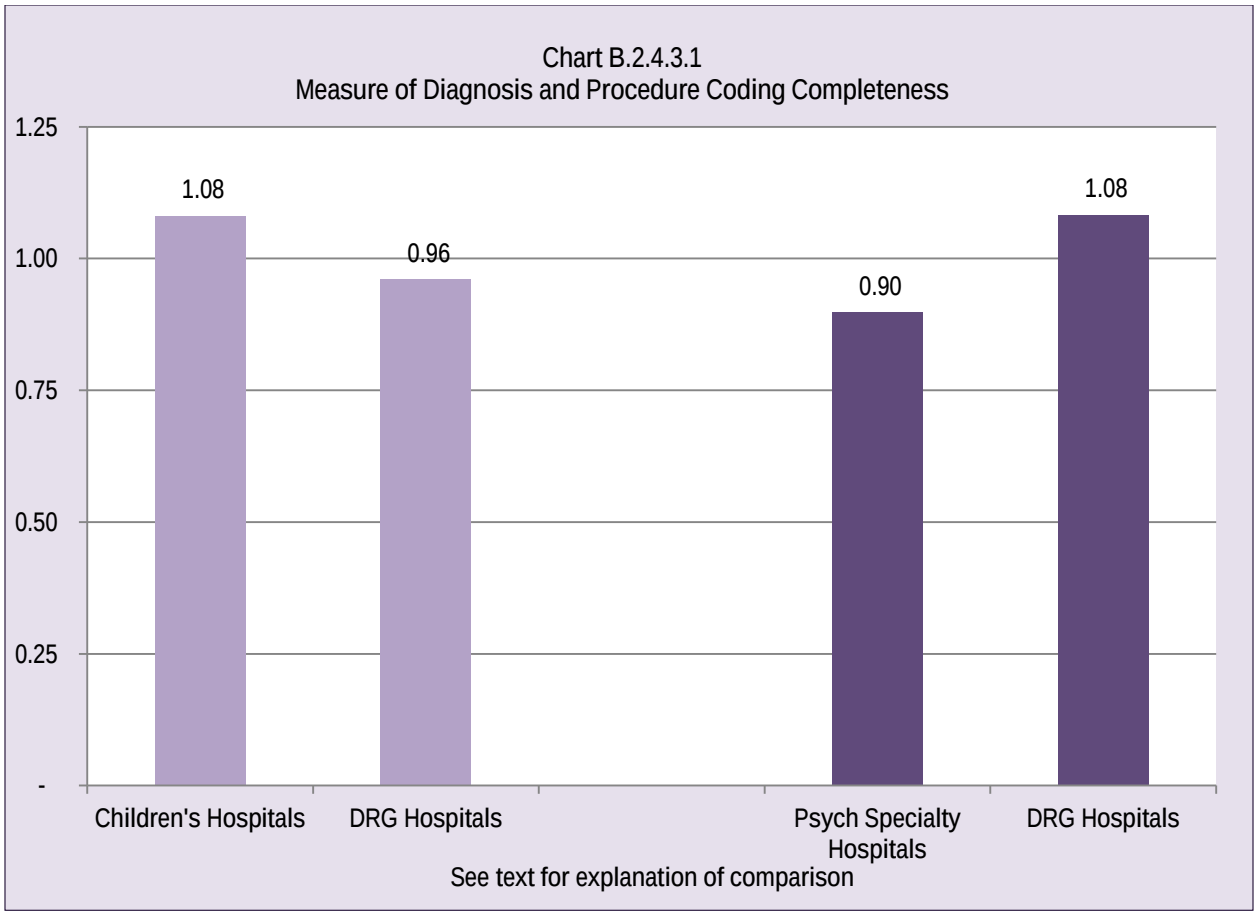
Within the FFS and PCCM sectors, Texas Medicaid reimbursed acute care hospitals based on MS-DRGs until 8/31/2012 after which APR-DRGs were implemented. These hospitals have strong financial incentives to be thorough in including diagnosis and procedure codes on claims, since these codes drive the DRG assignment for the claim. Medicaid reimburses other hospitals on cost reimbursement principles using the "TEFRA" reimbursement methodology, which is a reference to the federal Tax Equity and Fiscal Responsibility Act of 1982. Primarily children's hospitals, rural, and state-owned teaching hospitals are reimbursed under the TEFRA methodology. Without the financial incentive of DRG payment, the concern is that diagnosis and procedure codes would be under-reported by children's and specialty psychiatric hospitals. A similar concern occurs on the managed care side, where DRG-style payment methods that reward complete coding are believed to be rarely used in calculating payment for

children's and specialty psychiatric hospitals.

