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QUALITY OF CARE IN PM-JAY: A First Look at Unplanned Readmissions and Mortality

PM-JAY POLICY BRIEF 7

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Background

A major objective of health insurance schemes around the world is to improve quality of care. Using payment policies, regulation, and rich information systems, there are enormous opportunities for purchasing agencies to make a substantial impact in this area. This potential can embrace all three aspects of quality – structure (e.g., trained staff, equipment, guidelines), process (e.g., investigation, treatment), and outcomes (e.g., morbidity and mortality).

As PM-JAY approaches its second anniversary and its major policies and systems begin to stabilize, the quality agenda is growing in importance. Basic building blocks – such as infrastructure requirements for empanelment and standard treatment guidelines – are already in place or under further development. At the national and state level, efforts are underway to scale up medical audits based on claims data and/or field visits. A quality framework and a list of quality of care indicators has been developed.

Among the most common metrics of quality in the hospital setting is unplanned readmissions. They have been a focus of health researchers and policy makers since the 1970s. In the United States, the Center for Medicare and Medicaid Services (CMS) factors in excess hospital readmissions in payments made to hospitals. In the case of surgical patients, readmission may be the result of complications during surgery or post-operative care. For medical patients, they may arise from conditions related to the original diagnosis. Readmissions typically impose a heavy burden on patients and their families and on health systems in general as a result of unnecessary care. In brief, they are common, costly, and often avoidable.

Highlights

- This brief presents the first estimates of two common quality of care indicators – readmission rates and hospital mortality – under PM-JAY.
- Approximately 1 in 20 patients in PM-JAY is readmitted to a hospital within 30 days of discharge, and 1 in 50 is readmitted within 7 days.
- Readmission rates vary widely across states, ranging from just over 1 percent in Arunachal Pradesh and Karnataka to over 11 percent in Kerala. The rates are higher for males and increase with patient age.
- Readmission rates also vary widely across specialties and procedures. Medical packages have significantly higher rates than surgical packages. Readmission rates are slightly higher in private hospitals than in public hospitals. National Health Care Providers (NHCPs) have the lowest readmission rates.
- In addition to the impact on the health and well-being of patients and families, readmissions also impose a financial burden, some of which could be avoidable. The estimated cost of readmissions to PM-JAY is between 3.4 and 4.9 percent of total spending. Policies to improve quality of care could improve health outcomes and reduce spending.
- A first look at in-hospital mortality data finds that 0.58 percent of PM-JAY patients died since the launch of the scheme in September 2018. While patients who died were on average older and sicker, variation in mortality rates across states and hospital type points to additional areas to improve quality of care.

Box 1: METHODOLOGY

This brief is based on a quantitative analysis of 59.6 lakh claims covering 36.8 lakh beneficiaries. To arrive at an appropriate denominator for measuring unplanned admission rates, several data adjustments were required as described in the main text.

Time period: From launch of the scheme on September 23, 2018 to November 30, 2019. In order to calculate 30-day readmission rates, all claims up to October 31, 2019 were analyzed.

Data sources: NHA's Transaction Management System (TMS). Not all states are presently integrated in the TMS (e.g., Rajasthan) and only certain hospitals within some states are integrated (e.g., Gujarat).

Definition of PM-JAY population: All families with INR 5 lakh coverage. This includes those covered by PM-JAY (co-financed by the Government of India and states) and all additional "extension" families fully funded by states under their own expanded coverage initiatives.

Limitations: TMS data does not have information on diagnosis, and procedure codes are not standardized. Mortality data is limited to in-hospital events, as post-discharge information is not collected.

This policy brief offers a first insight into hospital readmission rates and in-hospital mortality rates under PM-JAY. It develops a methodology tailored to PM-JAY claims data to estimate overall readmission rates, and explores variation across states, demographic groups, hospital type, specialties, and procedures. It also analyzes other characteristics of readmission and provides an estimate of how much readmissions cost the scheme. Lastly, it provides some initial insights into in-hospital mortality under PM-JAY.

Key Findings and Implications

What is PM-JAY's readmission rate? The importance of careful measurement

The major data challenge in estimating readmission rates in PM-JAY is to separate "unplanned" readmissions from others. Structured processes such as chemotherapy and dialysis require regular visits, while others may need a diagnostic service followed by a surgical intervention. Including such visits will overstate readmission rates. In addition, patients requiring multiple procedures in PM-JAY are sometimes recorded as separate pre-authorizations during the same admission. Careful exclusion of such instances is crucial to obtain meaningful estimates of readmission rates.

To restrict the claims data to eligible cases, two independent panels of experts exhaustively reviewed the list of procedures under PM-JAY to identify those that are prone to readmissions by design. Of the 5,479 PM-JAY and state procedures utilized through November 2019, a total of 1,245 (22.7 percent) were identified as excludable from the readmission analysis. In four specialties – Medical Oncology, Radiation Oncology, Mental Disorders, and Surgical Oncology – all procedures were deemed "readmission prone" and excluded from the analysis. Other specialties such as Pediatric Cancers, Oral and Maxillofacial Surgery and Ophthalmology also had large fractions of excludable procedures. One specific procedure, Hemodialysis, which belongs to both General Medicine and General Surgery specialties, accounted for 36.9 percent of all excludable data (15.6 percent of all data). This exercise resulted in 43.2 percent of all admissions (associated with 24.7 percent of the beneficiaries) being excluded from the analysis. A smaller fraction of the data was excluded due to missing or erroneous discharge dates (7.2 percent) and multiple pre-authorizations (1.8 percent). The final data set for analysis contains 50.4 percent of all observations, belonging to 73.6 percent of the beneficiaries. Table 1 provides details of the data construction process.

The importance of careful construction of data cannot be understated. Estimated from the full data set, the "crude" 7-day and 30-day readmission rate would be 23.8 percent and 31.7 percent, respectively (Table 2). Removing the excludable procedures lowers this to 7.1 percent and 10.6 percent. The removal of cases with multiple pre-authorizations provides the most accurate estimate, yielding a 7-day readmission rate of 2.2 percent and a 30-day readmission rate of 5.1 percent. Although not directly comparable, the all-cause 30-day hospital readmission rate in the United States was 8.6 percent in 2012.[1]

1. America's Health Rankings analysis of The Dartmouth Atlas of Health Care, United Health Foundation, Americas Health Rankings. org. Accessed May 2020.

