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# Medical Payment Series: The Rise of the DRG Payment Model

Guanjun Jiang, FCAS
Qiuwen Peng, FSA, CERA

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As in many other countries, China's healthcare expenditures are increasing, with the imbalance between social health insurance revenues and expenditures continuing to intensify. Some social health insurance pooling regions require subsidies from local governments to operate because their insurance revenues cannot meet their expenditures.

The government has been actively promoting the structural reform of the healthcare system, establishing the National Health Commission (NHC) and the National Healthcare Security Administration (NHSA) in 2018. Healthcare payments that were formerly managed by multiple different entities (the National Development and Reform Commission, the Ministry of Human Resources and Social Security, the Ministry of Health, and the Ministry of Civil Affairs) are now managed solely by the NHSA. The reform to healthcare payments is expected to move ahead quickly at the behest of the State Council, from the current fee-for-service model to actively piloting the implementation of multiple social health insurance payment model types. In an announcement entitled "Notice Regarding Applications for Diagnosis-Related Group Payment National Pilot Program" released on December 20, 2018 the NHSA indicated that it would be developing a diagnosis-related group (DRG) standard suited to the country's healthcare system and social health insurance management capabilities, and would be accelerating the DRG pilot programs in selected cities.

Most developed markets have gone from fee-for-service to the DRG payment model, while some developed countries have started pilot programs for a value-based payment model. Milliman will be doing a series of articles focusing on the evolution and development of healthcare payment models in different markets.

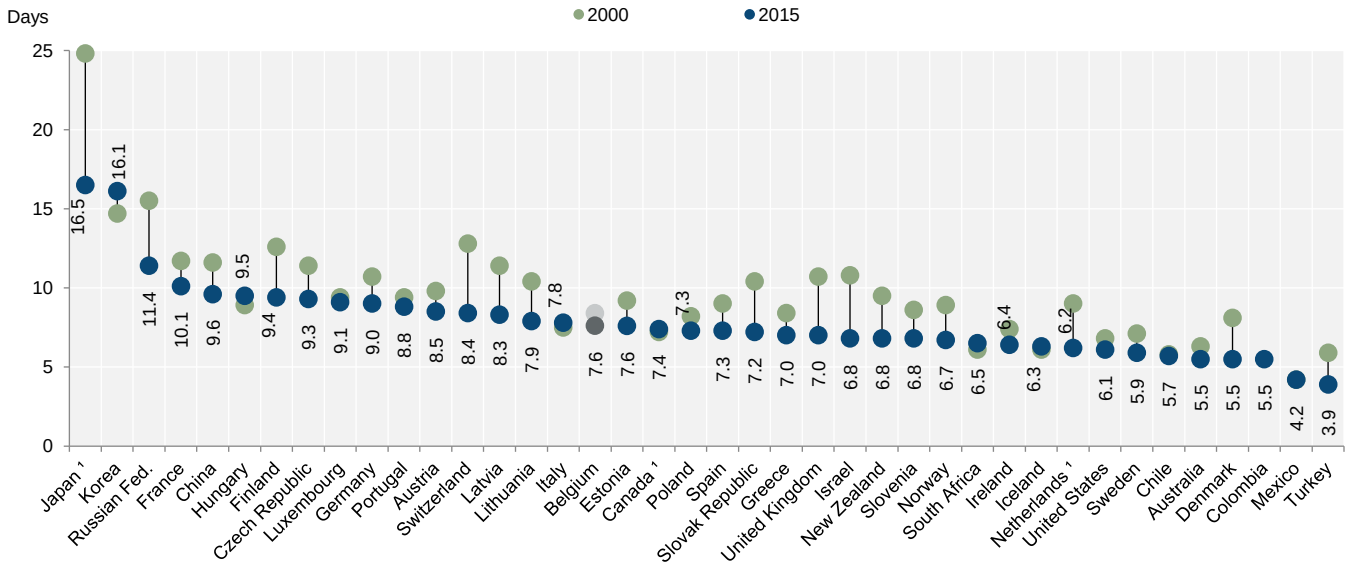
The present article will look at the DRG payment model. We will investigate the transition from the currently mainstream fee-for-service model to the DRG payment model, the history of DRG in foreign markets and the lessons to be learned therefrom, as well as the potential challenges to having a DRG payment model in China's system and the means of addressing said challenges.