One measure of coding completeness is simply the average number of diagnosis and procedure codes per claim. This measure is useful if the casemix is very similar between DRG hospitals and TEFRA hospitals. A more careful approach would be to adjust for the differences in the types of clients. Therefore, TMHP did a casemix-adjusted comparison, making use of the fact that every claim shows a principal diagnosis. The principal diagnosis typically drives the assignment of the base APR-DRG.[25] (In some cases, the principal operating room procedure drives the assignment of the base APR-DRG.) The average count of diagnoses and procedures for each base APR-DRG was calculated and used as a norm to compare DRG and TEFRA hospitals.[26] The children's hospitals were compared with pediatric stays at the general hospitals while the specialty psychiatric hospitals were compared with psychiatric stays at the general hospitals.

The results, as shown in Chart B.2.4.3.1 and Table B.2.4.3.1, suggested that children's hospitals tend to code more completely than the acute care general hospitals. The children's hospitals reported an average of 7.24 diagnosis and procedure codes per claim (Table B.2.4.3.1). Based on the mix of base APR-DRGs at these hospitals, an average of 6.70 codes would have been expected. The ratio of actual to expected code counts per claim was therefore 1.08. For acute care general hospitals treating pediatric patients, the actual number of codes was 5.44 but the expected number was 5.66 so the actual/expected ratio was 0.96. Although it remains possible that even more diagnosis and procedure codes should have been reported at the children's hospitals, the chart implies that there was no obvious coding deficit in coding in the children's hospitals relative to the general hospitals.

Freestanding psychiatric hospitals reported many fewer diagnosis and procedure codes than would be expected given their mix of base DRGs. On average, freestanding psychiatric hospitals reported 5.24 codes per claim, whereas 5.83 would be expected. Acute care general hospitals reported 6.53 codes per claim, or more than the 6.03 expected. The actual/expected ratio was therefore 1.08. It was also noteworthy that 6.53 codes per claim at the general hospitals were 25 percent more than the 5.24 average at the freestanding hospitals. The differences in both absolute terms and relative to expectations suggest that coding was relatively incomplete in the freestanding psychiatric hospitals.



When coding is incomplete, the average casemix of patients can be understated. That, in turn, would understate the expected PPR rates, resulting in reported PPR performance ratios that are worse than they may be in reality. If there is a bias (where "bias" in used in the statistical sense), then its magnitude cannot be determined without better data from these hospitals. The magnitude may be modest, however, because Table 2.5.1 did not show large differences in PPR rates between severity levels for the most common MH/SA conditions.

Table 2.4.3.1
Actual and Expected Diagnosis and Procedure Coding by DRG Hospitals, Children's Hospitals and Freestanding Psych Hospitals

Hospital Group	DRG Group	Total Stays	Total Diagnosis and Procedure Codes	Average Diagnosis/Procedure Codes per Stay		
				Actual	Expected	Actual/Expected
DRG hospitals	Mental health	21,223	138,583	6.53	6.03	1.08
Freestanding psych	Mental health	18,034	94,409	5.24	5.83	0.90
All hospitals	Mental health	39,257	232,992	5.94	5.94	1.00
DRG hospitals	Pediatric	79,854	434,227	5.44	5.66	0.96
Children's hospitals	Pediatric	32,749	237,209	7.24	6.70	1.08
All hospitals	Pediatric	112,603	671,436	5.96	5.96	1.00

Notes:

1) "Mental health" refers to Freestanding Psych Facilities compared to DRG hospitals with APR-DRG between 750 and 777

2) "Pediatric" refers to Children's hospitals compared to hospitals with DRG hospitals with Recipients under age 18

3) The calculation of the actual to expected ratios was performed as follows:

a—For each base APR-DRG, the statewide average count of diagnoses and procedures was calculated.

b—The statewide average diagnosis/procedure counts were multiplied by the counts for each base APR-DRG within each hospital group (e.g., DRG hospitals or children's hospitals) to arrive at the expected diagnosis/procedure counts for that hospital group.

c—Actual/expected ratios were then calculated. By definition, the A/E ratio = 1.00 across all hospitals.

d—This analytical technique is known as indirect rate standardization.