Table 1: Preparation of data for the analysis of readmission rates

Criteria	Cases	
	Number	Percentage
Base data set (through October 2019)	**55,55,416**	**100%**
Excludable procedures	**24,01,550**	**43.2%**
Procedures prone to readmissions	23,10,339	41.6%
Procedures in unspecified category	51,660	0.9%
Based on keyword search	4,48,294	8.1%
Missing discharge date	**4,01,667**	**7.2%**
Cases with multiple pre-authorizations and errors in admission or discharge date	**1,00,333**	**1.8%**
Final data set	**27,97,902**	**50.4%**

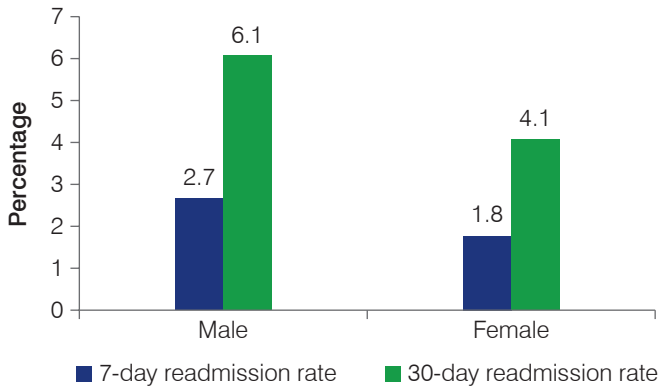
Note: The reasons for excluding a case from analysis are not mutually exclusive. Therefore, the total number of cases used in analysis is greater than the arithmetic sum of the total number of affected cases by each exclusion criteria.

Table 2: Readmission rate: Careful preparation of data is very important

Type of readmission rate	Data used	7-day readmission rate (%)	30-day readmission rate (%)
Crude	Full data set	23.8	31.7
Intermediate	Removes excludable packages	7.1	10.6
Final	Removes excludable packages, cases with multiple pre-authorizations, cases with errors in dates	2.2	5.1

The national 30-day readmission rate has been relatively stable since the start of the scheme, with the monthly rate hovering between 4.4 percent and 5.5 percent. Readmission rates are significantly higher for men than for women. While 6.1 percent of men are readmitted within 30 days, the comparable rate among women is only 4.1 percent (Figure 1). Readmission rates are higher among children, lowest for those aged 20 to 25, and then increase gradually with age. These age patterns are consistent with health care utilization patterns and population health needs.

Figure 1: Men have higher readmission rates



Readmission rates vary widely by state, specialty, procedure, and hospital type

There is significant variation in readmission rates at the state level (Figure 2). At the upper end, Kerala has a 30-day readmission rate of 11.3 percent and Gujarat has a rate of 7.8 percent. At the lower end, Bihar, Karnataka and Arunachal Pradesh have 30-day readmission rates that are below 2 percent. There is no apparent regional pattern of readmissions among states. For example, Andhra Pradesh and Karnataka have readmission rates that are much lower than in neighboring Kerala and Tamil Nadu.

The variation in readmission rates across states in part reflects the variation in patient and case mix that seeks care in each state. States with higher readmission rates tend to have patients that are older and have a larger share of male patients, two factors which are predictors of readmissions (Figure 3 and Figure 4). States such as Gujarat also have a higher utilization rate of Cardiology packages. Other factors might also play a role, such as differences in infrastructure, population health literacy and access to care. Understanding the drivers of this heterogeneity in readmission rates across states is a promising area for future research.

Overall 30-day readmission rates are higher for medical procedures than surgical procedures, at 8.4 and 3.2 percent respectively. In general, poor diagnosis and resolution of the original condition are the most

