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The current medical insurance status of type 2 diabetes mellitus patients in Hong Kong

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Abstract
The number of diabetes mellitus (DM), especially type 2 diabetic patients is increasing sharply worldwide recent years due to urbanization, lack of physical activity, population aging and growing rapidly of central obesity. The most diabetic patients about more than 90% are type 2 DM, which have long disease duration courses, more and complex complications. So the therapy cost of type 2 DM is strong financial burden not only for the patient and his family but also for government and society. However, there are a lot of healthcare insurance systems and co-payment schemes contemporary in Hong Kong. So this review aims to comment systematically the current insurance status of type 2 DM in Hong Kong. First, generally introduce type 2 DM care background and its heavy financial burden in Hong Kong. Second, sum up the common healthcare insurance policy for chronic diseases in Hong Kong. Thirdly, review the medical insurance model of DM in Hong Kong and highlight the Patients properties. As well as finally, we outlook the healthcare insurance for type 2 DM patients at Hong Kong in the near future.

Keywords: healthcare insurance, diabetes mellitus, Hong Kong

1. Introduction

The number of diabetes mellitus (DM), especially type 2 diabetic patients is increasing sharply worldwide recent years due to urbanization, lack of physical activity, population aging and growing rapidly of central obesity. With the latest estimation by the International Diabetes Federation, the prevalence of DM has continued to increase from 382 million in 2013 to 592 million in 2035, and will be one in ten adults, that is to say, will be 642 million DM people worldwide until the year 2040 [1]. Particularly high prevalence rates are found in Mexico (12.6%) and Egypt (16.8%), surpassing the rates of some high-income countries, such as U.S.A (9.2%) and Germany (8.2%) [2]. In the next few decades, DM will be among the most common chronic diseases, which will pose a serious global public health threat. While in Asia, the prevalence of DM increased to 11% of adults in South Korea of the year 2013 [3, 4], reached to 12.3% in Singapore in 2013 [5], to 4.8% in Indonesia in 2012 [6], and to 9.3% for men and 6.4% for women in Taiwan in 2008 [7]. A systematic review reported that the DM prevalence in mainland China increased from 2.6% in 2000 to 9.7% in 2010 [8], and to 10.9% in 2013 [9]. As for Hong Kong, the prevalence of DM in adults is about 10% [10] and there 740 thousand DM patients estimated. However, this data do not include the undiagnosed and nonreported DM cases. By the year 2025, it is estimated that 12.8% of Hong Kong population involving more than one million inhabitants will suffer from DM [11, 12, 13]. Furthermore, a comparison study presented that Chinese living in Hong Kong had a higher prevalence of DM than those are in mainland [8, 10].

Coping with its prevalence and the healthcare burden arising from DM is a major challenge to almost all medical security systems in global. In 2007, the global health expenditure to treat and prevent DM and its complications was estimated to be at least 232 billion US dollars [5]. In mainland China, the direct medical costs of DM and related complications is estimated to 26 billion US dollars in 2007, which represented 81% of total medical costs. These costs are expected to increase to 47.2 billion US dollars by the year 2030 [14, 15]. Hong Kong, as one of the developed regions of the world and developed cities of China, is no exception. The direct medical cost for DM and its complications management was estimated to take up 3.9% of the total health care expenditures and 6.4% of the public health expenditure [16]. Due to its adverse effect on people's health, DM also imposes an economic burden on individuals and households affected apart from on healthcare systems. The most diabetic patients about more than 90% are type 2 DM, which have long continuity of disease duration courses as well as more and complex complications. The cost of managing type 2 DM patients with macrovascular and microvascular complications increased [17] by twofold compared to that of the patients without any complications [8]. So the therapy cost of type 2 DM is strong financial burden not only for the patient and his family but also for government and society such as the employers. The study results show that healthcare insurance coverage and some protective effects against out-of-pocket expenditures, but mainly for those with higher incomes, while the poor often lacked coverage. Once patients were covered by healthcare insurance, their risks of incurring catastrophic expenditures decreased significantly [2, 18].