B.2.5 Other Data Validation Steps

B.2.5.1 Discharge Status

In the discharge status field, the hospital indicates whether the patient went home, died, left against medical advice, was transferred to another hospital, was transferred to another setting (such as a nursing home), or remains in the same hospital. For PPR analysis, this field is essential. Deaths, discharges against medical advice, and acute care transfers are excluded from the PPR analysis.

In general, the data in this field were in line with expectations. Two managed care plans, however, showed over 99 percent of their patients discharged home, with literally zero transfers, deaths, or discharges against medical advice. Such a pattern is highly unlikely. Because this important field was suspect, all 14,263 claims from these plans were excluded from the dataset.

Another 425 managed care encounters were excluded due to various other issues with regard to discharge status. Most commonly, the discharge status was 30 (still a patient) but there was no subsequent claim.

B.2.5.2 Type of Bill

As described in Section B.2.1.1, one purpose of the TOB field is to identify interim claims. For example, three claims for a single stay might show bill types 112 (first interim claim), 113 (continuing interim claim), and 114 (final interim claim). When the Claims Data File is created, the claim chaining process shows the chained claim as having the bill type associated with the first claim in the chain, 112 in this example. In the analytical dataset these values were changed to 111 to show that the record now represents a complete admit-through-discharge claim.

B.3 Grouping by APR-DRG

B.3.1 Overview

APR-DRGs are one of the DRG algorithms used to classify inpatients according to their clinical characteristics. After the Medicare Severity Diagnosis Related Group (MS-DRG) algorithm used by Medicare, the APR-DRG algorithm is probably the most widely known DRG algorithm. While Medicare DRGs were designed for use only in the Medicare population, APR-DRGs were designed for an all-patient population. In particular, APR-DRGs were designed to be more appropriate than Medicare DRGs for pediatrics, obstetrics, and various conditions that are not common in a Medicare population. APR-DRGs have been found to be suitable for a Medicaid population and are increasingly being used by Medicaid programs to calculate payment.[27]

APR-DRGs were developed by 3M Health Information Systems and the National Association of Children's Hospitals and Related Institutions.

B.3.2 Base DRG and the Severity of Illness

An advantage of APR-DRGs for analyses such as the present study is that the algorithm has a straightforward, easily understandable structure. Each APR-DRG is in the format 123-4. The first three digits represent the base DRG, which can be thought of as the reason for admission (usually the principal diagnosis, but sometimes the principal operating room procedure). The fourth digit represents the severity of illness on an ordinal scale of 1 to 4. Each inpatient stay is assigned to a single APR-DRG in an 18-step process that is documented in the APR-DRG definitions manual available from 3M Health Information Systems.

The PPR software includes logic to assign a stay to an APR-DRG. This assignment is identical to what stand-alone APR-DRG software would do, with two exceptions. First, some tracheostomy stays are re-assigned from the tracheostomy APR-DRG to an APR-DRG that reflects the underlying condition (e.g., stroke or pneumonia). Second, eight APR-DRGs have been split into two. The split allows the PPR logic to differentiate more finely between readmissions that were likely planned (e.g., cardiac catheterization following an initial admission for cardiac ischemia) and those that were likely unplanned (e.g., cardiac catheterization with a diagnosis of acute ischemia).

Version 30 of the combined APR-DRG and PPR software package was used for this analysis. Although this version was released in October 2012, it can be appropriately used for claims with earlier dates of service.

B.3.3 Validation of APR-DRG Assignments

About 0.19 percent of stays in the records received grouped to an error DRG, either "ungroupable" or the principal diagnosis code listed was not appropriate as a principal diagnosis (Table B.2.1).This percentage is in line with similar experience elsewhere.

B.4 Medicaid Care Category

Medicaid Care Category (MCC) is a categorization algorithm developed by TMHP for purposes of this analysis. It is intended to result in a manageable list of categories (eleven) that are aligned with both the policy areas of a typical Medicaid program and the internal organization of a typical hospital. Table 1.1.1 shows the number of stays in the analytical dataset in each care category. Pediatric patients were defined as 18 and under; the categories of medical, surgical, etc. were defined by the APR-DRG; and patients in the obstetric category could be of any age. In purpose, MCCs are similar to Major Diagnostic Categories (MDCs), which are based on DRGs and used by many hospital researchers. For purposes of an analysis such as this one, the chief drawback of the MDC categorization is that it does not split out pediatric stays. The number of MCCs is also easier to work with than the number of MDCs (25).