Figure 2: Readmission rates vary widely across states

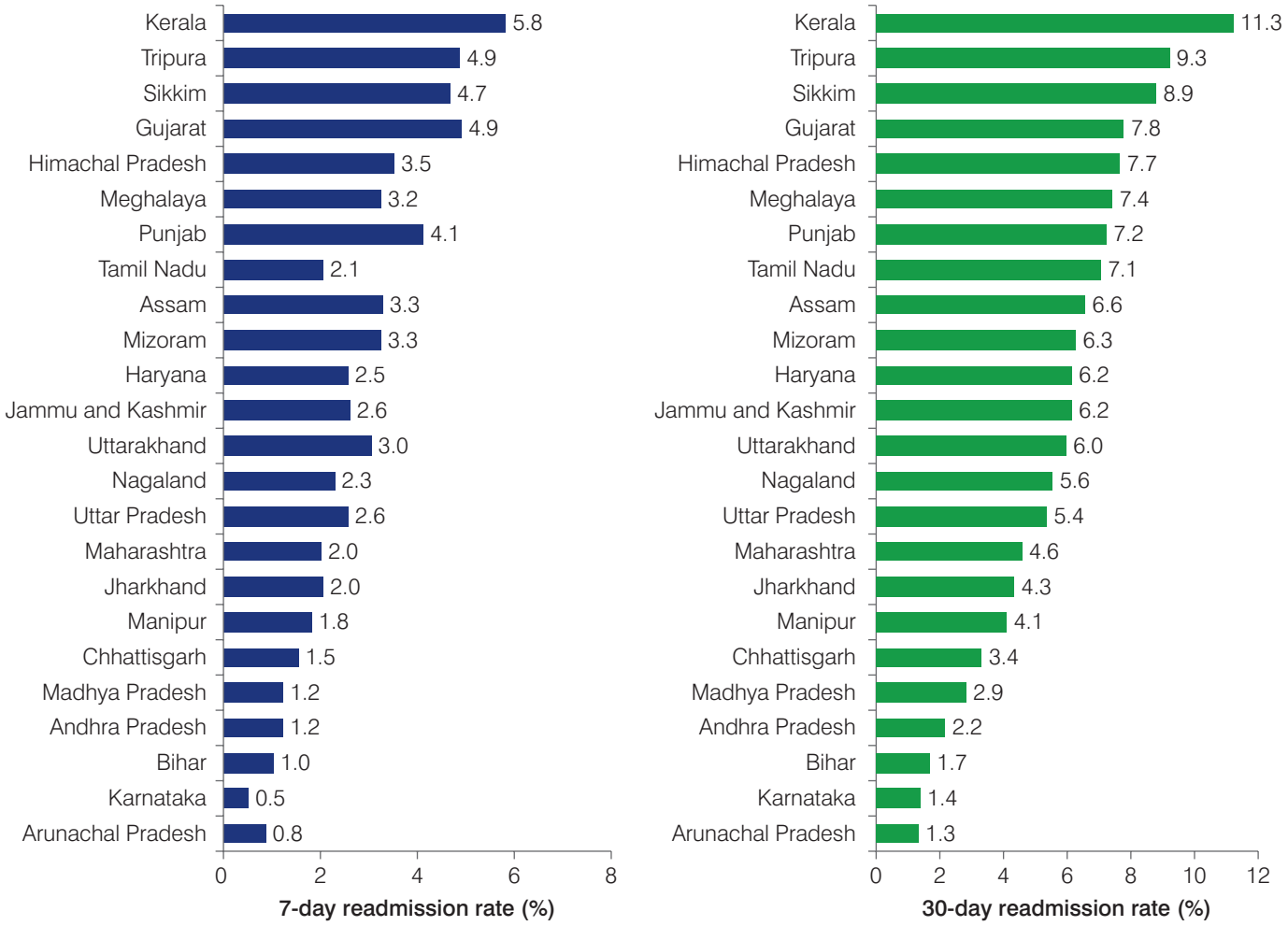


Figure 3: Readmission rates are correlated with patient age

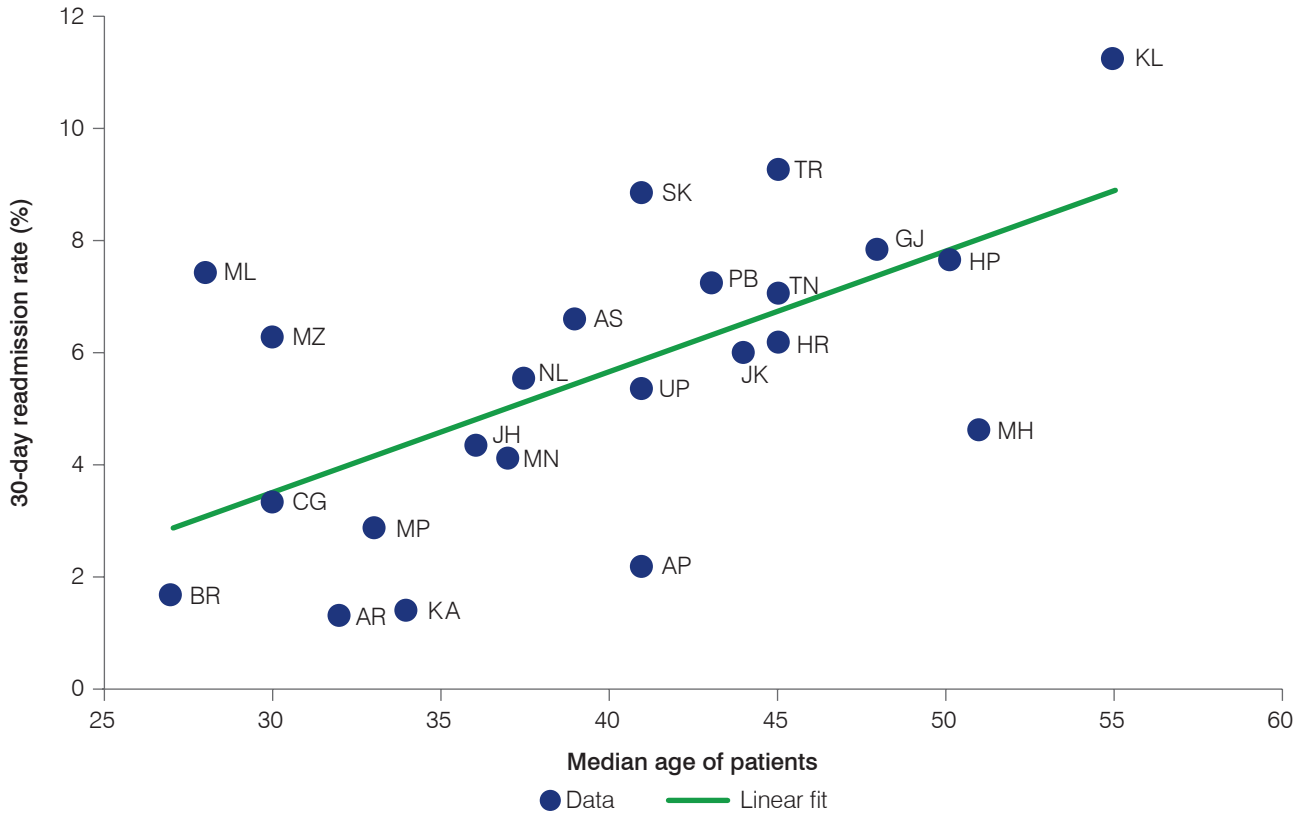
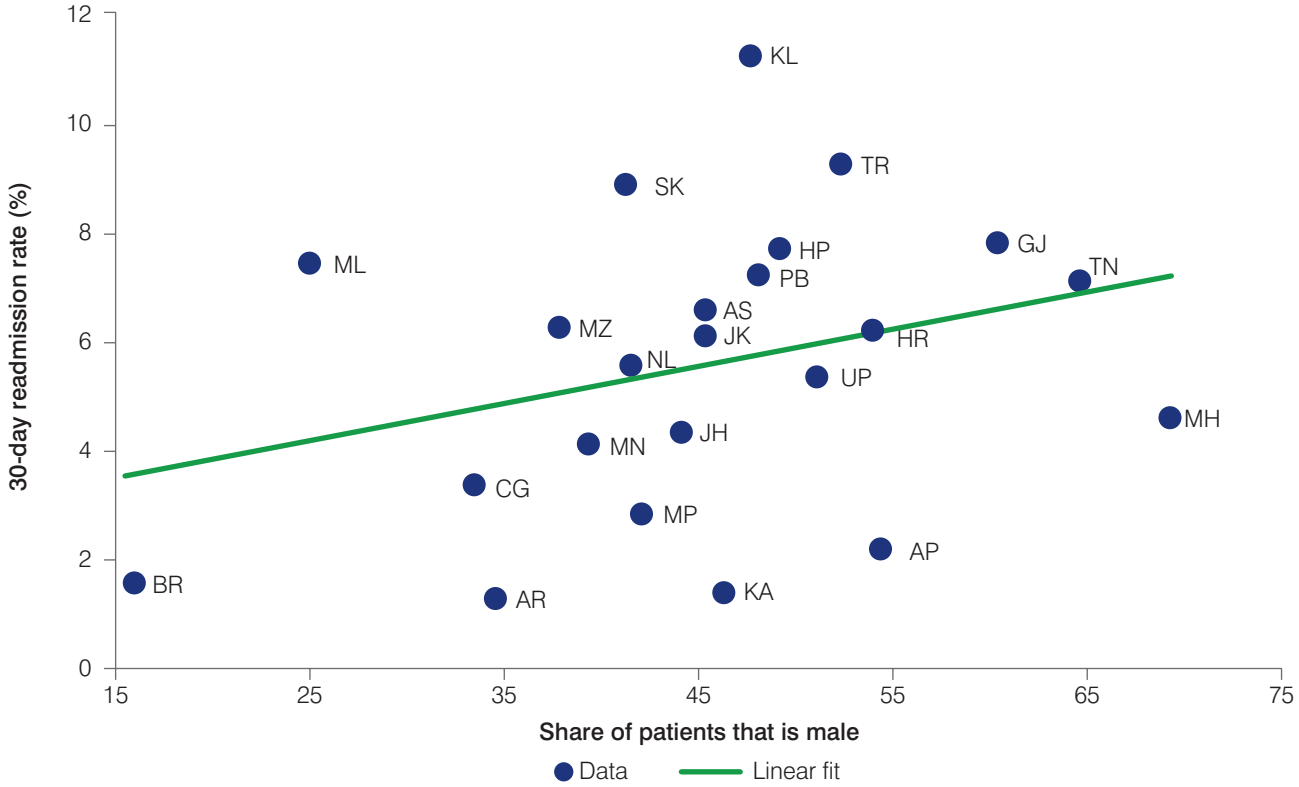
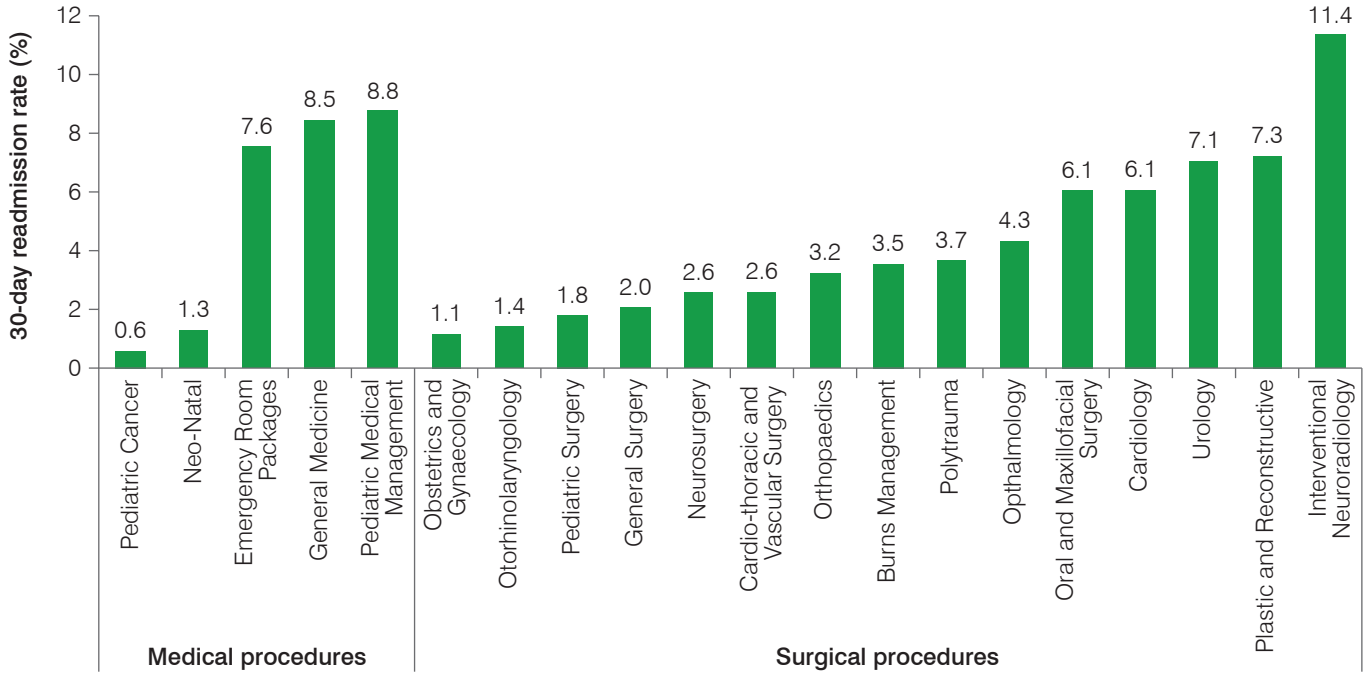