## Fee-for-Service

Under the fee-for-service model, healthcare providers (i.e. hospitals) charge fixed fees for the individual services they provide, such as for diagnostics, treatment, surgeries, medications, consultation and implants. Fee-for-service is a relatively common means of making healthcare payments. It is the primary way that social health insurance is billed in China, where hospitals are reimbursed by social health insurance according to a set fee schedule.

Under the fee-for-service model, hospitals simply bill for the quantity of services provided. Various problems may arise from this, the most critical being the potential for over-treatment. This is a topic that frequently arises in both academic studies and in the media.

- The average length of stay in China is significantly longer than that in many other countries.
- Over 70% of inpatients in China are given antibiotics, a far higher percentage than the maximum rate of 30% set by WHO. China's average use of antibiotics is higher than at least 75% of countries in Europe and North America.
- In the countries of Europe and North America, Singapore and Japan, 30% of coronary stents are drug-eluting. The rate is 60 to 90% in large hospitals in China, and even up to 100% in some hospitals.



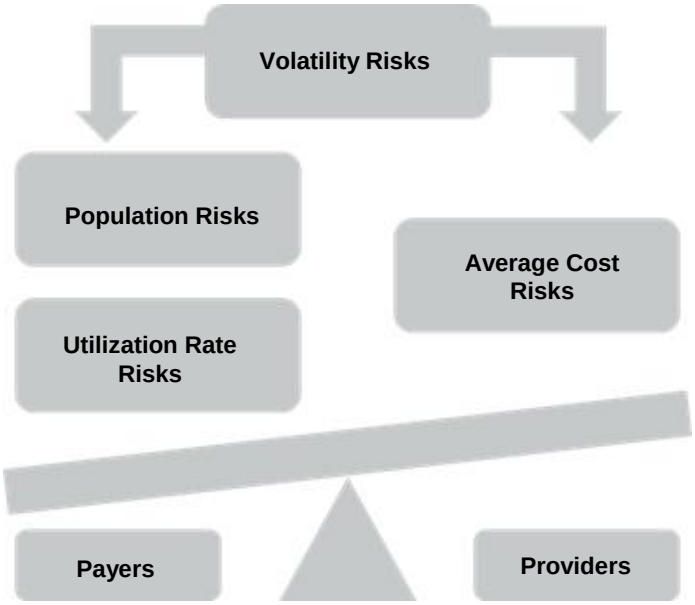

Source: OECD Health Statistics, 2017

There is no doubt that the causes of over-treatment are manifold and even insidious. From the perspective of the hospital, unnecessarily increasing medical care services results in higher revenues. This is attainable due to the unique nature of medical treatment, the complexity of medical knowledge, the asymmetric possession of information between doctors and patients, and considerations of economic interest. There is less of a focus on practical results and quality when it comes to healthcare services. From the perspective of the patient, social health insurance payments mean that treatment incurs small out-of-pocket expenses. With little regard for the tally on a medical bill, a patient has no motivation to refuse medical services that might be helpful.

Over-treatment seems to be an inevitable outcome of the fee-for-service model. As a means of resolving the problem of over-treatment, as well as gaining a clearer understanding of the other potential drawbacks of fee-for-service, it is critical that we conduct an in-depth investigation into the uncertainties collectively faced by both healthcare payers and providers, as well as look at how both sides can work together more effectively in coordinating the management of the medical treatment process and overall treatment costs. One of the principles of working together more effectively is that the party better positioned to control the driving factors behind medical healthcare should be responsible for managing said factors, while at the same time enjoying the outcomes of said management. The uncertainties or risk factors associated with overall healthcare costs include at least the following:

- Population risks associated with population size and demographics. These factors are generally more difficult for healthcare providers to control, therefore it is more advantageous for payers to work with government resources in managing these factors.
- Healthcare providers and payers may be required to share the risks associated with the utilization rate, and will have to work out a way of managing it.
- Providers have more authority when it comes to controlling the average cost risks, as treatment choices by doctors have a direct impact on healthcare costs. Healthcare providers are more advantageously situated to manage these risks.
- Volatility risks tend to be affected by changes in the external environment, such as natural disasters or flu seasons, for example. These are difficult to control with the resources and technical capabilities currently available to healthcare providers and payers, and may require commercial insurance or reinsurance mechanisms.