B.5 PPR Analysis

B.5.1 Overview

The PPR methodology developed by 3M Health Information Systems is separate and quite distinct from other methods of measuring readmissions. Refer to Section 1.4 for further information on the PPR methodology. The logic for defining PPRs is well documented in R.F. Averill et al., Potentially Preventable Readmissions Classification System Definitions Manual (Wallingford, CT: 3M Health Information Systems, 2010). The 3M methodology has been used in the Florida, Maryland and Utah all-payer populations, the New York Medicaid population, and the Medicare population.[28]

B.5.2 Time Frame

A "PPR chain" is created when more than one readmission follows an initial admission. For example, a two-day stay on January 1 followed by a two-day readmission on January 10 followed by another two-day readmission on January 20 constitutes a single PPR chain. To count in a chain, each readmission must be within the PPR window (e.g., 15 days) of the discharge date of the previous stay. In this example, the third stay counts in the PPR chain because it occurred within 15 days of the second stay, even though more than 15 days had passed since the discharge from the first stay.

Although the analytical dataset comprises 12 months of data, the PPR results are based only on 11 months of data. That is, for admissions in the September-July period TMHP looked for readmissions in the September-August period. The use of a one-month "run-out" period minimizes the likelihood that readmissions were omitted from the analytical dataset. An example of such an omission would be if a patient were admitted on July 31, discharged on August 20, and then readmitted on September 1. Similarly, if a patient were admitted in July, readmitted in August and readmitted again in September, then the PPR results would count the readmission chain accurately but miss the second readmission in the count of total readmissions.

B.5.3 PPR Grouping Errors

About 0.01 percent of stays in the records received were excluded because the PPR software could not assign it as an initial stay or a readmission.

B.5.4 PPR Exclusions and Non-Events

The 3M PPR methodology used in this analysis differs from all-cause readmission methodologies in several ways. One important difference is the emphasis on whether there is a plausible clinical connection between the initial admission and the readmission. The "PPR exclusion" logic in the software identifies situations where it is very likely that a readmission was either planned (e.g., chemotherapy for major metastatic cancer), unpreventable (e.g., infections for HIV/AIDS patients), or beyond a hospital's influence (e.g., patient left against medical advice).

Other stays were excluded from the study under the category of "non-event." These include admissions into an acute care hospital for non-acute care services such as rehabilitation, aftercare, and convalescence. Non-events also include transfers to another acute care hospital.

B.6 Casemix Adjustment of PPR Rates

B.6.1 Overview

Differences among hospitals and other patient groupings (e.g., by healthcare delivery method) were accounted for using the method of indirect standardization. Indirect standardization involves comparing

an actual rate for a group of patients with an expected rate that is based on the characteristics of the group being assessed (e.g., age, type of illness) and derived from rates observed in a larger population having the same characteristics. This is commonly expressed as the ratio of the actual rate to the expected rate, called the actual-to-expected (A/E) ratio. Section B.6.2 describes how expected values were developed.

The numbers reported describe actual PPR rates for Texas Medicaid patients in SFY 2012. There is no statistical uncertainty. However, it is natural to generalize from experience in a single year, using it as a basis for predicting future experience. Such generalization effectively treats the 2012 experience as a sample of some larger reality. If the results are used in this way, it is important to keep in mind that the results are subject to natural, random variation. This is particularly important when assessing the rates of small hospitals or small subsets of patients (e.g., care categories) within a hospital.

This report has two features to help hospitals guard against over-interpretation of results based on small volumes. First, A/E ratios are reported only for patient groupings that meet a minimum volume test, which is discussed in Section B.6.4. Second, for each A/E ratio that is reported, TMHP performed a statistical test of the likelihood that the actual rate observed would occur in a group of the same size and composition drawn at random from among Texas Medicaid inpatients in SFY 2012. This test is discussed in Section B.6.5.

