

Unblocking the barriers of access to direct-acting antiviral-based hepatitis C treatment in China: lessons learnt from Tianjin city

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Abstract

Background China has a substantial burden of chronic viral hepatitis. This study examines the evolution of approaches to navigate the barriers to access to direct-acting antiviral (DAA) based treatment for hepatitis C in Tianjin city, China. Methods Review of publically available literatures including published and grey literatures. On-site data extraction and key informant interview were conducted. Results Tianjin is the first area to pilot a capitated provider payment program for treatment of hepatitis C. Through which, the retirees, employees and residents spend 0.7, 1.0 and 5.6-6.8 months of their salary and disposable income for the treatment respectively. The Patient Assistance Program (PAP) eligible patients in financial hardship pay nothing for DAA, but have to pay insurance the expenditures of diagnosis and tests, and medications for adverse reactions with limited reimbursement. The PAP-eligible low-income patients who need treatment longer than 3 months have to co-pay with insurance the advance 3-month treatment before obtaining free DAA for continued treatment. By the end of March 2019, 876 hepatitis C patients registered the new insurance coverage and were treated in Tianjin, among which 153 were cured, 723 were under treatment and follow-up. Conclusions A government-led multi-party cooperation has enabled Tianjin to start unblocking the barriers. International experiences demonstrated that centralized bulk procurement is a good leverage for price negotiation, especially when innovative payment approaches are used to remove price as a barrier to access. To re-produce the above success, continued efforts are needed to develop stronger strategic price negotiation, preferably at the regional level or central level.

Background

The World Health Organization (WHO) called for elimination of viral hepatitis as a public health threat by 2030 [1]. Specific global targets were set on prevention and control of viral hepatitis such as new infections and deaths to be reduced by 90% and 65% respectively [2]. The number of viral hepatitis related deaths was comparable with the number of deaths from tuberculosis, but exceeded the number of deaths from HIV in 2015 [1]. 71 million people were estimated to be living with hepatitis C viral (HCV) worldwide, and an estimated of 399 000 persons died from the consequences of HCV infection in 2015 [3]. The Western Pacific Region bears one-third of the world's deaths caused by hepatitis, translating to more than 1 200 deaths every day. It was estimated that 14 million people were living with chronic hepatitis C in 2016 in this region, and the pandemic of viral hepatitis takes a heavy toll on lives and health systems for countries [4].

Interferon-based regimens have been the sole therapies of HCV for decades, but are associated with serious adverse events and low virus clearance rate. The recent discovery of oral direct-acting antivirals (DAAs), for their high cure rate and demonstrated safety, heralded a revolution and changed the landscape of hepatitis C treatment and prevention. However, high prices of these new therapies became barriers of access to treatment, many countries continue to face the challenge of financing such expensive medicines. In order to reduce the disease burden through HCV cure, different approaches have been adopted by countries tailored for their specific context. Such examples include both the developed and the developing countries like Australia and Brazil through lump-sum remuneration and Productive Development Partnerships (PDPs) approaches [5,6].

China has a substantial burden of chronic viral hepatitis. The estimated HCV prevalence is 0.43% which is by comparison to surrounding countries, not at a high level [7]. The absolute number (7.6 million) is large [8,9]. New cases of hepatitis C reported annually exceed 200 000 in the most recent four years [10]. However, treatment rates among those infected is low, estimated at less than 1.3% [11]. This study examines the evolution of approaches to navigate the barriers to access to DAAs for HCV in Tianjin city, China.

Methods

We reviewed published and grey literatures including landmark or highly regarded reports, work suggested by peers and documents of government and international organizations. On-site data were extracted from the database of Tianjin Healthcare Security Management and Settlement Centre and Hepatitis C Patient Assistance Program initiated by the China Primary Health Care Foundation. This study also drew on insights of key informants from relevant central (Beijing) and local government agencies in charge of health administration, healthcare security administration, disease control and prevention; international governmental and non-governmental organizations; and specialty hospitals in Tianjin. Other stakeholders including international organizations, pharmaceutical companies also contributed to the study (a list of key informants see Annex 1).