The fee-for-service model does not lend itself to healthcare providers and payers working together to manage risk factors for medical costs. By contrast, the DRG payment model uses fixed reimbursements based on DRG payment model, allowing providers to reduce unnecessary medical services to a large degree. This results in more rational medical treatment based on patients' conditions and the proactive management of average cost risks, thus effectively controlling the overall healthcare costs.




## DRG Payment Model

The DRG payment model originated in the United States. It has subsequently been adopted in other countries and regions because it is more effective than previous payment methods. Please see the information at the bottom of this article for the brief history of DRG in the United States and other markets.

Unlike fee-for-service, the DRG payment model groups similar episodes together for bundled reimbursement so that the healthcare provider will receive the same fixed price for treatments within a DRG. Each DRG has a payment weight assigned to it so that higher payment weights are reimbursed at a higher rate.

***DRG payment weight = DRG average cost / average cost of all medical and surgical treatment cases***

In order to calculate individual DRG payment weights, grouping rules are established by assigning medical or surgical treatment cases into different DRGs. Reasonable costs for case complexity and treatment costs are linked together. Generally speaking, the greater the complexity of medical or surgical cases, the more medical resources are required for treatment, along with a greater likelihood of variables in treatment outcomes. Hospitals ought to receive higher payments for these types of cases. Similarly, more severe medical or surgical cases require a greater use of resources for which hospitals ought to be reimbursed at a higher rate.

In light of this, the DRG model puts patients characterized by clinical similarity and medical resource use together into one group. Inpatients in the same DRG will generally receive similar medical treatment, stay in hospital for a similar duration and consume a similar amount of resources, meaning that medical or surgical cases in the same DRG will generate a similar amount of medical costs. This is the reasoning behind the fixed DRG-based reimbursements received by healthcare providers.

DRG assignment relies on the assessment of disease severity and resource consumption, typically determined by the patient's diagnostic information, procedure information, discharge summary, age and gender, among other things. The diagnostic information is generally based on the primary clinical diagnosis and the associated comorbidities or complications associated with diagnostic codes. Procedure information comes from the procedure codes. The current CN-DRG issued by the DRG Quality Control Center of the Medical Administration Bureau of the National Health Commission makes use of the internationally recognized ICD-10 diagnosis codes and the ICD-9-CM procedure codes.

DRG assignment methods in many countries are mostly similar, though there are slight differences. The following is a methodological description using the CN-DRG as an example.

1. Clinical similarity is the first thing to be considered for DRG assignment. Diagnostic categories are broken down by organ systems, such as diseases of the nervous system, eye diseases etc. The major diagnostic categories (MDC) are based on the diagnostic information associated with the diagnostic codes. The CN-DRG uses the diagnostic codes of ICD-10.
2. Cases assigned to diagnostic categories are further classed as surgical or non-surgical hospitalizations based on the procedure code. This determines the impact of the use of operating rooms on medical resources and treatment costs. The CN-DRG uses the procedure codes of ICD-9-CM. Surgical inpatients are categorized according to surgical procedure, e.g. major or more complicated surgery, less complicated surgery and other surgery. Non-surgical inpatients are categorized by neoplasm, disease conditions or specific disease.
3. Medical and surgical cases are further categorized by whether there are comorbidities or complications, or by age, gender and discharge status. Comorbidities and complications are generally found through secondary diagnoses.

Information collected for medical or surgical cases is extremely important when it comes to the accuracy of DRG assignment. This places great demands on a hospital's information and

coding systems. In addition to collecting basic demographic information such as age and gender, hospitals are required to enter complete and accurate diagnostic and procedure codes. Incomplete or inaccurate codes can lead to improper or mistaken DRG assignment of medical or surgical cases, leading to major discrepancies in the fee schedules.

China's medical information system is currently being upgraded, progressing from solely using social health insurance payment codes to also incorporating diagnostic and procedure codes associated with the DRG model being piloted in the country. Beijing led the way with DRG studies in the 1990s, and began its pilot program, BJ-DRG in 2008. Then in 2015, the DRG Quality Control Center of the Medical Administration Bureau of the National Health Commission released the CN-DRG. Unlike in other countries, where DRG was used as a basis for medical payment from the beginning, early DRG studies and testing in China tended toward using DRG for healthcare management and assessments. However, DRG has now gradually come to be seen as a payment model, including in the C-DRG released in 2017 by the Finance Department of the National Health Commission and in certain DRG versions such as the Lianzhong and Shenkang DRGs.