B.6.2 Development of Expected Rates

Expected rates were based on the PPR experience of all Texas Medicaid patients in SFY 2012. Four important characteristics that are strongly correlated with the incidence of PPRs were taken into account:

- ***APR-DRG:*** The principal condition for which the patient was treated and important procedures performed, as categorized by the 3M software (see Section B.3.2).
- ***Severity of illness (SOI):*** A four-level scale based on all conditions for which the patient was treated, as categorized by the 3M software (see Section B.3.2).
- ***Age:*** Pediatric (18 and under) or adult (18 and over).
- ***MH/SA co-morbidity:*** For medical-surgical stays, whether or not the patient had a major mental health or substance abuse condition as a comorbidity. (A MH/SA comorbidity is not

strongly correlated with the PPR rate when the initial admission is MH/SA or obstetrics.)

For each combination of APR-DRG, severity of illness, and age, the actual statewide PPR rate was established as the norm, except for obstetrics, for which no distinction by age was made. The first three columns of Table B.6.2.1 illustrate these norms. The MH/SA comorbidity characteristic was accounted for as an adjustment to the norm for medical/surgical stays only (not MH/SA or obstetrics). Table 2.5.2 documents the MH/SA adjustment factors that were used.

Each initial admission was assigned an expected PPR rate, which is (i) the norm for the applicable APR-DRG, SOI, and age combination, times (ii) the applicable MH/SA adjustment factor. The expected rate for an individual initial admission represents the estimated probability that it would be followed by a PPR. For a group of initial admissions, the sum of these estimated probabilities is the expected number of readmission chains, and the average is the expected PPR rate. Table B.6.2.1 illustrates this process for a medical/surgical DRG, a mental health/substance abuse DRG, and an obstetric DRG.

Table B.6.2.1
Illustration of Norm Development and Calculation of Expected Values

Patient Characteristics			Norms		Estimated Probability of a PPR
APR-DRG	Age (Category)	MH/SA Co-morbidity?	Average Statewide PPR Rate	MH/SA Adjust. Factor	
420-2 Diabetes	Pediatric	No	10.0%	0.989	9.89%
420-2 Diabetes	Adult	No	14.3%	0.976	13.94%
420-2 Diabetes	Pediatric	Yes	10.0%	1.481	14.81%
420-2 Diabetes	Adult	Yes	20.0%	1.141	22.82%
751-1 Major Depression	Pediatric	N/A	10.0%	1.000	10.00%
751-1 Major Depression	Adult	N/A	13.3%	1.000	13.33%
540-1 Cesarean Section	N/A	N/A	1.5%	1.000	1.50%

Notes:

1. For medical/surgical APR-DRGs, the estimated probability of a PPR depends on the base APR-DRG, the severity of illness, patient age (pediatric vs. adult) and the presence orf absence of major mental health/substance abuse comorbidity as defined in the PPR algorithm.

2. For MH/SA stays, the estimated probability of a PPR depends on the base APR-DRG, the level of severity and the patient age.

3. For obstetric stays, the estimated probability of a PPR depends on the base APR-DRG and the severity of illness.

B.6.3 Comparing PPR Rates across Years

In general, it is inadvisable to compare PPR rates without adjusting for differences in casemix. This caution also applies to comparing PPR rates across time periods. Section 2.8 noted that the Texas Medicaid PPR rate was 3.704 percent in SFY 2010, 3.678 in SFY 2011, and 3.740 in SFY 2012. (Extra decimal places are shown for clarity.) In principle, this could have occurred because "real" PPR performance while casemix was unchanged, because casemix increased while "real" PPR performance was unchanged, or a combination changed of the two factors.

Table B.6.3.1 shows a simplified and hypothetical example of a factor decomposition between Year 1 and Year 2. In essence, each year's PPR rate is a weighted average of the individual PPR rates for every unique combination of four-digit APR-DRG, age group, and major MH/SA comorbidity. To control for changes in casemix, the number of stays in Year 2 for each unique combination of APR-DRG, age group, and MH/SA comorbidity is used as the weights for calculating PPR rates in both Year 1 and Year 2. Any change must therefore reflect only changes in "real" PPR performance and not changes in casemix.

This analytical technique was borrowed from the calculation of price indexes in economics.[29] Use of Year 2 weights is a Paasche index. Use of earlier year weights would be a Laspeyres index and would generate

a different result. In Section 2.8, a Paasche index was used to split the increase of 0.128 percentage points between SFY 2009 and SFY 2010 into a 0.034 percentage point increase representing "real" change in PPR rates and a 0.094 percentage point increase representing change in casemix. Strictly speaking, the two factors are multiplicative, not additive. This distinction can be safely ignored when the overall change is small. If a Laspeyres index had been used, the split would have been a 0.019 percentage point increase representing "real" change in PPR rates and a 0.110 percentage point increase representing casemix change. Under either approach, most of the year-to-year change in the PPR rate was due to casemix change. The change in the PPR rate between 3.678 in SFY 2011 and 3.740 in SFY 2012 was sufficiently small—0.062 percentage point in total—that factor decomposition was not performed.