Results

China's efforts towards elimination of viral hepatitis as a public health threat

In responding to the global vision of eliminating hepatitis C as a public health threat, several actions were taken by the Chinese government. The Prevention and Treatment Guideline for Hepatitis C was updated to incorporate the latest DAAs as part of standards of treatment for hepatitis C in 2015[9]. In 2017, the National Viral Hepatitis Prevention and Control Plan (2017-2020) was developed and released [12]. The National Diagnosis Standard for Hepatitis C was updated in 2018 [13], which for the first time presented the distribution of HCV genotypes in China to support better clinical decision making.

In 2016, DAAs were included in the new priority review channel for regulatory approvals of novel medicines, which was part of the regulatory reforms. The first oral DAA, daclatasvir-asunaprevir was marketed in April 2017, which officially enabled China to enter a new era of hepatitis C treatment. This was followed with several other DAAs, including the first locally developed DAA, danoprevir in 2018. By the end of March 2019, nine DAAs were registered, and further three were undergoing clinical trials in China (Annex 2) [14]. However, access of these DAAs remains limited, due to the very high retail prices, ranging between US\$ 10 000-17 600 per standard treatment course in the private sector.[a]

The approach to unblock the barriers of financing these high-priced medicines and to ensure reduction of out-of-pocket (OOP) expenses in China is to ensure inclusion under health insurance. In October 2018, the National Health Commission (NHC) announced inclusion of the pan-genotypic DAA sofosbuvir/velpatasvir in the National Essential Medicines List [15]. However, listing as essential medicines does not mean it can be publicly funded in China. As patients can only get access to the publicly funded medicines through health insurance. Being listed by health insurance is a prerequisite of getting access. Selections of essential medicines and reimbursed medicines are administered by different government agencies with different processes, and by different expert committees. NHC is in charge of listing essential medicines, and the newly established National Healthcare Security Administration (NHSA) takes care of listing reimbursed medicines. Until the end of April, none of the nine marketed DAAs was listed by NHSA yet, including the one listed by NHC as national essential medicines.

With increasing availability of new DAAs in the Chinese market, several local health insurance programs piloted publicly funded initiatives to improve access. Zhejiang province pioneered to have sofosbuvir and sofosbuvir/velpatasvir covered by the provincial catastrophic health insurance [16]. This was followed by Tianjin, Chengdu and Changchun city, Jiangsu, Shandong, Jilin and Anhui provinces. Most of the local health insurance programs negotiated prices of DAAs, and set a fixed proportion of co-payment with patient, with insurance reimbursement ranged between 40%-90%. Patients are usually required to pay 10-20% of the total expenditure OOP, or a fixed amount of nearly US\$ 3000 before getting reimbursed. Tianjin was the first to pilot a capitated provider payment, which prospectively set per patient price and pay hospitals in lump-sum rather than reimbursing a proportion of total expenditure with retrospective fee-for-service (FFS) provider payment.

The approaches of Tianjin city

Epidemiology

Tianjin, a city in the east of China, is one of the four municipalities directly under the central government. It is an economic center in the Bohai Bay, the largest open coastal city in the north of China with 15.60 million permanent residents [17]. The 2010 point of prevalence survey of hepatitis C showed that, the prevalence rate among the registered permanent residents in Tianjin was 24.10 per 100 000 (132/ 547 782) [18]. A 2013 study found that, the mortality rate of hepatitis C related cirrhosis and liver cancer was 0.6 per 100 000 [19]. Data from the Notifiable Communicable Diseases Reporting System of Tianjin showed that, a total of 8 421 new cases of hepatitis C were reported during 2004-2018 (914 in 2018). The notification rate of hepatitis C in 100 000 permanent residents ranged from the highest of 7.03 in 2006, dropped steadily to the lowest of 2.95 in 2012. Notifications increased after 2012, and reached 5.86 per 100 000 permanent residents in 2018 [20-24].

