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Availability, Health-Care Costs, and Utilization Patterns of Biologics in Taiwan

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ABSTRACT

Objective: To provide an overview of the use of biologics in Taiwan, including the access to new biologics, the impact of this access on the growth of health-care expenditure, and the utilization patterns. **Methods:** We first conducted a market-level analysis to investigate the availability of global biologics in Taiwan as well as the growth and concentration of aggregate spending on biologics. We then conducted a patient-level analysis to investigate the costs and utilization patterns for selected new biologics. **Results:** We found that the concentration index is such that the 20 leading biologics in Taiwan account for more than 90% of the total spending on biologics. In our patient-level study on four biologics, the annual cost of treatment per patient ranged from NT$100,000 to NT$400,000. The prevalence rate of the user was between 6.5 and 37.2 per 100,000 of population. The treatment costs were inversely related to the prevalence rate of users. We also found that physicians in larger and public hospitals were more likely to prescribe new biologics to their patients compared with their counterparts practicing in smaller and private hospitals. In addition, we found that physicians were more likely to prescribe biologics to patients with more severe diseases and higher comorbidities. **Conclusions:** We conclude that public spending on biologics in Taiwan is highly targeted toward about 20 products with higher annual expenditures and growth rates and that the utilization of these biologics is targeted at a small number of patients. In addition, the access to these costly biologics is not uniform among patients in a country with universal coverage for prescription drugs.

Keywords: access to new biologics, biologics, health-care costs, technology diffusion.

Introduction

Biologics are defined as medicines whose active substance is made from a living organism or its products and are produced by using biotechnology methods or other cutting-edge technologies. Biologics differ from chemically synthesized drugs along many dimensions, including manufacturing, the market dynamics, mode of administration, target specificity, body distribution, and half-life [1–3]. In recent years, nearly one-fourth of all new chemical entities launched in the United States and the European Union have been biologics [4]. Thus, biologics are important new health-care technologies. The market for biologics has grown more rapidly than that for general pharmaceutical products, and as a result the share of biologics in global pharmaceutical sales has increased rapidly from 4.4% in 1998 to 10.5% in 2007.

As observed in many other new technologies in medicine, the adoption of biologics is costly. Compared with chemically synthesized drugs, manufacturing biologics is much more complex. Moreover, biologics have, until recently, usually targeted small patient populations. Given these characteristics of their manufacturing and marketing, it is not surprising that the prices of many biologics are relatively high [5]. The high cost of adopting new biologics often becomes a public concern, particularly in health systems dominated by public financing where decisions about which biologics will be covered by public programs can become highly politicized. As a result, countries often face a policy dilemma between providing access to new biologics and controlling their health-care budgets.

The purpose of this article was to provide an overview of the use of biologics in Taiwan with a special focus on the accessibility and cost impacts of new biologics. On the basis of both population and sampling claims data obtained from the national health insurance (NHI) program, we performed market- and patient-level analysis to explore several issues surrounding the utilization of biologics in Taiwan. Specifically, we analyzed the access issue by comparing the lists of biologics in Taiwan's NHI formulary with the list of blockbuster biologics in the global market. In addition, we analyzed the trend of NHI spending on biologics over time. Furthermore, we performed patient-level analysis for individual biologics to analyze the costs and utilization patterns of selected new biologics.

There are several advantages in using Taiwanese data to quantify the impact of adopting new biologics on health-care costs and

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Table 1 – Launch dates of blockbuster biologics in Taiwan.

