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Original Article

# Changes in the prescription pattern of antipsychotics for schizophrenic outpatients after the implementation of a global budgeting program

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Received March 4, 2013; accepted January 3, 2014

## Abstract

**Background:** A hospital-based global budget (GB) program was implemented by the Taiwan Bureau of National Health Insurance (TBNHI) to control the rising costs of medical care. We investigated whether the introduction of the GB program affected prescriptions for second-generation antipsychotics (SGAs) for schizophrenic outpatients in public and private medical and psychiatric centers.

**Methods:** The prescription data of schizophrenic outpatients treated between 2001 and 2004 were retrieved from the TBNHI database, which included outpatients who were diagnosed as having schizophrenia during the period from 1996 to 2001. Because the new health insurance policy may have had a lag effect on physicians' decision regarding SGA prescription, we used January 2004 as the timepoint to divide the data, which was 6 months after GB implementation. Thus, data from the 6-month period immediately after the GB implementation were included in the pre-GB period. Second-generation antipsychotics included in the study were clozapine, risperidone, olanzapine, quetiapine, ziprasidone, zotepin, and amisulpride.

**Results:** After January 2004, the proportion of SGA use in outpatient departments did not show an upward trend, as had been observed in the pre-GB period, which appeared at a staggering pace lasting for 12 months ( $p = 0.0004$ ). Compared with medical centers, SGA expenditures in the psychiatric centers were less affected in the GB period ( $p < 0.0001$ ). Compared to the private sector, the SGA expenditures in the public sector were less affected in the GB period ( $p < 0.019$ ).

**Conclusion:** We concluded that the GB implementation reduced SGA expenditures significantly. The extent of influence varied among hospitals (i.e., public versus private, medical versus psychiatric centers), which was most likely caused by financial factors.

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**Keywords:** global budgeting; National Health Insurance; schizophrenia

Conflicts of interest: The authors declare that there are no conflicts of interest related to the subject matter or materials discussed in this article.

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## 1. Introduction

The process of how physicians make decisions with regard to prescriptions has received greater attention as medical costs continue to rise, leading to increased expenditures on health services.<sup>1,2</sup> Financial incentives are one factor affecting

physicians' medical behavior.<sup>3</sup> To curtail medical expenditures, many cost regulation programs have been implemented in hospitals by governments and insurance providers. One of these programs is global budgeting (GB). The implementation of GB has resulted in a reduction in the number of admissions and the adoption of an efficient case-mix.<sup>4</sup>

The GB program was introduced in Taiwan for dental services in 1998; it was subsequently initiated for Chinese medicine in 2000, for Western medicine community clinics in 2001, and finally for hospital services (including out- and inpatient services) in 2002. Among the four GB programs, the hospital GB program in 2004 accounted for approximately 65% of the total National Health Insurance (NHI) expenditure.<sup>5</sup> The current Taiwan GB program is an expenditure-cap system with a "floating point value" mechanism that is used to precisely match the predetermined budget using the formula:

$$\Sigma[(\text{service volume}) \times (\text{unit prices})] \times [\text{floating point value}] \quad [1]$$

The predetermined budget in a particular year is negotiated and determined by the previous year's budget. To meet the predetermined national expenditure, the total expenditure claimed is reimbursed based on an adjusted amount—the expenditure claimed multiplied by the floating point value. The floating point value for each hospital is retrospectively determined every 3 months after the completion of official review for previous claims. According to the formula, the floating point value is negatively associated with the nationwide service volume, which includes the number of patients seen and issued medical orders. A higher service volume will result in a lower floating point value that year for all contracted hospitals. For the purpose of reducing the growing expenditures on health care, the Bureau of National Health Insurance (BNHI) in Taiwan introduced "Hospital-based Self-management" in January 2004, which is a hospital-based GB program.<sup>6</sup> The BNHI encouraged hospitals to participate voluntarily in the Hospital-based Self-management project. Many adaptive medical approaches to the implementation of GB in hospitals have been applied, which include: (1) persuading and enforcing physicians to prescribe cheaper drugs; (2) limiting the kinds of drugs drawn into the hospital; and (3) implementing computerized physician order management to reduce drug expenditures.<sup>7</sup> Because of the impact of GB, changes in physicians' medical behavior such as reduced prescription of drugs, limited daily service hours in clinics,<sup>8</sup> and reduced drug expenditures<sup>9</sup> have been noted in studies conducted in Western countries. The progressive implementation of GB for different medical services has enabled researchers to examine the effects of the policy on clear timelines.