On the whole, the public healthcare of Hong Kong is virtually free to the individual and leads the world in medical service system. Hong Kong government basically has achieved the goal that every citizen can receive lifelong holistic healthcare, and no one will be denied adequate medical treatment due to lack of means. Additionally there are nearly 160 insurance companies and various sorts of

health security in Hong Kong. Thus the medical insurance plays a critical role for patients in private clinic setting in Hong Kong. So this review aims to introduce systematically the current insurance status of type 2 DM in Hong Kong. First, generally introduce type 2 DM care background and its heavy financial burden in Hong Kong. Second, sum up the common healthcare insurance policy for chronic diseases in Hong Kong. Thirdly, review the medical insurance model of DM in Hong Kong and highlight the patients properties. As well as finally, we outlook the insurance for type 2 diabetes patients at Hong Kong in the near future.

2. The financial burden of type 2 DM patients

2.1 General introduction of type 2 DM

DM is a chronic disorder characterised by raised blood glucose levels, secondary to a complete or relative lack of insulin. There are four types of DM including type 1 DM, type 2 DM, gestational DM and others DM. More than 90% of the DM patients is type 2 diabetes, common in adults, and often coexist with obesity, hypertension, dyslipidemia and hyperinsulinism, which is commonly definited Metabolic Syndrome. The therapies of type 2 DM are integrated approaches including health dietary, regular aerobic exercise, drug treatment, blood glucose monitoring and DM education, as well as management of diabetic complications and coexisting diseases such as hypertension, coronary disease and stroke *etc*. For controlling the blood glucose at the stable level and prevention the complications, the DM patients should receive intensive therapy and integral component monitoring, especially at the beginning of diagnosis (Fig. 1).But in fact, along with the latent disease course, even though the fasting glucose level, glycosylated hemoglobin A1c, blood pressure and low density lipoprotein cholesterol are controlled for the target, the various chronic complications of DM will happen also. So it is very important for type 2 DM patients to check regular and screen follow-up at different care levels. Thus proper management and control of blood glucose level on a regular basis is very critical and the suboptimal control of DM can result in various complications including cardiovascular diseases, stroke, kidney failure, blindness and leg amputation [13, 19].