Figure 4: Readmission rates are correlated with the share of male patients



common causes of readmissions in medical cases. In surgical cases, complications during surgery or post-operative care are the main drivers. Among medical specialties, General Medicine and Pediatric Medical Management have the highest observed readmission rates. Given that General Medicine alone accounts for 28 percent of total PM-JAY claim volume, a high readmission rate for this specialty is notable. Among surgical procedures, Interventional Neuroradiology has a 30-day readmission rate of 11.4 percent, although these procedures account for less than 0.1 percent of utilization. Among surgical procedures, Obstetrics and Gynaecology account for the largest claim volume but they have the lowest readmission rates (Figure 5). Within General Medicine, the biggest contributor is the single

Figure 5: Interventional Neuroradiology and Pediatric Medical Management are the specialties with the highest readmission rates



generic procedure that leaves significant discretion to the physician/hospital (Table 3). These patterns warrant further investigation to understand causes of readmissions and improve quality of care.

A closer look at the procedures that contribute the most to readmissions can also help narrow the focus for addressing the issue. In addition to General Medicine packages, some commonly occurring and easily treatable conditions such as Acute Febrile Illnesses and Severe Anemia contribute more than 2 percent of all readmission cases (Table 3). In fact, 20 procedures contribute to 50 percent of the readmission cases. The top contributing procedure also varies widely by state. In the high readmission state of Kerala, the main contributing procedure is General Medicine, which accounts for 51.2 percent of all readmissions in the state. In Gujarat, Coronary Angiogram (CAG) contributes 38.5 percent of all readmissions. Respiratory illness such as acute exacerbation of COPD, respiratory failures and pneumonia are the key contributing procedures in Himachal Pradesh, Jammu and Kashmir, Mizoram and Uttarakhand.

Readmission rates are marginally higher in private hospitals than public hospitals. The 30-day readmission rate in private hospitals is 5.2 percent compared to 5.0 percent in public hospitals (Figure 6). Similarly, 7-day readmission rates are 2.5 percent and 2.1 percent, respectively. National Health Care Providers (NHCPs, which are 38 national institutes of excellence empaneled directly by the National Health Authority) have the lowest 30-day and 7-day readmission rates, 3.6 percent and 1.3 percent respectively. While these differences could arise due to different incentive structures in private and public hospitals, they could also reflect differences in quality of care or differences in patient and case mix. If private hospitals tend to perform more complex procedures that are prone to readmissions, incentives alone are an insufficient explanation. Disentangling quality issues from incentive issues is another fruitful area for future research.