Table B.6.3.1

Hypothetical Illustration of Using Index Values to Compare PPR Rates Across Time Periods

APR-DRG	Age Group	MH/SA Comorbid	A	B	C	D	E	F	G	H	I
			Year 1 Initial Admits	Year 1 Volume Weight	Year 1 PPR Rate	Year 1 Wt'd Average (B x C)	Year 2 Initial Admits	Year 2 Volume Weight	Year 2 PPR Rate	Year 2 Wt'd Average (F x G)	Year 1 PPR Rate x Year 2 Vol Wt (C x F)
420-2 Diabetes	Ped	No	5	0.0143	1.90%	0.000278	40	0.1212	0.50%	0.000609	0.002361
420-2 Diabetes	Adult	No	10	0.0286	5.00%	0.001433	35	0.1061	2.60%	0.002791	0.005319
420-2 Diabetes	Ped	Yes	15	0.0429	9.10%	0.003896	20	0.0606	0.00%	-	0.00551
420-2 Diabetes	Adult	Yes	20	0.0571	11.00%	0.006272	10	0.0303	5.70%	0.001732	0.003326
751-1 Maj Dep	Ped	Yes	100	0.2857	8.60%	0.024455	10	0.0303	7.80%	0.002363	0.002594
751-1 Maj Dep	Adult	Yes	150	0.4286	8.70%	0.037474	15	0.0455	11.40%	0.005178	0.003974
540-1 C-Section		No	50	0.1429	1.10%	0.001544	200	0.6061	1.20%	0.007433	0.00655
Total			350	1		0.075352	330	1		0.020106	0.029633
				Year 1 PPR Rate:		7.54%		Year 2 PPR rate:		2.01%	
											Year 1 PPR rate if casemix were the same in Year 1 as it was in Year 2: 2.96%

Explanation:

1. In this example, PPR rates in columns C and G are approximately realistic but volume numbers in columns A and E have been simplified and exaggerated to highlight differences.

2. The actual PPR rate drops sharply from 7.54% in Year 1 to 2.01% in Year 2.

3. However, there has been a sharp change in casemix. Year 1 has many fewer Major Depression stays but many more Diabetes and Cesarean Section stays. In general, the PPR rate for Major Depression is much higher than the PPR rate for Cesarean Section. So the question to be addressed is: how much of the change in the overall PPR rate is due to the change in casemix and how much is due to changes in PPR rates at the DRG level?

4. In Columns D and H, the overall PPR rate is the weighted average of the individual PPR rates, using the volumes of initial admissions to generate the weights.

5. Column I controls for changes in casemix by multiplying the Year 1 individual PPR rates by the Year 2 volume weights. The result is a weighted average of 2.96%.

6. The interpretation is as follows: After controlling for changes in casemix, the PPR rate decreased from 2.96% in Year 1 to 2.01% in Year 2.

7. As noted in the text, the actual effect of controlling for casemix change was much lower than in this hypothetical illustration.

B.6.4 Minimum Volume Test

For very low volumes, the A/E ratio is subject to large swings resulting from random events and should not be reported or tested for significance. Table B.6.4.1 shows several scenarios. The first case is a group of 40 admissions from the patients with a single combination of APR-DRG, severity of illness, and age combination where the statewide PPR rate is 5 percent. A chance difference of one readmission changes the A/E ratio by 50 percent, from 1.0 to 0.5 in the case of reduction or 1.0 to 1.5 in the case of an increase. There are no intermediate possibilities; it is impossible for this group to have an A/E ratio of 0.9 or 1.1.

The second and third examples show how the expected rate also can affect the degree of volatility in the A/E ratio. This is why the number of readmission chains is part of the minimum volume test. The fourth example shows a hospital whose volume just barely meets the minimum volume test. One more or one less PPR still has a noticeable impact on the hospital's A/E ratio, but the impact is less than in examples 1, 2, or 3. As the volume of initial admissions increases or as the expected or actual PPR rates increase, it is apparent that one more or one fewer PPR chain has less and less impact on the stability of the A/E ratio.