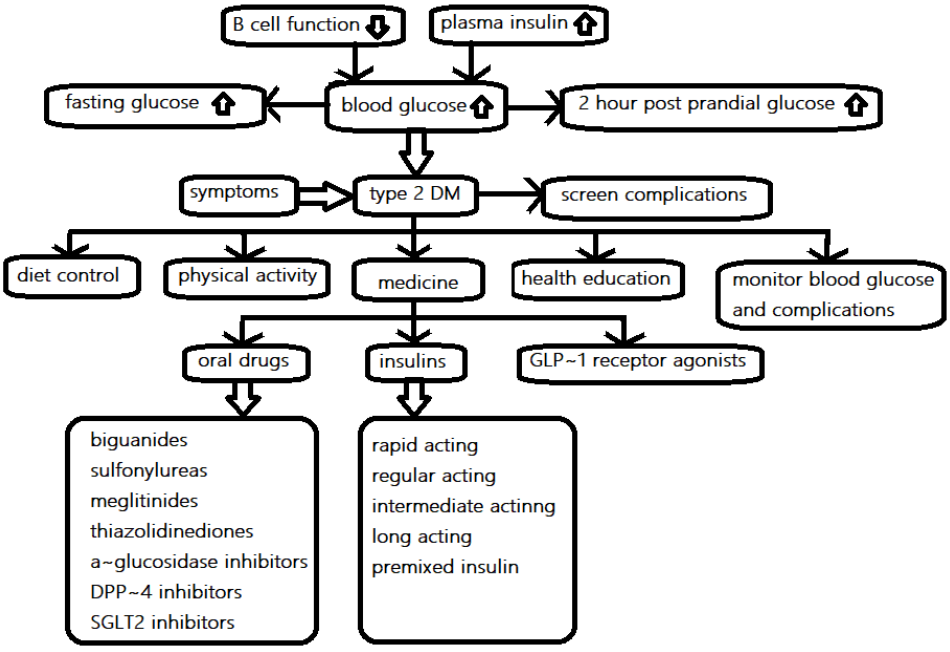

Fig 1: The diagnosis and therapy for type 2 DM

2.2 The background and policy of type 2 DM care in Hong Kong

The Hospital Authority of Hong Kong is responsible for managing all the public medical care institutions in Hong Kong. It has a dual track system with public and private care along each other in Hong Kong. On one hand, there are 41 hospitals, 47 Specialist Outpatient Clinics and 73 General Outpatient Clinics undergoing Hospital Authority. They provide inpatient and specialist care, as well as primary care for the early stage of chronic disease for patients. The specialist and inpatient care is mainly provided by the public sector around 90%, while provides 29% of primary outpatient care through the General Outpatient Clinics. On the other hand, the private sector include 11 private hospitals, around 100 private clinics and more than 2000 private doctors in solo or group practice (Fig.2).The public healthcare organizations open and service to all citizens but the private sector will be on the individual choice depending on affordability. As there is a lot of the primary care provided by the public sector actually involving the chronic patients, who find it is too expensive for the long term treatment of their chronic diseases by private doctors. Additionally, the number of DM patients under care of the Hospital Authority rise from 397 thousand in 2009/2010 to 408 thousand in 2015/2016. Actually, there are 33 to 35 thousand DM patients having been diagnosed and added the public healthcare system annually [20]. So the expenditure of the Hospital Authority is highly dependent on government funding and running on a tight budget. Therefore it is a major burden to the Hospital Authority because of caring more than 90% DM patients. Of course the private sector perform on payment-out-pocket by patients or private medical insurance.

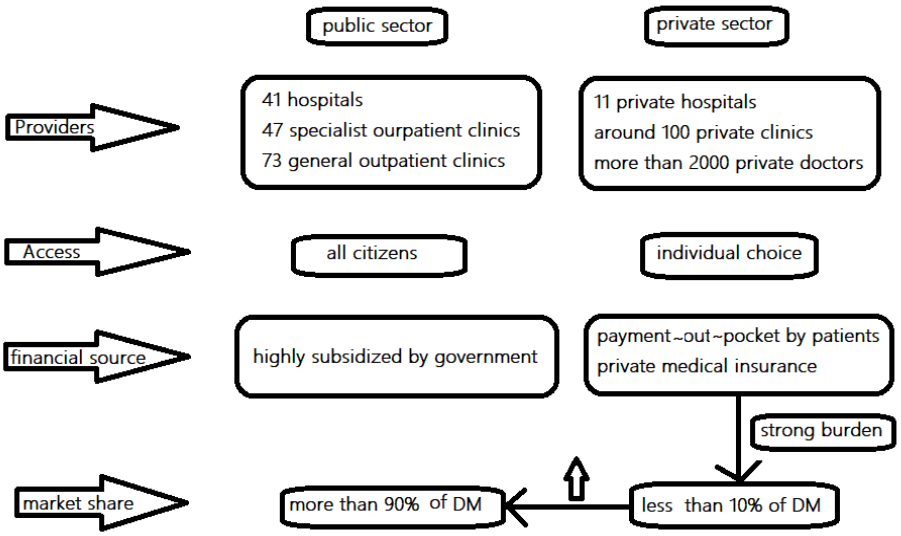

Fig 2: The healthcare system of Hong Kong

A special note should be made regarding the use of glucose lowering agents under the Hospital Authority. There is a corporate drug formulary in which drugs are classified into general level that used freely by all doctors, special level only used for specific clinical indications by designated specialists, and self-financed items will be purchased by DM patients out-of-pocket. Thus for type 2 DM patients, the general drugs include metformin, sulphonylureas, pioglitazone and human insulin. The special drugs including DPP-4 inhibitor and SGLT-2 inhibitor can only be used when the combination of metformin and sulphonylureas fail to control glycemia, no matter how to add pioglitazone. As well as the insulin analogues can be used for those patients with repeated hypoglycemia on human insulin or with cardiovacular and kidney complications. At last but not least, the Glucagon-like peptide-1 analogues are self-financed drugs because of the high prices.

From 2009, the Hospital Authority started to pay attention for DM care and develop a system approach such as Corporate Clinical Practice Guideline on the management of type 2 DM, Risk Assessment and management Program for DM, Reference Framework for diabetes care for adults in primary care setting, even a Central Committee on Diabetic Services having been set up. But the heavy financial burden of DM is still the main sustainable obstacle for healthcare.

2.3 The heavy financial burden of type 2 DM patients

According to the data of Hong Kong Diabetes Registry, an annualized rate of 16.43 per 1 000 person-years for mortality of DM and 14.08 per 1 000 person-years for incident chronic heart disease in the cohort, which were similar to the results of other community based databases [21, 22]. Along with therapies and interventions for coronary artery disease continue to improve, more and more type 2 DM patients may be expected to survive long enough but develop the other organs failure. The long latent period of nature history for type 2 DM and so many criteria for screening the chronic complications, which means the large economic burden and an available cost-effective treatment. Thus the majority of patients with chronic illnesses are managed in public hospital more for financial reasons than disease severity.