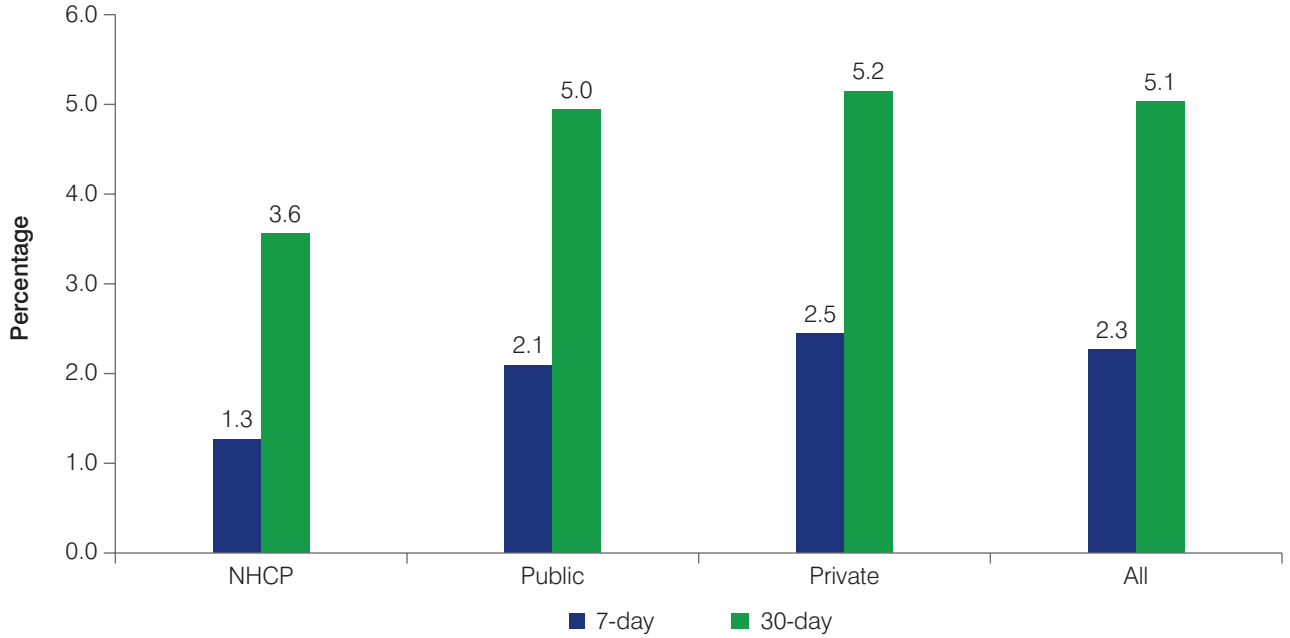
A closer look at readmission patterns

To further explore the role of quality versus incentives, it is helpful to look at the correlation between readmissions rates and both length of stay and claim amounts from the original admission. If quality of care received is higher for patients that are admitted for a

Table 3: Top 20 procedures contributing to readmissions

Procedure name	Share of readmissions (%)	30-day readmission rate (%)
General Medicine - admission per the decision of the treating doctor	16.8	14.3
Global developmental delay/ Intellectual disability of unknown etiology	3.0	79.9
Acute Febrile Illness	2.6	4.5
Management of acute MI with angiogram	2.4	23.4
Severe Anemia	2.3	9.4
Enteric fever	2.3	3.6
Management chronic Hepatitis B/C - Entecavir	2.0	49.6
Acute gastroenteritis with moderate dehydration	2.0	4.5
Management chronic Hepatitis B/C - Tenofovir	1.9	53.7
Intermittent peritoneal dialysis	1.7	94.4
Acute exacerbation of COPD	1.7	11.1
Medical treatment of acute MI with thrombolysis	1.7	14.9
Ureteroscopy, stone removal with Lithotripsy	1.6	23.7
Urinary Tract Infections	1.5	8.1
General Ward - unspecified	1.4	8.9
Pyrexia of unknown origin	1.3	4.8
PTCA - single stent (medicated, inclusive of diagnostic angiogram)	1.3	2.5
CAG (coronary angiography)	1.1	23.6
DJ stent unilateral including cystoscopy, ureteric catheterization, retrograde pyelogram	1.1	11.2
Acute exacerbation of COPD	1.0	11.0

Figure 6: Readmission rates are marginally higher at private hospitals



longer period (for example, due to better post-operative care), there would be a negative correlation between stay length and readmission rates. At the same time, if incentives also affect readmission rates, one would expect to find a negative correlation between the initial claim amount and readmission rates. Figure 7 and Figure 8 plot the deciles of stay length and claim amount on the horizontal axis and 30-day readmission rates on the vertical axis. They offer evidence in support of both hypotheses. Readmission rates are higher for shorter original hospital stays and lower original claim size and tend to decrease as stay length and claim amounts increase.

Patients are most commonly readmitted to the same specialty and the same hospital. For medical patients, 79 percent of readmissions are for subsequent medical cases, and for surgical patients, 69 percent of readmissions are for surgical cases. Although readmission rates vary by specialty, overall, 72 percent of patients are readmitted in the same specialty. This rate varies by specialty. For cases where the original specialty is General Medicine, 75 percent of readmissions are to General Medicine itself. For Urology, this figure is 84 percent.

It is possible that readmissions arise from complications in the original treatment which may

Figure 7: Readmission rates are lower for patients who had longer original hospital stays