The DRG payment model that China is currently studying and testing comprises a strategic step in moving from the traditional fee-for-service model to a more effective payment model, making for a better balance of efficiency and quality in medical service provision and resulting in several advantages for the healthcare industry in China.

First, the DRG payment model fundamentally reduces the potential for gaming between the payer and the provider, thereby optimizing the use of medical resources. It makes for an unambiguous assessment of the complexity and severity of medical conditions, along with providing for a better understanding of what resources are required for conditions of varying degrees of complexity or severity. Fixed payments to hospitals are more easily determined this way. The previous case-based payment model also categorized inpatients based on diagnostic categories, but the reimbursement amounts did not reflect the complexity or severity of their conditions, or the intensity of medical resource use. Under the DRG payment model, all healthcare services represent cost from the perspective of the hospital, fundamentally reducing the doctors' incentive to induce over-treatment. Unnecessary healthcare services are therefore controlled, and the sensible arrangement of treatment with regard to the complexity of a condition shortens average length of stay, resulting in a realistic means of controlling costs. The hospital will be more willing to deploy medical resources in an appropriate manner, as this will improve the efficiency of their services and result in a higher profit margin from the fixed payments that they receive. The early results of DRG pilot testing in Germany show a 35% reduction in medical costs and 30% shorter length of stay.

Second, DRG will enable healthcare payers to manage and forecast their overall medical payments. In addition to controlling medical costs, this will allow them to gain a clearer high-level understanding of future overall healthcare expenditure. When it is actually put in place, the NHSA (the largest healthcare payer in China) will be able to conduct financial planning based on a relatively fixed budget, making for fairly healthy operations.

Third, as a healthcare management and performance tool, DRG will elevate the caliber of management and performance monitoring in the healthcare industry as a whole and in hospitals individually. This will include promoting upgrades to hospital information systems, accelerating the widespread adoption of electronic medical records, and improving the standardization of medical coding throughout China.

Of course healthcare management is a challenging task in any country, and DRG is not a panacea. The experience of DRG adoption in other countries can be instructive. For example, hospitals may upcode DRGs to maximize their own interests; insufficient DRG payments can lead to healthcare shortages; and the excessive pursuit of profits while reducing necessary medical services can result in a deterioration in the quality of healthcare.

Some developed countries have looked into alternative payment models as they promote DRG. For example, the payment model based on healthcare efficiency and quality of care established in the United States includes accountable care organizations (ACOs) and bundled payment models. The United Kingdom is trying out a risk sharing mechanism between payers and providers based on healthcare value. We will discuss this further in a series of future articles.

## Potential Challenges for DRG in China and Corresponding Solutions

DRG will be tested on a wider scale in China now that medical payments have been taken over by the NHSA. With this coming payment model change, we need to fully consider the potential challenges presented by the implementation process as well as their corresponding solutions.

First, the DRG rollout will be disruptive to healthcare providers both in terms of finances and healthcare management, and the disparities in how different hospitals will be affected financially are potentially huge. In the coding upgrade for the DRG payment model in the United States, for example, the impacts on hospitals of moving from the CMS-DRG to the MS-DRG varied enormously. Some hospitals saw a 30% drop in hospitalization revenues while others saw an increase of 104%. In moving from fee-for-service to DRG, the management of the average cost risk has been transferred from the payer to the provider. Hospitals are now required to engage in more financial management, which may not be a particular strength of the majority of hospital administrators. During the DRG rollout, hospitals need to integrate their professional strengths in the areas of their information technology, statistical analysis and actuarial analysis to establish capabilities in data analysis and financial management. They need to use previous medical cost data in order to engage in pre-analysis and continue with monitoring of the impact of the DRG payment model. They may also want to set up mechanisms to identify and manage outliers which impact the homogeneity of a DRG. LOS trim points have been used to provide a safeguard for those minor volume but huge cost intense outlier admissions, especially for coma, sepsis and multi-organ failure cases.