The use of second-generation antipsychotics (SGAs) was believed to have been reduced by the implementation of GB. However, in Taiwan and in other nations, there are few data supporting this postulation. Furthermore, psychiatric services in Taiwan are provided by four main types of institutions: medical centers, psychiatric centers, public hospitals, and

private hospitals. Business operating characteristics such as finance and management model are assumed to be different among various types of hospitals.<sup>10–12</sup> We postulated that the incentives for psychiatrists to prescribe SGA vary by hospital type. To our knowledge, the impact of GB on psychiatrists' prescriptions of SGA for schizophrenic patients has not been investigated. Thus, in the present study, we evaluated the effects of GB on the use of SGA prescriptions by psychiatrists in various types of hospitals.

This study attempted to answer two questions. First, does the implementation of hospital-based GB affect psychiatrists' ongoing prescription of SGA for the treatment of schizophrenia? Second, if this kind of impact does exist, is it different among various types of hospitals? This study accordingly examined two hypotheses: (1) after the implementation of GB, the proportion of SGA use in outpatients would still show a rising trend, regardless of the effects of GB; and (2) compared to psychiatrists in the public sector and psychiatric centers, their counterparts in the private sector and in medical centers are less likely to decrease their use of SGA prescriptions.

## 2. Methods

### 2.1. Database

This study was approved by the Institutional Review Board of Yuli Hospital, Hualien, Taiwan. Data from between 2001 and 2004 were collected from the NHI database, which included outpatients who were diagnosed as having schizophrenia during the period of 1996–2001. The SGAs included in the study were clozapine, risperidone, olanzapine, quetiapine, ziprasidone, zotepin, and amisulpride. We set the "dividing point" as January 2004 for several reasons. First, physicians' behavior may have been affected by a lag effect after the implementation of a hospital physician integration strategy.<sup>13</sup> Second, during the months of April 2003 through December 2003, an epidemic of severe acute respiratory syndrome may have prevented patients from going to the hospitals to see their doctors in person<sup>14</sup>; they may instead have preferred chronic disease refill cards to maintain their previous treatments. Third, after the implementation of GB, the medical charges in certain areas within hospital departments were still not under GB control from July 1, 2003 to December 31, 2003.<sup>15</sup> The percentages of SGA expenditures (i.e., the expenditure of SGA/the expenditure of all antipsychotics) in outpatient departments were calculated for the observation period. We used descriptive statistics to examine the trends of SGA use.

### 2.2. Data analytic procedures

A general linear regression model (GLM) was applied to compare trends in the proportion of SGA expenditures before and after the dividing timepoint. Differences in SGA expenditure were examined, based on public sectors versus private sectors and based on psychiatric centers versus medical centers. The statistical software of STATA 8.0 (Stata

Corporation, Texas, USA) and SAS 9.1 (SAS Institute, Cary, NC) were used. Fig. 1 shows the algorithm of data selection, analysis, and stratification.

The GLM was based on our analysis of the global trends of SGA use, which were used to set up the regression equation below:

$$\text{Proportion} = \text{intercept} + x1*\text{time} + x2*\text{event} + x3*\text{time} * \text{event} \quad [2]$$

“Proportion” indicates the proportion of SGA expenditure; “time” is the number of months between the starting point of the database and the point under examination. “Event” indicates the implementation of GB; event = 0 is the condition prior to the implementation of GB and event = 1 is the

condition after the implementation of GB. To examine whether the trends in the proportion of SGA expenditure changed after the dividing timepoint, we determined the significance of interactions for “time” and “event”. To investigate the trends of SGA use between the public sector and private sector, we set up an equation below:

$$\text{Proportion} = \text{intercept} + x1*\text{time} + x2*\text{event} + x3*\text{time} * \text{event} * \text{type} \quad [3]$$

“Type” indicates the types of sectors; type = 0 indicates the public sector and type = 1 indicates the private sector. To examine whether the trends in the proportion of SGA expenditure changed after the dividing timepoint between the public and private sectors, we similarly assessed whether the