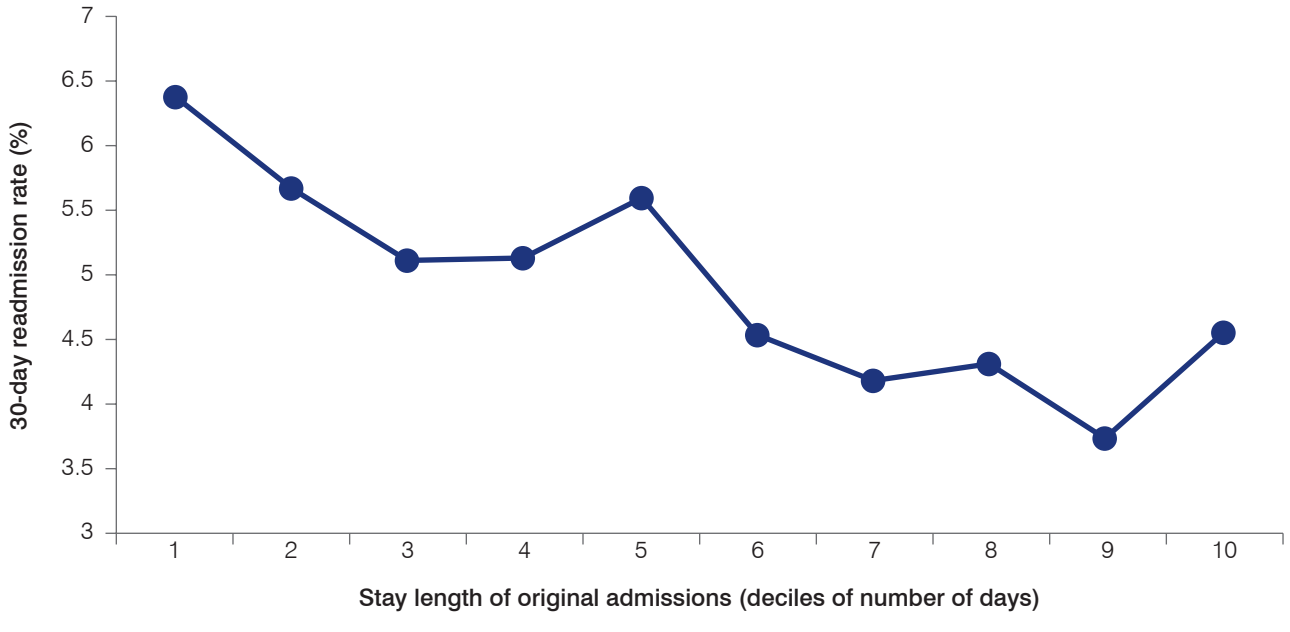
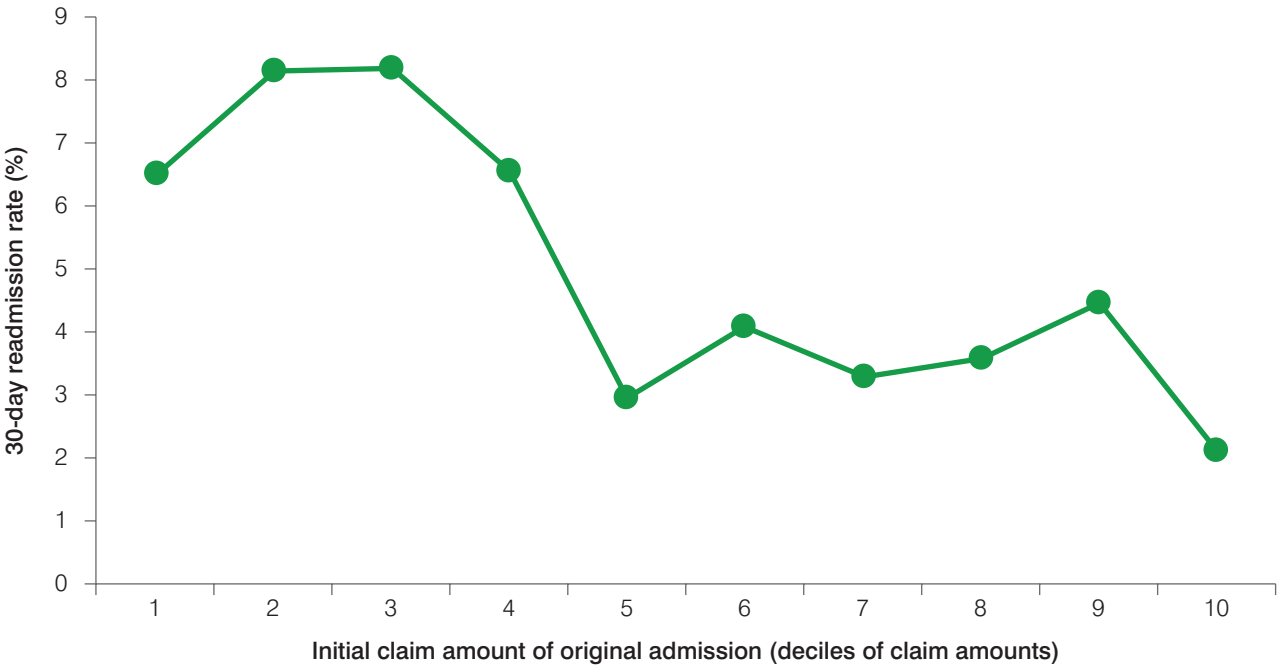


Figure 8: Readmission rates are lower for patients with higher original claim amounts



require referral to higher level hospitals. They could also reflect patient preference to switch from one sector to another following complications, for example, from public to private. Nevertheless, analysis shows that 70 percent of patients who are readmitted do so at the same hospital where they initially received treatment. This switching is somewhat higher for the public sector than the private sector. Public sector patients get readmitted to the same hospital 64 percent of the time versus 70 percent for private hospitals. However, there is relatively low switching across public and private sectors. In instances where the original admission is to a public hospital, 68 percent of readmission cases are back to public hospitals. In cases where the original admission is to a private hospital, 70 percent of readmissions are back to private hospitals.

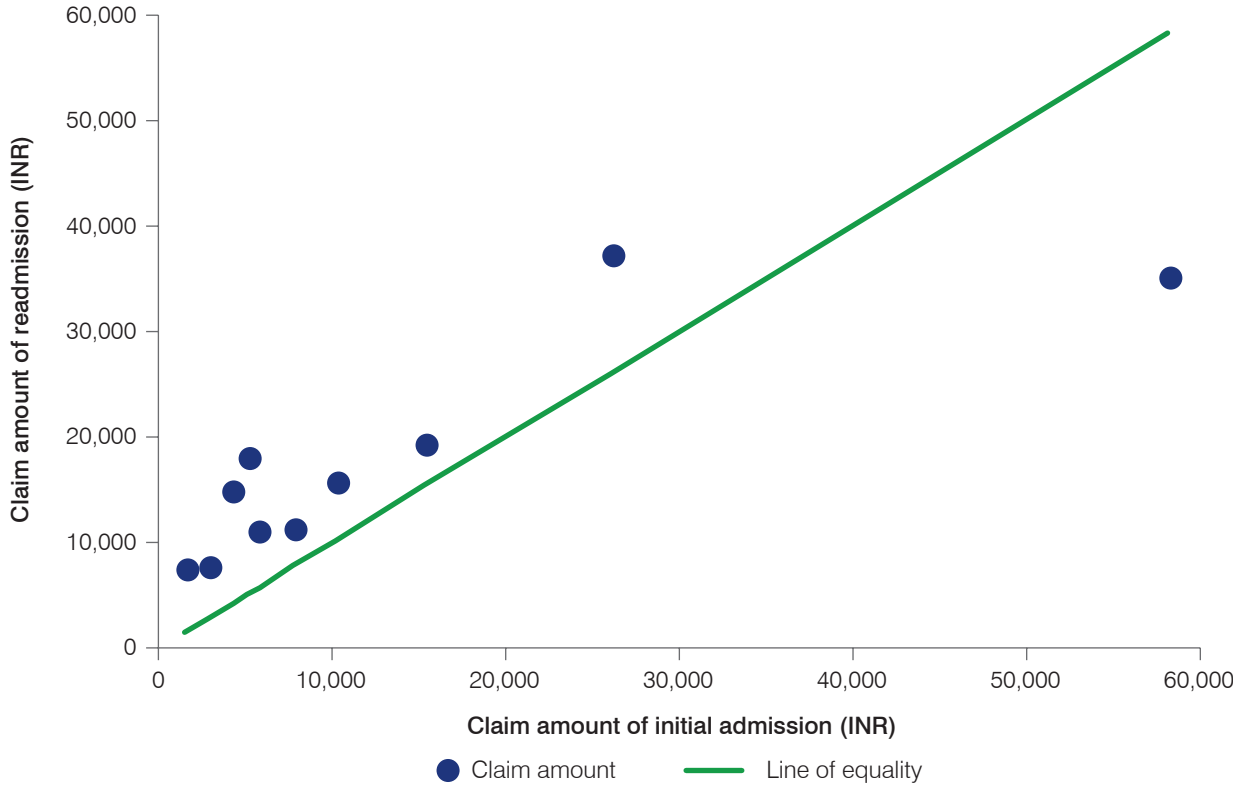
Readmissions impose additional costs on PM-JAY