Since it is useful for a hospital to see its complete data, the hospital-specific reports show all stays. To discourage over-interpretation of the results, the report includes the A/E ratio only if (1) the group of stays had at least 40 initial admissions, (2) there were at least 5 actual readmission chains, and (3) there were at least 5 expected readmission chains. These levels follow precedents established by Maryland and Florida.

Table B.6.4.1
Scenarios Illustrating Fluctuation of A/E Ratio When Volume Is Low

Group Size	Expected		Actual		A/E Ratio
	Rate	# PPRs	# PPRs	PPR Rate	
Example 1: 40 initial admissions and an expected PPR rate of 5%					
40	5%	2	1	2.5%	0.5
			2	5.0%	1.0
			3	7.5%	1.5
Example 2: 50 initial admissions and an expected PPR rate of 2%					
50	2%	1	0	0.0%	0.0
			1	2.0%	1.0
			2	4.0%	2.0
Example 3: 50 initial admissions and an expected PPR rate of 5%					
50	8%	4	2	4.0%	0.5
			3	6.0%	0.8
			4	8.0%	1.0
			5	10.0%	1.3
			6	12.0%	1.5
Example 4: 100 initial admissions and an expected PPR rate of 5%					
100	5%	5	2	2.0%	0.4
			3	3.0%	0.6
			4	4.0%	0.8
			5	5.0%	1.0
			6	6.0%	1.2

B.6.5 Statistical Test of Significance

The significance of hospital-specific actual/expected rates was tested using the Cochran-Mantel-Haenszel (CMH) test of conditional independence.[30] The CMH statistic is an estimate of how likely it would be for a hospital's A/E ratio to be 1.00 in reality yet for the observed difference from 1.00 to be as wide as it is. Other things equal, the CMH statistic is higher when the number of stays is large and/or the observed A/E ratio is further away from 1.00. For the CMH statistics in this report, the thresholds are 2.7055 at the 90 percent confidence level and 3.8415 at the 95 percent confidence level. Because the study compares 226 hospitals using a 10 percent confidence level, 22 hospitals would be expected to show statistically significant differences from zero due simply to chance. (This is an example of the multiple comparisons issue in statistics.) A description of the application of the CMH test to indirectly standardized PPR rates can be found in the methodology documentation provided by the Florida Agency for Health Care Administration (reported at www.floridahealthfinder.gov).[31]

Notes

1 Results in this analysis were produced using data obtained through the use of proprietary computer software created, owned and licensed by the 3M Company. All copyrights in and to the 3M™ Software are owned by 3M.All rights reserved.

2 In 2010, net patient revenue (both inpatient and outpatient) for the Texas hospital industry was $49.9 billion. American Hospital Association, Hospital Statistics 2012 (Chicago: AHA, 2012), p. 137. The comparison of discharges takes into account the exclusion of normal newborns in the AHA definition of a discharge. Statewide data for 2012 would be similar to 2010.

3 Refer to Texas Health and Human Services Commission, *Hospital Services Handbook* (Austin: HHSC, 2011), p. HS-9.

4 "Newborns" were defined as all babies 0 to 7 days old on the date of admission as well as a subset of babies age 8 to 14 days old, that is, those with low birthweight who may still have had complications originating in the perinatal period. See Richard F. Averill, Norbert I. Goldfield, Jack Hughes et al., *3M™ APR DRG Classification System: Definitions Manual,* Version 28.0 (Wallingford, CT: 3M HIS, 2010), p. 26.

5 In a few cases, Medicaid acts as the primary payer when dually eligible clients exhaust or are ineligible for the Medicare inpatient hospital benefit. These stays are included in the analytical dataset used for this report.

6 Gerard F. Anderson and Earl P. Steinberg, "Hospital Readmissions in the Medicare Population," *New England Journal of Medicine,* 311:21 (Nov. 22, 1984), pp. 1349-1353.

7 Institute of Medicine, *To Err Is Human* (Washington, DC: IOM, 1999); Donald M. Berwick, *Escape Fire: Designs for the Future of Health Care* (San Francisco: Jossey Bass, 2004).

8 Guy L. Clifton, *Flatlined: Resuscitating American Medicine* (New Brunswick, NJ: Rutgers University Press, 2009), p. xi.