Financing HCV treatment: before 2014

Before DAAs were marketed in China, interferon therapy was the only regimen recommended for the treatment of hepatitis C under the coverage of Tianjin Basic Health Insurance. The standards for treatment was a dose of 180µg interferon, one subcutaneous injection per week for 6-12 months, and usually combined with oral ribavirin. Nearly all patients relapsed after treatment and required re-treatment [12]. Repeated injections lead to poor compliance and tolerance, and involved additional treatment for adverse drug reactions (ADRs). In addition, most hepatitis C patients chose inpatient care as a way to access better benefic package. Patients have to pay US\$ 75 (residents) and US\$ 194 (employees) OOP before getting reimbursed, and there is an annual reimbursement cap for outpatient care (US\$ 450 for the residents and US\$ 820 for the employees). While the annual reimbursement cap for inpatient care is much higher (US\$ 45 000 for the residents and US\$ 75 000 for the employees) [25,26]. The cost of frequent hospitalization was high at around US\$ 16 400 per 12 months, including ward and inpatient care fees, costs for diagnosis and tests, interferon, ribavirin and other medicines to manage ADRs [27]. Even interferon was covered by the insurance, 11% and 16% of the total cost were paid OOP by retirees and employees, and 35%-45% by the residents (higher premium contribution getting lower OOP). The OOP payment accounted 2.2 and 3.2 months of the retirees and employees' salary, and 17.6-22.6 months of the residents' disposable income (Table 1). The insurance designated hospitals were co-paid by insurance and patients for the actual expenditure with retrospective FFS method.

Financing HCV treatment: 2014-2017

Repeat inpatient care and resource exhausted FFS provider payments were expensive, and clearly this approach was not efficient use of healthcare resources. In 2014, Tianjin Basic Health Insurance shifted the provider payment for hepatitis C treatment from FFS to capitation. The capitated amount of per patient covered costs of interferon, ribavirin, as well as necessary tests and ADR treatments at around US\$ 5700 for 6 months and US\$ 11 300 for 12 months. This

amount was co-paid by insurance and patients following the inpatient care benefit package, but patients did not necessarily pay OOP before getting reimbursed [27-29]. Only those who were treated at the day-care-ward, and followed the clinical pathway as defined by Tianjin Basic Health Insurance could register to the pilot program [30], which was implemented in one hepatitis specialty hospital in Tianjin. With this plan, 10% and 15% of the total cost were paid OOP by retirees and employees, and 35%-45% by the residents. The OOP patient accounted 1.1 and 1.6 months of the retirees and employees' salary, and 9.7-12.5 of the residents' disposable income (Table 1). The designated hospital was co-paid at US\$ 11 300 by insurance and patients with prospective capitated payment method. Hospitals bore the over-run cost, and could keep the balance in case that the real treatment cost is less than the capitated amount.

Evolving the financing of HCV treatment from 2018

In 2018, when increasing numbers of DAA being registered and marketed in China, Tianjin Basic Health Insurance negotiated the prices of all marketed DAAs. US\$ 5300 per standard treatment course was agreed for most of DAAs except sofosbuvir/velpatasvir, which was about 60% of the private market price. A fixed amount of US\$ 6045 was set as per patient price for outpatient care, valid for two years until 2020. This includes US\$ 750 for necessary diagnosis and tests, medications for ADRs, and monitoring and management fees (including HCV RNA testing but not genotype testing). Clinical pathways were formulated by Tianjin Basic Health Insurance, which enable clinicians to have tailor-made treatment choices. DAAs included in the clinical pathways are presented in Annex 3. Patients get reimbursed following the specialty outpatient care benefit package. Before getting reimbursed, US\$ 75 (residents) and US\$ 194 (employees) have to be paid OOP. With this pilot, 13% and 18% of the total cost is paid OOP by retirees and employees, and 45%-55% by the residents. The OOP payment accounts 0.7 and 1.0 months of the retirees and employees' salary, and 5.6-6.8 months of the residents' disposable income (Table 1). Up until now, three specialty hospitals have been designated, who are co-paid at a amount of US\$ 6045 by insurance and patients with the prospective capitated payment method. Hospitals bear the over-run cost, and keeps the balance in case that the real treatment cost is less than the capitated amount. Designated hospitals can directly transfer the prescriptions to the designated retail pharmacies through the health insurance information system, DAAs are dispensed at the retail pharmacies. Five retail pharmacies are designated in Tianjin city.