In Hong Kong, the data presented by Clinical Practice Guideline, there are currently around 400,000 diabetic patients under its care at 17 hospitals which providing secondary care for 40% and 73 General Outpatient Clinics which providing primary care for 60%.A number of clinical care and patient empowerment programmes have been set up to support structured and systematic diabetes care. With such a system approach, there have been overall improvements in diabetes care with the percentage of DM patients with glycosylated hemoglobin less than 7% rising from 40% in 2010 to 52% in 2015 [20]. So many achievements have been done on improving the symptoms and the marker levels of DM patients in Hong Kong by the government effort. But on the contrary, charged with the responsibility for healthcare safety net for all citizens, the Hospital Authority has to provide efficient and effective care for the majority of DM patients in Hong Kong within a very tight budget yet. Therefore in developed countries and regions, Type 2 DM is a major cost driver for healthcare systems, with annual growth of DM over the past two decades and continuing to grow, same for that in developing areas also.

There was an randomized controlled trial on diabetic retinopathy screening with a small copayment versus free access from 2 clinic in Hong Kong. The results showed that patients with higher socioeconomic status were more likely to attend screening and had a lower prevalence of diabetes retinopathy detected [23]. This phenomenon was termed “inverse care law” and operated more completely where medical care was most exposed to market forces [24]. It is despite the general acceptance of copayments for healthcare services in the mixed medical economy of Hong Kong, a jurisdiction with a high average Gross Domestic Product per capita. It was also reported that some recent progress has been made in the U.S.A by innovatively merging incentives with community resources, for incetance, getting health insurance plans to reimburse lifestyle interventions [25]. But on the contrary, there was study not find any differences of quality of life between subjects from private group (self-paying, higher income) or government healthcare sector (free, lower income) [26]. The other results show the insurance was associated with protection from catastrophic

Spending in middle-income countries but not low-income countries [27]. These different results and opinions will be the direction on subject of further research also.

3. General introduction of medical insurance for chronic diseases in Hong Kong

Generally speaking, the healthcare security systems of Hong Kong can be divided into two sectors. One is public health security, the other one is private health insurance. On the one hand, Hong Kong government provides almost free healthcare for everyone mainly through the public potion, which serves not only local citizens or permanent residents, but also nonpermanent residents. That means, once a person stays in Hong Kong, holding a valid visa and Hong Kong Identify Card, he is able to enjoy public health care already. On the other hand, Hong Kong people have abundant resources to aquire commercial insurance for medical financial problems. It is worth mentioning that there is a private health insurance scheme released in 2010, which is voluntary as well as government-regulated. Presently Hong Kong is at a vital stage in formulating detailed proposals for this Health Protection Programe. By providing better protection and efficient private insurance products, the programme may serve as an alternative for public health care, aimed at those who are willing to and able to afford private medical services, particularly the middle class. In the detailed proposals for the programme, Hong Kong government attaches great importance to encouraging residents participate in the scheme. The priority include tax incentives and subsidies [28].

Recently, the Food and Health Bureau of Hong Kong announced details of the Voluntary Health Insurance Scheme on March 2018.We believe this Scheme will encourage people to use private healthcare services and therefore help to relieve pressure on public healthcare facilities in the long term. Starting from a free market of medical insurance, this Scheme sets a framework of minimum benefits, which is tangible and definite improvement in the development of medical insurance in Hong Kong. As to the chronic disease such as DM, the Hong Kong health insurance plan which includes chronic condition coverage can do better to alleviate the costs of treating and ensure that insurant has comprehensive protection should the condition deteriorate. In Hong Kong, there are a number of different ways of health insurance plans will provide coverage for chronic diseases under a chronic condition coverage benefit. The exact coverage offered in relation to chronic conditions under Hong Kong medical insurance policy will vary dependent on the insurance company and the plan which insurant choose and purchase.