Name of drug	Manufacturing firms	ATC code	Launch date
Aranesp (darbepoetin alfa)	Amgen	B03XA02	May 1, 2004
Avastin (bevacizumab)	Genentech	L01XC07	NA
Avonex (interferon beta-1a)	Biogen/IDEC	–	NA
Betaseron (interferon beta-1b)	Bayer Schering	L03AB08	March 1, 1998
Cerezyme (imiglucerase)	Genzyme	A16AB02	October 22, 1998
Enbrel (etanercept)	Amgen	L04AB01	March 1, 2003
Erbitux (cetuximab)	ImClone Systems	L01XC06	March 1, 2007
Herceptin (trastuzumab)	Genentech	L01XC03	April 1, 2002
Humalog (insulin lispro injection)	Eli Lilly	A10AD04 A10AB04 A10AC04	February 1, 2004
Humira (adalimumab)	Abbott Laboratories	L04AB04	September 1, 2004
Lantus (insulin glargine injection)	Sanofi-Aventis	A10AE04	February 1, 2004
Neulasta (pegfilgrastim)	Amgen	L03AA13	NA
Neupogen (filgrastim)	Amgen	L03AA02	1995
Novolog (insulin aspart injection)	Novo Nordisk	A10AB05 A10AD05	2003
NovoSeven (coagulation factor VIIa)	Novo Nordisk	–	NA
Pegasys (peginterferon alfa-2a)	Roche	L03AB11	November 1, 2003
Rebif (interferon beta-1a)	MerckSerono	L03AB07	April 1, 2002
Remicade (infliximab)	Centacor (J&J)	L04AB02	NA
Rituxan (rituximab)	Genentech	L01XC02	April 1, 2002
Synagis (palivizumab)	MedImmune	J06BB16	NA

Note: Blockbuster biologics indicate that their annual sales exceeded US$1 billion in 2007.
ATC, Anatomical Therapeutic Chemical classification system; NA, not available.

utilization patterns. First, Taiwan has a social insurance system providing universal insurance coverage for physician services, hospital care, and prescription drugs. To control the cost of public insurance, the government in Taiwan regulates the price paid by the single health insurance plan for individual drugs [6]. The single-payer system allows policymakers as well as researchers to trace the impact of introducing new drugs on national health costs.

Second, about one-quarter of Taiwan's health-care expenditure is on pharmaceuticals. As compared with other developed countries, the higher spending makes it more likely for prescription drugs to become the target of cost containment. As a result, the experience of Taiwan provides a valuable insight into understanding how policymakers struggle with the conflict between increasing access to new drugs and controlling health-care costs.

Data and Methods

The data used in this study had two main sources. First, we obtained data on the aggregate expenditure on biologics from NHI population claims data. Second, we used a longitudinal data set to analyze the costs and utilization patterns of individual biologics. This data set contains 1 million individuals (about 4.35% of the total population in Taiwan) randomly selected from the registry of NHI beneficiaries in the year 2005. The sampling file was then merged with the insurance claim files that trace back all the medical utilization records of the same individuals in every year and follow their medical utilizations in subsequent years, hereafter referred to as the 2005 Longitudinal Health Insurance Database (LHID).

The 2005 LHID was made publicly available through the National Health Research Institute. This data set contains detailed records on the utilization of personal health-care services, including outpatient visits, hospital admissions, and prescription drugs. We merged the data for outpatient visits with the corresponding drugs prescribed and dispensed by using anonymous identification numbers. The advantage of this data set is that all the medical utilizations can be linked together for the same patient. As a result, the data provide information on the characteristics of patients, providers, and the drugs prescribed.

In this article, we adopted two approaches to analyze the use of biologics in Taiwan. We first conducted a market-level analysis to investigate the availability of global biologics in Taiwan as well as the growth and concentration of aggregate spending on biologics. The advantage of this approach is that it provides population-based information on the overall utilization of biologics in Taiwan. The market-level analysis, however, does not provide information on individual patients. We then conducted a patient-level analysis to provide a descriptive analysis of the costs and utilization patterns for four important biologics, namely, Enbrel, Mabthera, Herceptin, and Pegasys, which were selected on the basis of higher annual sales and higher growth rates. In the patient-level analysis, we analyzed the mean cost of treatment per patient by using the cohort data that all the prescriptions have been linked together for the same patients. By means of aggregation and four case studies, we summarize the findings of this research.

Market-Level Analysis

Taiwan has established, under its system of NHI, a national formulary that includes all pharmaceuticals subject to reimbursement by the NHI. The detailed list of drugs in the drug formulary provides a base on which to analyze the availability of biologics in Taiwan by comparing the list based on the NHI formulary with the list of important biologics in the global market.

In Table 1, we summarize a list of 20 important biologics in the global market whose annual sales exceeded US$1 billion in 2007. Among them, 14 biologics are available in Taiwan through the coverage of public insurance. The launch dates of these biologics range from 1998 to 2007. By 2007, six biologics—Avastin, Avonex, Neulasta, NovoSeven, Remicade, and Synagis—were not covered