Patients in financial hardship are eligible for the Patient-Assistance-Program (PAP) created by China Primary Health Care Foundation (CPHCF). They have to be certified by the Tianjin Civil Affairs Bureau, and provide a record of receiving minimum living allowance during the past consecutive 12 months. The eligible patients can be provided with up to 6 bottles of originator sofosbuvir free of charge. Low-income patients (whose annual immediate family[2] income is less than 2.5 times of the family annual medical expense) can apply up to 3 bottles of originator sofosbuvir free of charge in case of need more than 3-month treatment. The pre-condition is that patients have to finish advance 3-month treatment with originator sofosbuvir before application, which can be reimbursed by insurance following the capitated specialty outpatient care benefit package. With the PAP, although patients in financial hardship pay nothing to sofosbuvir, they have to pay genotype tests OOP, and have the expenditures of necessary diagnosis and tests, medications for ADRs co-paid with insurance (following the common outpatient care benefit package). However, this benefit package is very limited (US\$ 75 OOP payment before getting reimbursed, insurance reimburses 50%, US\$ 450 reimbursement cap). This common outpatient benefit package also applies to the expenditures of continued treatment of low-income patients who require more than 3-month treatment. They can register the new insurance coverage to complete their advance treatment, co-pay with insurance under the specialty outpatient benefit package, and have to add genetic testing to their total OOP payment (Table 1). Hospitals are co-paid by insurance and patients for the actual treatment cost with retrospective FFS method.

By the end of March 2019, there were 876 hepatitis C patients registered the new insurance coverage and treated in Tianjin. Among which, two adopted pegylated interferon + ribavirin + DAA treatment protocol, 874 were treated with DAA (Figure 1). As of the end of March 2019, 153 were cured, 723 were under treatment and follow-up.[3] There were a total of 148 patients (11 patients in financial hardship and 137 low-income patients) supported by the hepatitis C PAP.[4]

[a] Calculated based on the lowest (CNY 11 200/month) and highest (CNY 19 660/month) market price of originator sofosbuvir in China, obtained from the key informants interview of the hepatitis C Patient Assistance Program in China. Conversions between US\$ and CNY were made with the rate of 1 US\$=6.7 CNY, this rate was applied throughout this manuscript.

[2] Defined by the Patient Assistance Program as: family members including parents, children, husband or wife.

^c Data were extracted from the database of Tianjin Healthcare Security Administration and Tianjin Healthcare Security Management and settlement Center.

^d Data were extracted from the database of the Patient Assistance Program managed by the China Primary Health Care Foundation.

Discussion

The capitated provider payment mechanism in Tianjin expects to create incentives for the designated hospitals to manage the patient and the health insurance budget in the most cost-effective way, and to achieve tripartite wins: to relieve individual financial burden of patients, to contain costs and to increase efficiency of treatment, and to secure the sustainability of the health insurance [31,32].

However, within the first year of implementation of the new insurance coverage, there were only 876 hepatitis C patients treated with DAAs in Tianjin. This number is already more than the total numbers of patients treated during 2014-2017 (684), and it is close to the number of new reported in 2018 (914). Majority of the former 77 patients under pegylated interferon/ribavirin treatment shifted to DAA treatment (Figure 1). 876 only accounts 10% of the accumulated notifications during 2004-2018 (8421) [22]. Considering the notifications before 2004 and the omissions, even adding the patients in financial hardship who received free DAA from PAP (only 11 patients in 2018), and assuming that there will be no new infections in the coming years, Tianjin will have to have at least 10 years to treat all the existing patients. This non-optimistic situation calls for further expansion of the treatment program.

Reasons behind the low treatment rate are manifold. The most important one is financial barrier. Although the negotiated prices of originator DAAs in Tianjin (US\$ 5300 per standard treatment course) is less than one third of the interferon treatment cost before 2014, it is still several times higher than those obtained by many other middle-income countries. Price of generic sofosbuvir produced by the Brazilian consortia involving private pharmaceutical companies and public laboratories through the PDP program reduced to US\$ 8.50/pill (US\$ 765 per 3-month) in 2018 [6]. Brazilian government also negotiated a price of originator sofosbuvir/ledipasvir at US\$ 1148.12, and US\$ 1470 for a pan-genotype originator sofosbuvir/velpatasvir for a total number of 50 000 treatments in 2019[33]. The rapid expansion of treatment in Brazil was largely due to the access to low-priced generics, and great price reduction of originator. That would not be achieved without direct involvement of the central government, which secured high political commitment and greater leveraged purchasing power.