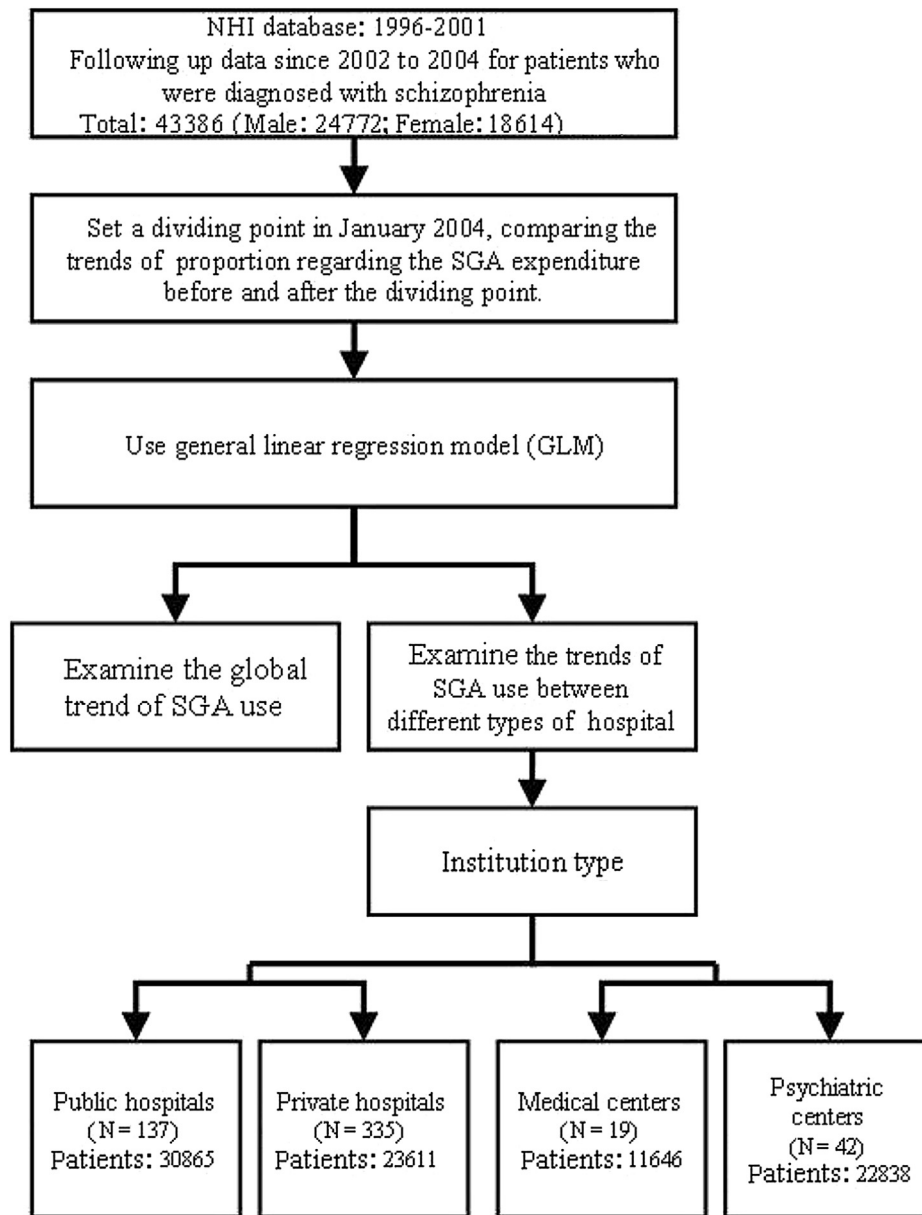


Fig. 1. The algorithm of data selection, analysis, and stratification. SGA = second-generation antipsychotic.

Table 1  
Multi linear regression model of global budget intervention and time on second-generation antipsychotic usage proportion.

Variables	Regression coefficient	Standard deviation	p
A: Time after GBI (mo)*	0.004	0.0003	<0.0001
B: GBI event (reference, before GBI)*	0.113	0.03	0.0006
Interaction: A × B*	-0.004	0.001	0.0004

\*Indicates a significance level of  $p < 0.05$ .  
GBI = global budget intervention; SGA = second-generation antipsychotics.

interactions between time, event, and type were significant. A significant interaction term suggested that the usage patterns of SGAs after the dividing timepoint varied among the different types of hospitals.