Of course, adjustments to healthcare management in hospitals will be needed. From the perspective of a hospital, any medical service represents a cost. Doctors need to standardize clinical care and reduce unnecessary medical services while maintaining the same quality of care, and hospitals need to systematically overhaul performance assessment and incentive management procedures for doctors and related management. Specific management areas may be more challenging, such as setting up the hospital information system. That system needs to be modified during the process of replacing paper medical records with electronic ones. Once DRG has been implemented, the information systems need to be synchronized with the diagnostic and procedure codes associated with the DRG payment model. The fact that payments will be based directly on these codes will mean that completeness and accuracy of patient information input are fairly critical, therefore the personnel performing these tasks will have to undergo training related to the diagnostic and procedure codes, as data entry on patient cover pages will be rigorously standardized.

Second, the hospital may attempt to game DRG for its own economic interests. Typical means of gaming are as follows:

- The DRG payment model actually transfers the uncertainty of average costs per admission to healthcare providers. However, the uncertainty associated with utilization rates remains with the healthcare payers. While controlling average costs per admission, implementing DRG could increase utilization rates, which is why it does not control overall medical costs. This sort of situation occurred during DRG implementation in the Taiwan region of China.
- Game coding algorithms. Selective coding is useful for DRG assignments with high fixed costs, i.e. upcoding. We have observed in some pilot program regions that the rate of ventilator usage has increased with DRG implementation due to specific medical or surgical cases being assigned to higher cost DRGs when ventilators are used.
- Some foreign markets have seen insufficient DRG payments for certain diseases, leading to shortages in healthcare for them.
- Once the DRG payment model has been promoted, services are essentially seen as costs. Hospitals could possibly reduce necessary medical services to enhance profits, turning over-treatment into insufficient treatment and thereby reducing the quality of medical care. What could also happen is that some hospitals may lack motivation to bring in high-end equipment or special drugs for patient treatment or to engage in prospective clinical studies.

When it comes the potential problems with putting DRG into place, meticulous preparations for the pilot program are necessary. For example, the potential impacts of DRG assignments and weighting calculation need to be fully considered, and suitable financial incentives in addition to DRG payments might be required for special medical equipment or clinical studies. Once DRG has been implemented, there needs to be comprehensive monitoring of the performance of the payment model in terms of healthcare capacity, quality, safety, efficiency and cost controls. Policies may be modified when needed, and comprehensive monitoring must be implemented in combination with a system of rewards and penalties.

While certain issues have arisen in some international markets using DRG, China is faced with special challenges, or at least some challenges that are more prominent than in other countries. For example:

Standardized design of DRG systems: At present there are multiple DRG coding systems in China, with municipal governments being willing to develop their own DRG grouping systems. Various levels of government have encountered gaming between government agencies, and there are no short-term prospects for standardization. The development of DRGs and their associated coding systems is human resource intensive, requiring regular maintenance and continual updates. There are redundancies due to multiple systems being developed concurrently, resulting in the inevitable waste of social resources. Subsequent research and benchmark comparisons will become a difficult problem when converting between different systems. Achieving a degree of standardized design could have a profound impact on DRG pilot programs, the efficiency of the implementation, and any subsequent reforms to medical payment policies.

Medical costing in China is now more complicated. The DRG payment model typically calculates the price for a group based on costs. In other countries, professional financial personnel are usually needed to perform healthcare costing accurately, generally by activity-based costing. In addition, clinical practices and medical costs may vary significantly by hospital, and also between urban and rural areas. This poses a challenge for the calculation of DRG base rate and relative weights as DRG assignment and weighting may not apply in all cases. An additional challenge in China is that the value of professional services in the country has long been underestimated, such that hospitals had no choice but to offset costs through drug sales and diagnostics. This has made costing extremely difficult. Current DRG weighting calculation generally uses major healthcare categories such as the adjusted prices for treatment, diagnostics, surgical procedures and drugs, but not calculated according to costs. DRG pilot programs need to gradually establish a system of cost-based weights.

## Conclusion

Healthcare payers and providers can expect to work together in a more coordinated fashion with DRG for healthcare payments. This will improve healthcare efficiency while keeping healthcare costs under control. Prospects are optimistic, though of course there will be ups and downs along the way.

## HISTORY OF DRG IN THE UNITED STATES

**1976**
**First generation DRGs (Medicare DRGs)**
- Episodes divided into 83 categories based on anatomical, pathophysiological and clinical characteristics.
- Then further subcategorized into 492 DRGs according to factors such as primary diagnosis, secondary diagnosis, surgical procedure, age etc.
- Each episode group exhibited the same clinical characteristics and hospitalization durations.