A final lens is to look at the additional costs imposed on PM-JAY by readmissions. Such estimates should be interpreted with caution for several reasons. First, while the analysis is careful to exclude procedures that are prone to readmissions (either by design or due to the nature of the health condition), it is unable to distinguish those readmissions arising out of unrelated events (for example, angiogram followed by a hip surgery). Second, the estimates do not imply that reducing the readmission rate to zero would reduce PM-JAY outlays by the same amount. Even among highly developed health systems, some readmissions are inevitable. Finally, and most importantly, even if readmissions were (hypothetically) reduced to zero, the cost associated with these cases are unlikely to be entirely eliminated since (revenue maximizing) hospitals may resort to increasing the average length of stay or providing more intensive care (e.g., bundling procedures).

With these caveats in order, the 5.1 percent 30-day readmission rate as estimated above accounted for a total outlay of INR 245 crores during the period from scheme launch until November 30th, 2019. This represents 4.9 percent of the total INR 5,044 crores spent on the eligible cases (i.e., removing excludable cases as described above) and 3.4 percent of the total PM-JAY outlays of INR 7,313 crores (i.e., for all 59.6 lakh claims).

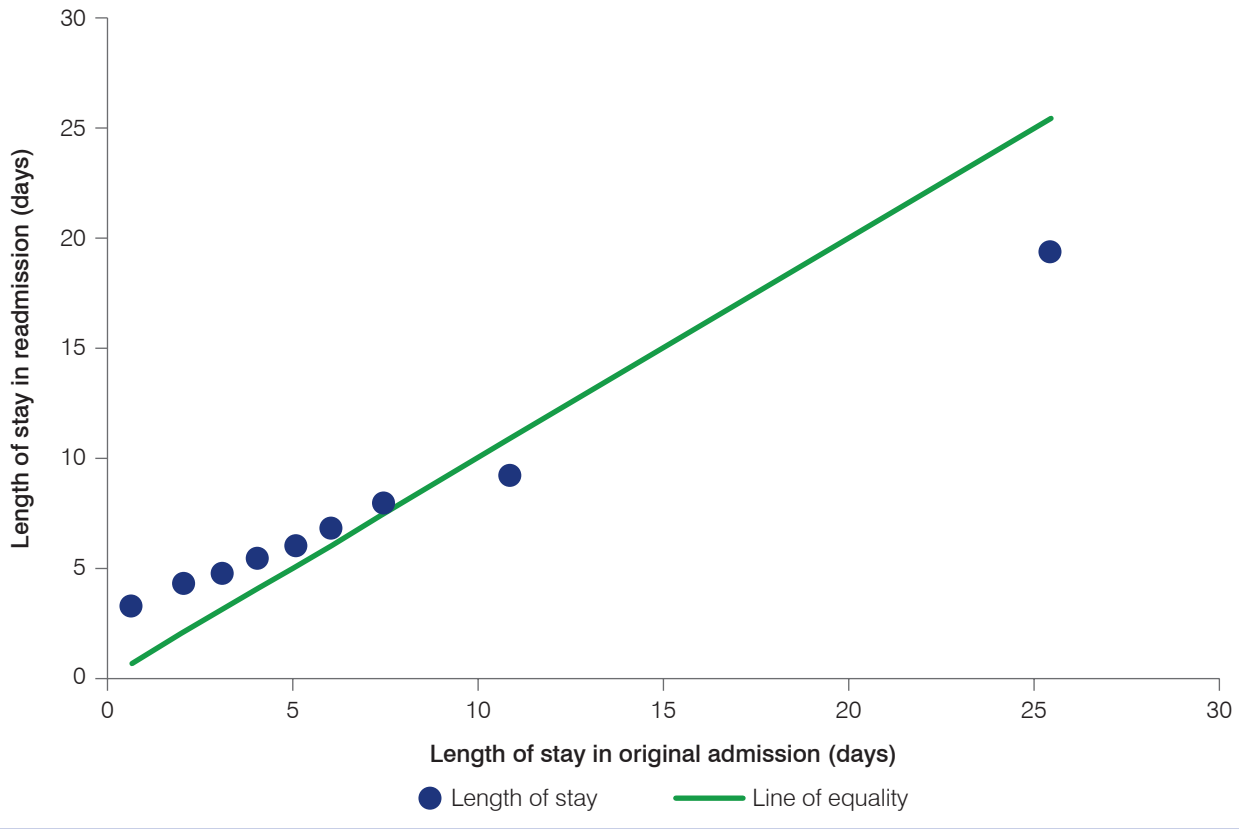
It is also worth noting that readmission cases are costlier on average than the original admissions. To see this, binned average values of claim amount (Figure 9) and stay length (Figure 10) of original admissions are plotted on the horizontal axis and the corresponding average values for the readmission cases for the same bins are shown on the vertical axis. The average claim amount in a readmission case is INR 19,295 compared to INR 12,652 in the corresponding original case. The average length of stay is also higher in the readmission, 7.5 days versus 6.6 days. At the lower end of the distributions, length of stays and claim amounts are higher for the readmission cases than the original cases, while they are lower at the upper end of the distributions. These patterns suggest that in some instances there may be potential to lower readmission rates by increasing the average length of stay.

Figure 9: Readmission cases produce a higher claim amount than the original admission



Note: The horizontal axis represents the claim amount of initial admission. This variable is binned into 10 groups (deciles) for illustrative purposes. The vertical axis represents the claim amount from the readmission. The scatter dots represent average claim amounts of readmission and initial admission for each bin of original admission.