### 3. Results

#### 3.1. Characteristics of the study samples

A total of 43,386 individuals, which included 24,772 males and 18,614 females, met the criteria for conducting comparisons between 137 hospitals in the public sector and 335 hospitals in the private sector, and between 19 medical centers and 42 psychiatric centers. The following GLM regression equation was applied (Table 1):

$$\text{Proportion} = 0.511 + (0.004 \times \text{month}) + (0.113 \times \text{event}) - (0.004 \times \text{month} \times \text{event}) \quad [4]$$

#### 3.2. Comparison of SGA usage trends prior to and after the dividing timepoint

Second-generation antipsychotic usage continued to rise after the regulations restricting the use of SGAs were loosened in September 2000. Prior to the dividing timepoint, the proportion of SGA expenditures continue to rise, whereas there was no obvious “rising trends” after the dividing timepoint with the apparent plateau lasting for 12 months. The trends of SGA expenditures in outpatient departments were significantly changed after the dividing point ( $t = -3.9, p = 0.0004$ ; Fig. 2).

#### 3.3. Medical centers versus psychiatric centers

The proportion of SGA expenditures in psychiatric centers showed a rising trend prior to the implementation of GB (i.e., prior to the dividing timepoint); however, the rate of increase was lower after the dividing timepoint. The proportions in medical centers showed a rising trend prior to the dividing timepoint. In the GB period, the proportion appeared initially to plateau, and thereafter had a slight subsequent decline. Fig. 3 shows that the trends of SGA use between these two types of hospitals differed significantly after the dividing timepoint ( $t = -5.3, p < 0.0001$ ).

#### 3.4. Public sector versus private sector

The proportion of SGA expenditures in public hospitals showed a smooth upward trend, whereas the proportion in

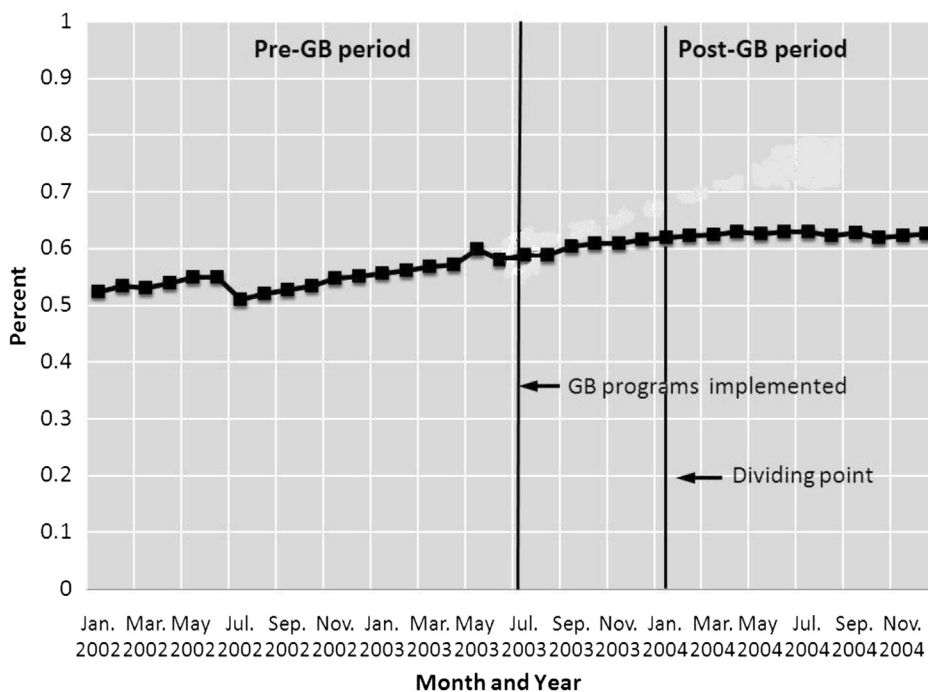


Fig. 2. The trends in the proportion of second-generation antipsychotic expenditures. There was an obvious drop in second-generation antipsychotic (SGA) expenditure in July 2002. We believe the implication of global budgeting (GB) in the psychiatry field at that time may explain the change. Beyond July 2002, the expenditure in psychiatry was excluded from the GB system.