There are three ways of typical insurance to cover these chronic diseases. The first one is coverage for acute phases of the condition. Although there is no known cure for chronic diseases presently, the patients is likely to display symptoms or go through a flare-up. For instance, diabetic ketoacidosis is an emergency condition. Normally, if a Hong Kong health insurance plan covers chronic condition for acute phases, it will only provide protection for the medication that is necessary to alleviate the symptoms related to the acute condition. The second one is annual coverage limits for the condition. In this way, a Hong Kong Health insurance plan sets a coverage limit on the amount of protection provided each year. This amount of protection should be associated with the treatment of the condition. Each year the insurant hold the policy, an annual coverage limit enables the insurant to obtain medication and treatment, until it accumulated to a financial limit which is pre-determined. For instance, should the patient suffer from DM, then for each year he can purchase medication on a certain amount, or seek for some medical consultations associated with the condition. Once an insurant renew his Hong Kong medical insurance policy, the annual limit will reset. The third one is lifetime chronic condition coverage limit. Under lifetime limit, a pre-determined level of protection will be provided for chronic diseases. However, the life time policy is a fixed number throughout the whole life, instead of renewing each policy year. Usually a lifetime limit for chronic disease coverage could be quite high. Even so, it is still of great importance to note that once the insurant has reached the limit, no any further coverage will be paid for the condition by the insurance plan [29, 30].

4. The benefit of the commercial insurance model of type 2 DM in Hong Kong

There are various benefits for DM patients from different insurance plans. The main healthcare insurance plans of Hong Kong location are listed as follows. Firstly, some healthcare plans, such as PRUhealth critical illness multi-care, PRUhealth critical illness extended care, and PRUhealth critical illness protector are supported by prudential general insurance Hong Kong limitid, which extend care to early stage of DM. The insurant will pay HKD 400,000 or USD 50,000 per life limit under all PRUhealth critical plans covering the same life assured.In case for the amputation of diabetic foot or diabetic retinopathy,the insurant will get the benefits include 20% of current sum assured of every PRUhealth critical plan [31]. Secondly, there are some plans supplied by Sun Life Hong Kong Limited. One is titled Sun Health Ultra Care and Sun Health Maxi Care, supporting a well-protected with the DM protector benefit. This benefit offers additional coverage upon diagnosis of the following DM, the early stage critical illness condition such as diabetic nephropathy and diabetic retinopathy. That also include the major stage critical illness condition of DM complications and the juvenile illness condition cover expires at age 18.The benefits include 37.5% of original sum assured and major stage critical illness benefit payable for DM complications in the first 10 policy year. From the 11th policy year onwards, the insurant can get 25% of original sum assured (additional) and major stage critical illness benefit payable. That is to say, the patient can acquired a maximum per life limit of HKD300, 000 or USD37, 500 for each claim on the separately phages. The other three schemes are Critical Medical Care Insurance Plan II with additional rider benefits from Multi Protection Benefit II, Sun Health Medical Premier, and Sun Health Medical Essential. All these plans are supplied for DM and its complications [32]. Thirdly, there is a Sweet Diabetes Insurance plan supplied by China Tai Ping Insurance Limited for critical DM complications, including sequelae of stroke, end-stage renal disease, amputation and blindness. The benefits of the insurant patients can receive the maximum insured amount reach to RMB 300,000 [33]. The details refer to Table 1.