With a comparatively high price, the financial burden of patients in Tianjin is still high even under the new insurance coverage, especially for the resident population, whose OOP payments account 45-55% of the total treatment cost. This is much higher than the proportion of national average of OOP payment to the total health expenditure (30%) [34]. Although patients in financial hardship and the low-income patients can get originator sofosbuvir free of charge, it is limited to sofosbuvir only, not covering other DAAs, especially the pan-genotype ones. This means that patients have to pay OOP for genetic testing and other necessary medicines and tests, which will bring additional financial burden.

Our study found that there was very few numbers of patients in financial hardship benefited from PAP in Tianjin in 2018. An existing study shows that rural population and the unemployed people were the major population among hepatitis C patients in Tianjin[35], who most probably are the group categorized as population in financial hardship. This implies under-enrollment of the patients in financial hardship to the PAP.

The second reason behind the low treatment maybe that, alternative approaches of access exist, like overseas shopping of DAAs. The international price of sofosbuvir already decreased to US\$ 750 per 3-month in 2017, and has been continuously decreasing. This is much lower than the originator price negotiated by Tianjin (US\$ 5300). The low-priced DAAs are available in an increasing numbers of developing countries like India, Thailand, Argentina, Egypt, Pakistan, etc. [36] Many studies revealed the booming overseas shopping services of novel life-saving medicines in China, which may bring high quality and safety risks to patients [37,38]. Unless the price is close to the international low level, the overseas shopping of cheaper life-saving medicines may still be an incompetent choice of the dying-to-survive patients.

Conclusions

Financial barriers are the most prominent one for access to highly effective DAA-based hepatitis C treatment. A government-led multi-party cooperation has enabled Tianjin to start unblocking the barriers. International experiences demonstrated that centralized bulk procurement is a good leverage for price negotiation, especially when innovative payment approaches are used to remove price as a barrier to access. To re-produce the above success, continued efforts are needed to develop stronger strategic price negotiation, preferably at the regional level or central level.

Abbreviations

WHO: World Health Organization; HCV: Hepatitis C viral; DAA: Direct-acting antiviral; PDP: Productive Development Partnership; OOP: Out-of-pocket; NHC: National Health Commission; NHSC: National Healthcare Security Administration; FFS: Fee-for-service; ADR: Adverse drug reaction; PAP: Patient-Assistance-Program; CPHCF: China Primary Health Care Foundation

Declarations

Ethics approval and consent to participate: According to the Ethical Review of Biomedical Research Involving Human Participants (No. 11 Document of 2016, National Health Commission of P.R.China, being effected since 1 December 2016, available: http://www.gov.cn/gongbao/content/2017/content_5227817.htm, in English), only research which collect, record, use, report or store human's sample, medical record, and behaviors of humans are needed for ethic approval. This study did not involve any of the mentioned activities, only consulted the key informants about the policies, procedures and public information, no ethical approval is needed.

Consent for publication: Not applicable.

Availability of data and material: All data generated or analyzed during this study are included in this published article.

Competing interests: All authors have no competing interests.

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Authors' contributions: PZ, RG, JL and MZ conducted the literature search and review. RG, PZ and JL interviewed the key informants under the leadership of JS. JS, CL, LH prepared the information needed for the table, made the calculation and formulate the table. RG, PZ and JL jointly wrote the first draft, which was critically commented by JS. Additional contributions from WW, PC and CZ were made to finalization of the article. All authors reviewed and revised the text.