**1985**
**Second generation DRGs (Refined DRGs)**
- All secondary diagnoses that are comorbidities or complications were classified into 136 secondary diagnosis groups.
- Those groups were further subdivided into several comorbidity and complication groups based on their degree of complexity.
- ICD-9-CM codes were used.
- Patient admission types and outcomes were added.
- Each group exhibited the same clinical characteristics, length of stay and healthcare resource use.

**1988**
**Third generation DRGs (All Patient DRGs)**
- Adjusted to 641 DRGs.
- Better reflection of case complexity, severity and intensity of medical service usage.
- Included all patients.
- Numerous improvements to the data collection system of the Health Care Financing Administration for insurance for the elderly.

**1994**
**Fourth generation DRGs (Severity DRGs)**
- Not applicable to Medicare. Medicare specific groups were cancelled.
- Added 24 DRGs.
- A total of 652 DRGs.

**1988**
**Fifth generation DRGs (All Patient Refined DRGs)**
- Applied to Medicare, except for newborns.
- Grouping by age, comorbidity and complication of the third generation DRGs was replaced by:
  i. Case severity
  ii. Four levels for patient mortality hazard (mild, moderate, severe, extremely severe)
- A total of 1,350 DRGs.

**2000**
**Sixth generation DRGs (International refined DRGs)**
- Allowed each country to use their own diagnostic and procedure codes.
- Adjusted case severity for diagnostic code of each country.
- Catered for each individual's clinical characteristics and affordability.
- Further developed other applications, such as care options determination, subsidy calculation, baseline calculation and clinical testing.
- A total of 992 DRGs.

## HISTORY OF DRG IN CHINA

**1988: DRG feasibility study**
• After a 4-year DRG feasibility research study, Beijing Hospital Research Institute concluded that DRG was feasible in China but would need to be adapted to local conditions.

**2004: Initial trial of DRG in Beijing**
• Peking University Third Hospital adopted DRG to revise the unreasonable payment structure. DRG allowed the hospital to independently modify its treatment model. It also maximized the utilization of human resource costs and eliminated the complexity of social health insurance audits by attempting accurate cost control.

**2006: DRG for China launched in Beijing**
• In 2008 the BJ-DRG put out a grouping tool with 654 DRGs covering 20 thousand diagnoses and 2,000 surgical procedures in clinical pathways.
• Modification of unreasonable medical payments in hospitals
• Collaborated with social health insurance to bring about payment reform.

**2011: DRG officially adopted for social health insurance payments in Beijing**
• In 2011 DRG was officially adopted by some hospitals in Beijing for social health insurance payments. Since 2012 the "direct division method" has been used as part of the "total control method."

**2012: Local DRG pilot programs and reform**
• Cost of treatment and drug continued to increase rapidly with inefficiencies of centralized drug purchasing and price controls. This triggered local DRG reform.
• 2013: Shenkang version, based on Australian DRG, was used by 37 third-grade hospitals for hospital performance management and oversight of inpatient performance indicators. However, this did not involve social health insurance payments or cost controls.

**2015: National Health Commission set up DRG Quality Control Center**
• The Medical Administration Bureau set up the DRG Quality Control Center and released the CN-DRG pilot program. The CN-DRG focused on hospital performance management, not on payment model.

**2015–2016: DRG in other cities**
• 2015: Local DRG payment model deployed in Jinhua, Zhejiang.
• 2016: DRG reform launched in Liuzhou, Guangxi by the Municipal Administration of Hospitals, with actual implementation performed by the Municipal Bureau of Social Security.

**2017: C-DRG payment reform**
• Mid year in 2017: The General Office of the State Council emphasized that DRG was the pathway for social health insurance payment reform hence several regions were selected for DRG pilot programs.
• 2017: The Center for Health Development Studies under the National Health Commission launched the C-DRG model consisting of payment reforms. The reforms were carried out at the national policy level, though social health insurance management agencies did not participate.

**2018: National Health Commission established**
• Issued Directive no. 27 with DRG pilot programs falling under its regime.

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**CONTACT**

Guanjun Jiang
guanjun.jiang@milliman.com

Qiuwen Peng
qiuwen.peng@milliman.com