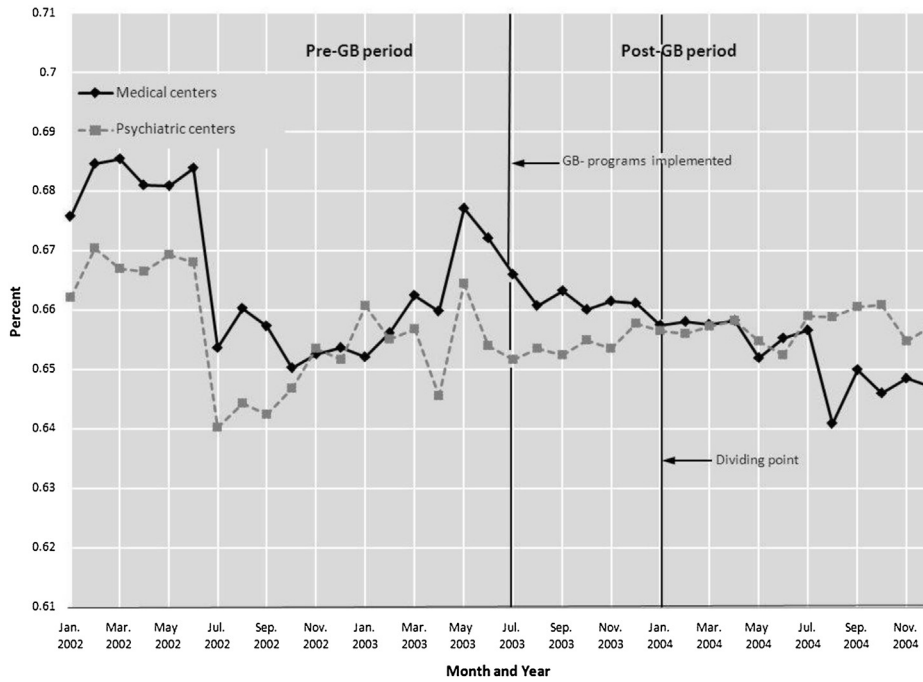


Fig. 3. The trends in the proportion of second-generation antipsychotic expenditures between medical centers and psychiatric centers in outpatient departments. GB = global budgeting.

private hospitals demonstrated a progressive decline. In addition, the trends of SGA use between these two types of hospitals were significantly different after the dividing timepoint ( $t = 2.6, p < 0.019$ ; Fig. 4).

#### 4. Discussion

Our findings indicate that the change in the medical payment system through the implementation of GB did indeed

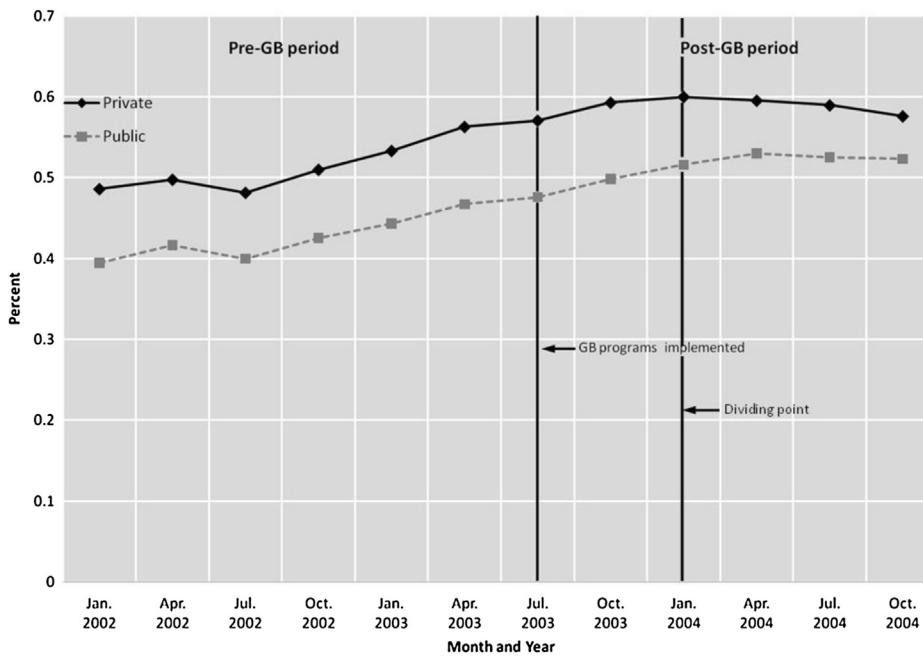


Fig. 4. The trends in the proportion of second-generation antipsychotic expenditures between private sector institutions and public sector institutions in outpatient departments. GB = global budgeting.