9 Section 1.4 is a summary of the PPR methodology developed by 3M Health Information Systems and used for this analysis. No changes were made to the methodology for this analysis. Detailed information about the methodology is available in the Richard F. Averill, Norbert I. Goldfield, Jack S. Hughes et al., *Potentially Preventable Readmissions Classification System Definitions Manual* (Wallingford, CT: 3M, October 2011). It is available to Texas hospitals that contact 3M at gmperfetto@mmm.com.

10 Much of the methodology presented in this section and Section 1.6 is based on the methodology used in Florida. Refer to the references above.

11 A minimum of five actual events and five expected events is a rule of thumb commonly used in analysis of categorical data. See Alan Agresti, *An Introduction to Categorical Data Analysis,* second edition (Hoboken, NJ: John Wiley & Sons, 2007), p. 40.

12 Agresti, Introduction to Categorical Data Analysis, pp. 114-15.

13 The $111.2 million figure is for PPRs that followed initial admissions in the 11-month period from September 2011 through July 2012. Annualized, the figure would be $121.3 million, or 3.5 percent of $3.5 billion from Table 1.1.1.

14 Stephen F. Jencks, Mark V. Williams and Eric A. Coleman, "Rehospitalizations among Patients in the

Medicare Fee-for-Service Program," *New England Journal of Medicine,* 360:14 (April 2, 2009), pp. 1418-1428.

15 Goldfield, N.I., McCullough, E.C., Huges, J.S., Tang, A.M., Eastman, B., Rawlins, L.K., Averill, R.F., "Identifying Potentially Preventable Readmissions," Health Care Financing Review. Vol 30. No1. pp. 75-91.

16 Agresti, Introduction to Categorical Data Analysis, p. 343.

17 "Major" is as defined in Appendix K of 3M Health Information Systems, *Potentially Preventable Readmissions Classification System Definitions Manual* (Wallingford, CT: 3M Health Information Systems, 2011).

18 Because the study includes multiple comparisons among hospitals, the reader should bear in mind that about 10% of the hospitals would show a statistically significant difference from 1.00 simply because of random variation. See Martin Bland, An Introduction to Medical Statistics, 3rd edition (New York: Oxford University Press, 2000), pp. 148-151.

19 During the development of the SFY 2012 PPR report, an error was discovered in the SFY 2011 statewide report which should be corrected. On page 31 of the SFY 2011 statewide PPR report, the correlation coefficient for all 226 hospitals was not 0.52 but rather 0.20. This error in the text of the report did not affect any hospital's A/E ratio calculation or the statewide PPR calculations.

20 Kevin Quinn and Connie Courts, *Sound Practices in Medicaid Payment for Hospital Care* (Hamilton, NJ: Center for Health Care Strategies, 2010).

21 Some definitions in this appendix are drawn from 3M Health Information Systems, *Potentially Preventable Readmissions Classification System: Definitions Manual* (Wallingford CT: 3M HIS, October 2011). All copyrights in and to the 3MTM Software are owned by 3M. All rights reserved.

22 This exclusion was also in effect for the SFY 2010, SFY 2011, and SFY 2012 analyses.

23 Strictly speaking, the bill type field comprises four digits, including a leading zero. TMHP follows convention in referring only to the three meaningful digits. Refer to Ingenix Inc., *Uniform Billing Editor* (Salt Lake City, UT: Ingenix, August 2010), pp. II-12 to II-109.

24 The figure includes all patients (including Medicare, Medicaid, commercial payers and uninsured) but excludes newborn days. AHA, *Hospital Statistics,* p. 137.

25 Using the full APR-DRG—base DRG plus the severity of illness—would be circular reasoning. Assignment of the severity of illness depends in part on the number of secondary diagnoses on a claim. The principal diagnosis, by contrast, must be present on every claim. An operating room procedure would also be important to be coded on any claim.

26 This analytic technique is known as indirect rate standardization. See Goldfield et al., "Identifying Potentially Preventable Readmissions," p. 78.

27 Quinn, "New Directions"; Quinn and Courts, Sound Practices, pp. 6-7.

28 For more information on the Florida analysis, refer to Goldfield et al., "Identifying Potentially Preventable Readmissions."

29 Roger Porkess, *The HarperCollins Dictionary of Statistics* (New York: HarperCollins, 1991), pp.111-114.

30 Agresti, Categorical Data Analysis.

31 Refer to www.floridahealthfinder.gov/Researchers/Reference/Methodology/Methodology.aspx#hreadmit.