Figure 10: Readmission cases generate a longer hospital stay than the original admission



Note: The horizontal axis represents the length of stay in the initial admission. This variable is binned into 10 groups (deciles) for illustrative purposes. The vertical axis represents the length of stay in readmission. The scatter dots represent average stay lengths of readmission and initial admission for each bin of original admission.

A first look at in-hospital mortality rates

Another widely used metric of quality of care is the mortality rate, specifically, mortality within 30 days of discharge from hospital. This is because deaths beyond this time period may have less to do with the care provided in hospitals and more to do with other complicating illnesses, patient behavior, and other post-discharge care. Unfortunately, PM-JAY data records mortality only when such events occur in hospitals and the data does not allow for estimation of 30-day mortality. Thus, the mortality rate that is estimated here is "in-hospital" mortality.

Since the launch of PM-JAY, 0.58 percent of patients (21,058 out of 36.8 lakh) died during hospitalization (Table 4). The patients who died were older (52.2 years versus 42.2 years for the average patient) and they were more likely to be male (59 percent versus 48 percent). Along the expected lines, they also appeared to be sicker, since on average, patients who died had 1.93 hospital admissions compared to 1.56 for the average patient. During the admission when death occurred, the number of procedures completed was also higher, 1.97 versus 1.63.

Looking across specialty and procedures, one-quarter of deaths occurred in one General Medicine procedure, which is also the most used procedure (Table 5). Respiratory failures account for 5.9 percent

Table 4: Mortality in hospitals in PM-JAY

	All patients	Patients who died in hospital
Number of beneficiaries	36,82,723	21,058
Average age	42.2	52.2
Percentage that is male	0.48	0.59
Number of hospital admissions	1.56	1.93
Number of procedures done	1.63	1.97

Table 5: Leading "causes" of in-hospital mortality

Procedure name	Share of all deaths (%)	Death rate (%)
General Medicine - admission per the decision of the treating doctor	25.0	3.3
Respiratory failure due to any cause (pneumonia, asthma, COPD, foreign body, head injury etc.)	5.9	6.4
Cerebrovascular accident	4.2	4.5
AKI/ renal failure	3.0	6.6
Critical care neonatal package: babies with birthweight of <1200g	2.5	5.2
Severe sepsis/ septic shock	2.3	6.0
Congestive Heart Failure	2.3	3.6
Acute exacerbation of COPD	2.2	2.4
Intensive neonatal care package: Babies with birthweight 1500-1799g	2.0	2.3
Advanced neonatal care package	1.9	4.9
Hemodialysis per sitting	1.6	0.9
Acute exacerbation of COPD	1.3	2.4
General ward (unspecified)	1.3	1.2
Severe anemia	1.2	0.8
Total Body Surface Area Burns (TBSA): >60%	1.1	40.2
Acute febrile illness	1.0	0.3
Pneumonia	1.0	1.6
Hematoma - Brain/head injuries	0.9	9.6
High end radiological diagnostic (CT, MRI, nuclear imaging)	0.9	2.2
PTCA - single stent	0.8	0.2

Table 6: Mortality rate by specialty and hospital type

Specialty	Death rate (%)	
	Public	Private
Burns Management	5.02	4.66
Cardio-thoracic	0.88	0.56
Cardiology	0.57	0.18
Emergency Room Packages	0.06	0.60
General Medicine	1.46	1.55
General Surgery	0.43	0.18
Interventional Neuroradiology	0.58	0.13
Neo-Natal	0.61	3.84
Neurosurgery	2.46	0.68
Obstetrics and Gynaecology	0.02	0.08
Ophthalmology	0.02	0.01
Oral and Maxillofacial Procedures	0.00	0.02
Orthopedics	0.15	0.07
Otorhinolaryngology	0.03	0.00
Pediatric Medical Management	0.33	1.35
Pediatric Surgery	0.76	0.12
Plastic and Reconstructive	0.38	0.24
Polytrauma	0.25	0.27
Surgical Oncology	0.35	0.28
Urology	0.19	0.03
Total	**0.70**	**0.50**

of all deaths that have occurred under PM-JAY so far, and the mortality rate within this procedure is also high at 6.4 percent. Two other procedures relating to acute exacerbation of COPD are also among the top 20 packages contributing to mortality. Since mortality for such conditions could be avoidable, a detailed look at the specific cases leading to mortality would be warranted.

Finally, the mortality rate also varies by hospital type and by specialty. The overall mortality rate is 0.70 percent in public hospitals and 0.50 percent in private hospitals (Table 6). In a comparison of mortality across public and private hospitals, two findings stand out. First, the mortality rate for neo-natal procedures is much higher in private hospitals than in public hospitals, 3.84 percent and 0.61 percent respectively. Second, the pattern of mortality for neurosurgery cases is reversed – the death rate is 0.68 percent in private hospitals versus 2.46 percent in public hospitals. While the observed patterns on the surface are a cause of concern and may reflect differences in quality of care in specific areas, they could also reflect differential patient- and case-mix. This issue may warrant further study.

Summary

This brief presents the first estimates of two important quality of care metrics – readmission rates and hospital mortality – under PM-JAY. There is significant variation in both indicators across states, specialties, and procedures, offering insights into how and where to achieve improved performance. Importantly, the exercise also shed light on ways to improve data collection and data quality to help advance the quality of care measurement agenda under PM-JAY. In the longer term, interventions to link quality with payment – an increasingly common feature of mature insurance programs worldwide – may also be considered.

References

1. America's Health Rankings analysis of The Dartmouth Atlas of Health Care, United Health Foundation, AmericasHealthRankings.org. Accessed May 2020.

Disclaimer

The findings, interpretations, and conclusions expressed in the policy brief are entirely those of the authors, and do not represent the views of any author's employer, official policy or position of any agency of the National Health Authority (NHA). The PM-JAY data used in the analysis should not be utilized/quoted without prior permission of NHA.

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List of PM-JAY Policy Briefs Published so far

1. **Raising the Bar:** Analysis of PM-JAY High-Value Claims (July 2019).
2. **PM-JAY Across India's States:** Need and Utilization (September 2019).
3. **PM-JAY and India's Aspirational Districts** (September 2019).
4. **Supply Side Response to Insurance Expansion:** Evidence from RSBY/MSBY in Chhattisgarh (October 2019).
5. **PM-JAY Without Borders:** Analysis of Portability Services (February 2020).
6. **Empowering Government Hospitals:** The Potential of Insurance (May 2020).
7. **Quality of Care in PM-JAY:** A First Look at Unplanned Readmissions and Mortality (May 2020).