affect physicians' behavior, which was manifested by the prescription of SGAs and by the varying prescription pattern of SGAs based on hospital type. The proportion of SGA expenditures markedly increased after September 2002 when SGA regulations were loosened. It is reasonable to postulate that SGA use would continue to rise without the intervention of regulatory measures. However, this rise in SGA expenditure was apparently halted after the implementation of GB. Global budgeting had less impact on the rise in SGA expenditures in psychiatric centers, compared to medical centers, and GB was less effective at curbing the increase in SGA expenditures in the public sector, compared to private hospitals.

#### 4.1. Global budgeting and changes in psychiatrists' medical behavior in Taiwan

Our study indicated that the implementation of the GB program influenced the prescription patterns of psychiatrists. The financial incentive in GB was a key factor affecting physicians' medical behavior. The GB program in Taiwan adopts the concept of expenditure cap and predetermines the amount of reimbursement.<sup>9</sup> A set of indicators is assessed: quality indicators, observation indicators, and survey indicators. If the medical cost is above a predetermined upper limit, the NHI will not cover the amount that exceeds the limit. If the medical cost is below the upper limit and the standards of a set of indicators are reached, the hospital can make a certain amount of profit. As noted in one study,<sup>4</sup> hospitals must reasonably reduce some costs such as pharmaceutical expenditures to maximize margins. An investigation of a psychiatric department in a general hospital that had implemented GB revealed the following phenomena: "increased number of days of prescription for psychiatric outpatient visits, diminution of the average length of hospitalization, and a reduction in the kinds of medication typically prescribed during hospitalization".<sup>13</sup>

#### 4.2. SGA use and types of hospitals

There are several possible reasons why the prescription pattern of SGAs could vary by the type of hospital. For the public sector, there is a weaker motivation to reap profits<sup>12</sup> and to receive the maximum budgetary imbursement from the NHI program. There is less financial pressure on public hospitals than on hospitals in the private sector.<sup>12</sup> Public hospitals have consequently shown a slower response to changes in medical policies.<sup>16</sup> In addition, the public sector tends to be held to a higher standard by the general population to meet their expectations, and this suggests that physicians in the public sector are likely to have a stronger concern for the welfare of the patients.<sup>12</sup> Some private hospitals in Taiwan have conversely adopted a physician fee program to improve physicians' performance. Hence, leaders and physicians in public hospitals are probably less influenced by economic incentives. Thus, they may tend to prescribe SGAs more in accordance with their patients' needs and be less affected by nonclinical factors.

#### 4.3. The significance of SGA usage pattern in public psychiatric centers

In September 2002, Taiwan's NHI loosened the regulations for the use of SGAs, based on their supremacy over first-generation antipsychotics (FGAs) for patients with schizophrenia. In comparison with the FGA, the SGAs such as risperidone and olanzapine have superior efficacy for negative symptoms, fewer extrapyramidal side effects, fewer relapses, and more effective control of psychotic symptoms<sup>17</sup> and tardive dyskinesia.<sup>18</sup> The SGAs also enhance compliance and life quality.<sup>19</sup> Clozapine, the SGA to be developed, is also regarded as the most effective medication for treatment-resistant schizophrenic patients.<sup>20</sup> Even though the SGAs are more expensive than FGAs, the use of SGAs continues to increase with a corresponding decrease in the use of FGAs in many countries, which suggests SGAs may be more effective than FGAs.<sup>21–25</sup> In view of the better efficacy for refractory patients, fewer and less severe neuromuscular side effects, and improved life quality, SGA use in psychiatric care could accordingly be an indicator of the quality of treatment in schizophrenic patients. In our study, the SGA use pattern in public psychiatric centers appeared least likely to be influenced by the implementation of GB (i.e., by financial incentives).

#### 4.4. Strengths and limitations of the study

Our study is the first investigation to explore the changes in the psychiatric care-related prescribing patterns of SGAs after the implementation of GB in Taiwan. Similar studies have analyzed smaller datasets. However, in the present study a large sample was obtained from Taiwan's NHI database, which is a national database. Furthermore, the database encompassed various types of hospitals such as psychiatric centers and medical centers in the public and in the private sectors, which allowed the authors to determine whether the type of hospital influenced the impact of GB on SGA use.