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Tables

Table 1 Benefit package, expenditure and cost sharing of hepatitis C treatment in Tianjin in three phases

Population	Before 2014		2014-2018		After 2018		Low-income patients		
	Employees/ Retirees ¹	Residents (with low to high premium contribution) ²	Employees/ Retirees ¹	Residents (with low to high premium contribution) ²	Employees/ Retirees ³	Residents (with low to high premium contribution) ⁴	Patients in financial hardship ⁵	need more than 3-month treatment ⁶	
Benefit package	Inpatient		Inpatient (day-care-ward)		Specialty outpatient		PAP + common outpatient ⁷	Specialty outpatient ⁸ + PAP + common outpatient ⁷	
Patient OOP before getting insurance reimbursed (US\$)	250	75	0	0	194	75	NA+75 ⁷	194 ⁸ + NA + 120/90 ⁷	75 ⁸ + NA + 75 ⁷
Insurance co-pay (%)	85/90	55-65	85/90	55-65	85/90	45-55	NA / 50 ⁷	85/90 ⁸ / NA / 55/95 ⁷	45-55 ⁸ / NA / 50 ⁷
Medicines & services covered	Interferon + ribavirin + ADR treatment + tests		Interferon + ribavirin + ADR treatment + tests		All DAAs marketed in China + interferon + ribavirin + ADR treatment + tests		Originator sofosbuvir	Originator sofosbuvir	
Cost per treatment course (US\$)	16 400 ⁹		11 300 ¹⁰		6045 ¹¹		PAP covered ¹² + tests & medications for ADRs	6045 ¹¹ + PAP covered ¹³ + tests & medications for ADRs	
Insurance payment (US\$)	13 728/14 535	8979-10 611	9 605/10 170	6215-7 345	4973/5 266	2687-3 284	Up to 450 ⁷	4973/5 266+ up to 820-1 500 ⁷	2687/2985/3284 + up to 450 ⁷
Patient OOP payment (US\$)	2672/1 865	7421/-5 789	1695/1 130	5085-3 955	1072/780	3358-2 761	Major expenditures of tests & medications for ADRs	1 072/780 + major expenditures of tests & medications for ADRs	3358/3060/2761 + major expenditures of tests & medications for ADRs
Patient OOP rate (%)	16/11	45-35	15/10	45-35	18/13	55-45	NA	18/13 plus ¹⁴	55/50/45 plus ¹⁴
Number of per capita monthly income spent for the OOP payment per treatment course	3.2/2.2 ¹⁵	22.6-7.6 ¹⁶	1.6/1.1 ¹⁵	12.5-9.7 ¹⁶	1.0/0.7 ¹⁵	6.8-5.6 ¹⁶	NA	1.0/0.7 ¹⁵ plus ¹⁴	6.8-5.6 ¹⁶ plus ¹⁴

Notes: PAP=patient-assistance-program; OOP=out-of-pocket; DAA=direct-acting antiviral; ADR=adverse drug reaction

Benefit package, patient OOP before getting insurance reimbursed, and insurance co-pay (%) were obtained from the key informants of Tianjin Healthcare Security Administration and Tianjin

Healthcare Security Management and Settlement Center. Detailed insurance policies about retirees/employees and residents of Tianjin can be accessed from the website of Tianjin Human

Resource and Social Security Bureau as following:

(<http://hrss.tj.gov.cn/ecdomain/framework/tj/ckoocoapccolbbogkjpniifpkdgnfeahc/clbhpndaccolbbogkjpniifpkdgnfeahc.do?isfloat=1&fileid=20081114155807953&moduleIDPage=clbhpndaccolbbogkjpniifpkdgnfeahc&siteIDPage=tj&pageID=ckoocoapccolbbogkjpniifpkdgnfeahc> in Chinese, accessed March 31, 2019). and

(<http://hrss.tj.gov.cn/ecdomain/framework/tj/ckoocoapccolbbogkjpniifpkdgnfeahc/clbhpndaccolbbogkjpniifpkdgnfeahc.do?isfloat=1&fileid=20130428083007295&moduleIDPage=clbhpndaccolbbogkjpniifpkdgnfeahc&siteIDPage=tj&pageID=ckoocoapccolbbogkjpniifpkdgnfeahc>, in Chinese, accessed March 31, 2019).

1 Employee beneficiaries of Tianjin Basic Health Insurance.

2 Residents beneficiaries of Tianjin Basic Health Insurance.

3 Employee beneficiaries of Tianjin Basic Health Insurance, qualified at least 3 consecutive years.

4 Resident beneficiaries of Tianjin Basic Health Insurance, qualified at least 3 consecutive years.

5 Patients in financial hardship as certified by the Tianjin Civil Affairs Bureau, and receive minimal living allowance during the past consecutive 12 months.