Table 1: The main healthcare insurance plans for DM patients in Hong Kong

name of the Plan	Supplied by Company Limited	For DM condations	Benefits for insurant patient	Details on website
PRUhealth critical illness multi-care	Prudential general insurance Hong Kong limitid	early stage of major disease condition	20% of current sum assured of this project, and 20% of current sum assured of Crisis multi-care enhancer.	www.prudential.com.hk
PRUhealth critical illness extended care	Prudential general insurance Hong Kong limitid	Early stage of major disease condition	20% of current sum assured of PRUhealth critical illness multi-care.	www.prudential.com.hk
PRUhealth critical illness protector	Prudential general insurance Hong Kong limitid	early stage of major disease conditions	20% of current sum assured of this project, and 20% of current sum assured of Crisis protection enhancer.	www.prudential.com.hk
Sun Health Ultra Care and Sun Health Maxi Care	Sun Life Hong Kong Limited	Diabetic Complications and Juvenile Illness Condition	(1)In the first 10 policy year: Diabetic Complications: 37.5% of Original Sum Assured (Additional) + Major Stage Critical Illness Benefit payable. Others: 37.5% of Original Sum Assured (Additional) + 37.5% of Original Sum Assured + proportionate face value of Special Bonus (if any). Subject to a maximum per life limit of HKD300, 000 or USD37, 500 for each claim. (2)From the 11th policy year onwards: Diabetic Complications: 25% of Original Sum Assured (Additional) + Major Stage Critical Illness Benefit payable. Others: 25% of Original Sum Assured (Additional) + 25% of Original Sum Assured (advanced) + proportionate face value of Special Bonus (if any). Subject to a maximum per life limit of HKD300,000 or USD37,500 for each claim.	https://www.sunlife.com.hk/HK/Insurance/Medical+and+Critical+Illness?vgnLocale=zh_TW
Critical Medical Care Insurance Plan II with additional rider benefits from Multi Protection Benefit II	SunLife Hong Kong Limited	Diabetic Complications	A Critical Illness Benefit equivalent to 100% of the Sum Assured of the policy will be paid.	https://www.sunlife.com.hk/HK/Insurance/Medical+and+Critical+Illness?vgnLocale=zh_TW
Sun Health Medical Premier	Sun Life Hong Kong Limited	Diabetic Complications	(1)Lifetime Limit:HKD60,000,000 or USD7,500,000 if worldwide,HKD45,000,000 or USD5,625,000 if worldwide excluding the US, HKD30,000,000 or USD3,750,000 if Asia. (2)Annual Limit: HKD20,000,000 or USD2,500,000 if worldwide,HKD15,000,000 or USD1,875,000 if worldwide excluding the US, HKD10,000,000 or USD1,250,000 if Asia.	https://www.sunlife.com.hk/HK/Insurance/Medical+and+Critical+Illness?vgnLocale=zh_TW
Sun Health Medical Essential	Sun Life Hong Kong Limited	Diabetic Complications	Lifetime Limit: HKD30, 000,000 or USD3, 750,000. Annual Limit: HKD10, 000,000 or USD1, 250,000.	https://www.sunlife.com.hk/HK/Insurance/Medical+and+Critical+Illness?vgnLocale=zh_TW
Sweet Diabetes Insurance	China Tai Ping Insurance Limited	DM complications (Sequelae of stroke, end-stage renal disease, amputation and blindness)	Maximum insured amount is RMB300,000	http://www.cntaiping.com/product/65687.html

5. Outlook for the medical insurance of type 2 DM in the future

With the change of disease spectrum, some meta Bolistic diseases such as DM and obesity have become the focus for clinical practice and insurance policy to meet the demand of market. The provision of DM care by insurance is an integral and representative component of the highly efficient and regarded public healthcare system of Hong Kong. Thus we need to do somethings as followed.

Above all, it is necessary to provide reasonable and effective financial strategies to manage the type 2 DM and bring the most benefits for patients. For example, to improve the medical insurance scope of type 2 DM.As we know, the earlier screening and interventions on the phase of pre-DM or impaired glucose tolerance, the more benefits will be presented on the prevention and delayed of DM and its complications. Some European countries where insurance companies and other health providers cover most

costs of the prevention programmes. But in some developing countries, such as mainland China, the DM patients have to pay all prevention expenses out of their own pockets irrespective of the insurance plan that they have bought [34, 35]. Hence if our insurance cover the weadth and depth of the DM more further, it will save the whole social hygiene resource in a long run.

Secondly, via the systemic review of current healthcare insurance status, we are able to provide indicators for the long-term allocation of medical resources for Hong Kong government. Such data can help policy makers to set priority in healthcare manpower plan, resource allocation and prevention policy. For instance, there are many type 2 DM patients due to the increased number of immigration from mainland China to Hong Kong and needing to be supported by insurance. Thus to improve the population's health and allow individuals to purchase private health insurance, more effective and easier insurance plans should be initiated to encourage greater use of this resource. It will reduce financial press of government, and according to the market-set price economic principle, a little cost can induce the patients attention to their DM condition.

Finally, even for patients with healthcare insurance, health expenses could still be a problem. More than one in ten seniors in the US reported using less of their required medications because of cost [36]. Moreover, not all medicines to treat DM are covered by health insurance, especially the newest and more expensive classes of mediciens. However, the further cost-effective analyses may be needed to address the gap between needs and resources. This can be the direction of research for the medical insurance and drug economics in the near future. In a word, it is far most important for the type 2 DM patients to receive the most medical benefits.

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