Another strength of this study was that an extended duration of follow-up was used. A 3-year period of observation was analyzed (1.5 years prior to and 1.5 years after the implementation of GB). Our study described findings related to the implementation of a large-scale global budgeting program in Taiwan, a country with relatively conservative gross domestic product health costs, and may therefore serve as a useful example for similar countries looking to develop effective strategies that can reign in escalating health care costs.

There were nonetheless some limitations in this study. Because there are strict privacy regulations which limit access to certain data in the NHI database, it was not possible to identify which hospitals were taking part in the hospital-based GB after July 2003. Hence, we used the whole database to compare the changes of the prescribing pattern after the implementation of GB in our study. This possibly underestimated the extent of decreased use of SGA. However, global trends of SGA use were obviously changed after the dividing timepoint. Thus, we are confident that GB did indeed have an effect on SGA use, even though not all medical or

psychiatric centers joined the GB program during the study period. If drug prices had changed during the observation period, the analysis of changes in the proportion of drug expenditures could have been confounded. However, there was no significant change of drug prices during the study period in our survey.

In addition, education is also a factor that influences physicians' medical behavior.<sup>3</sup> When the U.S. Food and Drug Administration (FDA) issued an advisory concerning the increased risk of suicide attempts among adolescents taking selective serotonin reuptake inhibitors (SSRIs), the number of SSRIs prescribed was reduced significantly.<sup>26</sup> The effects of education on physicians' medical behavior could not be completely excluded in our study. In recent years, metabolic syndrome caused by SGAs has become an important issue.<sup>27–29</sup> Many psychiatrists are becoming more cautious and conservative in prescribing SGAs because of education by reading current literature, engaging in peer group discussions, and attending international forums. This effect may be less pronounced in our study for the following reasons. The impact of education with regard to complications of SGA was assumed to be distributed evenly in each type of hospital. After the implementation of GB, there was no official advisory in Taiwan on the metabolic side effects of all kinds of SGAs that was similar to the advisory on SSRIs issued by the FDA in the United States.

To date, very few studies have examined the effects of hospital-price regulation on the prescription of psychotropic agents. More research is needed on this increasingly important issue because many governments are adopting health policies to contain expenditure, which could result in reduced quality of care, especially for those with severe mental illness. We herein propose several recommendations, based on our findings that health policymakers may find useful. The government should identify psychiatric patients with major psychiatric disorders so that adequate care can be provided, even in the event that the expenditure cap is exceeded. It is also important to carefully evaluate the future impact of health policy prior to its implementation, and subsequently design a more stable strategy to avoid reducing these patients' quality of care (e.g., by limiting the use of SGAs). Furthermore, it is important for the government to value the important contribution of public psychiatric hospitals and to maximize the financial aid and quality of care in the public sector. Further suggestions include the following: after the implementation of GB, outcomes can be compared regarding medical quality or patients' quality of life such as readmission rates, years of hospitalization, suicide rates, and level of patient satisfaction. In addition, the same model can be applied to assess the extent of change in the prescription pattern for other psychotropic medications such as antidepressants, anxiolytics, and mood stabilizers.

In conclusion, our study has suggested that the implementation of GB did in fact change physician prescription behavior. Financial incentives derived from the programs and compensation schemes have an important role in forming the adaptive behaviors of hospitals and individual physicians. In addition, public psychiatric hospitals may offer better

treatments for patients with chronic schizophrenia who need long-term institutional care. Our findings demonstrated that the quality of care in public psychiatric hospitals for chronic psychotic patients must be enhanced. Health policymakers must consider the potential negative impact of GB on public mental health institutions.

The authors hope that the present study will stimulate further research interest to determine the effects of health policies on the behavior of psychiatrists and hospitals with a view of promoting the quality of life and the mental health of patients in need of psychiatric care.

## Acknowledgments

This study is financially supported by grant number YLH-IRP-9601, and approved with certificate number YLH-IRB-9604 by the local Institutional Review Board of Yuli Hospital (Hualien, Taiwan). This study is based in part on data from the National Health Insurance Research Database provided by the Bureau of National Health Insurance, Department of Health, and managed by the National Health Research Institutes. The interpretations and conclusions contained in the paper do not represent those of the Bureau of National Health Insurance, Department of Health, or National Health Research Institutes.

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