6 Annual family (immediate family, defined as family members including parents, children, husband or wife) income ≤ 2.5 times of the annual family healthcare expenditures, information obtained from the key informants of PAP.

7 Costs for tests & other necessary medications for ADRs can be reimbursed by insurance following the common outpatient benefit package.

8 First 3-month treatment with originator sofosbuvir of low-income patients before applying for free originator sofosbuvir, can be reimbursed by insurance following the specialty outpatient care benefit package under the capitated payment program.

9 Average costs per treatment course (CNY 110,000/48 weeks) before 2014, as reported by Ni S, Wang L. Chronic hepatitis C treatment cost is reduced in Tianjin. Tianjin Social Insurance, 2014(3):30-31.

10 Capitated amount set for the interferon per standard treatment course in 2014 (CNY 76 000/48 months).

11 Capitated amount set for DAA treatment per standard treatment course in 2018 (CNY 40 500).

12 6 bottles of originator sofosbuvir provided by PAP free of charge for patients in financial hardship as defined by PAP.

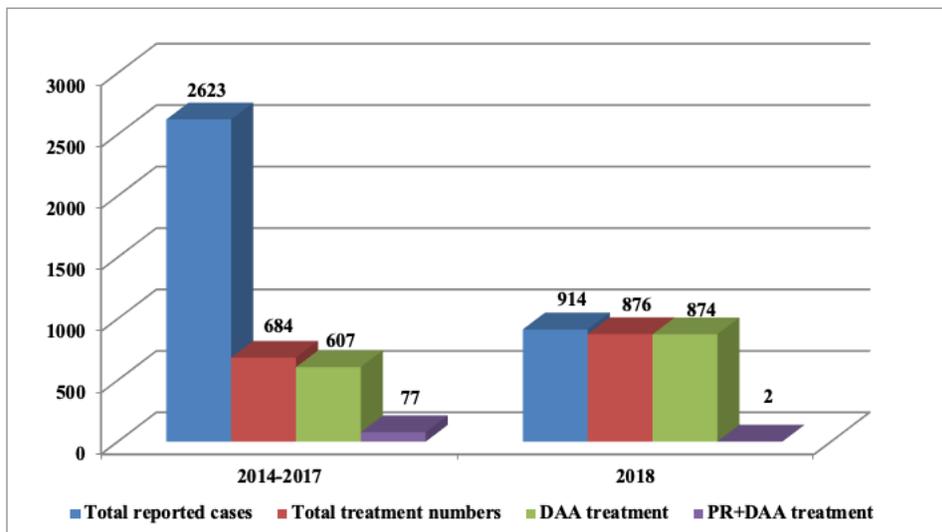
13 3 bottles of originator sofosbuvir provided by PAP free of charge for low-income patients as defined by PAP.

14 Including the first 3-month treatment with originator sofosbuvir, which can be reimbursed by insurance following the specialty outpatient care benefit package under the capitated payment program, plus costs for tests & other necessary medications for ADRs for additional free sofosbuvir follow-up treatment provided by APA, which can be reimbursed by the insurance following the common outpatient benefit package.

15 Annual average salary per capita of Tianjin employees was applied for the calculation: CNY 67 773 in 2013, CNY 83 428 (2014-2017), CNY 7 073/month in 2018. Obtained from the National Bureau of Statistics of China. <http://data.stats.gov.cn>; Tianjin Municipal Human Resource and Social Security Bureau. <http://hrss.tj.gov.cn/ecdomain/framework/tj/index.jsp> (in Chinese, accessed March 31, 2019).

16 Annual average disposable income per capita of Tianjin residents was applied for the calculation: CNY 26 359.20 in 2013, CNY 32 805.11 (2014-2017), CNY 39 506 in 2018. Obtained from the National Bureau of Statistics of China. <http://data.stats.gov.cn>; Tianjin Statistics Bureau. http://stats.tj.gov.cn/Category_1/Index.aspx (in Chinese, accessed March 31, 2019).

Figures



Notes: DAA=direct-acting antiviral; PR=pegylated interferon + ribavirin

Figure 1

Reported cases and treatment numbers of hepatitis C covered by the Basic Health Insurance programs of Tianjin 2014-2017 vs. 2018

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix.docx](#)