Outpatient Drug Expenditures and Prescription Policies for Diseases with High Cost to the National Health Insurance System in Taiwan

Hui-Chu Lang,[1] Mei-Shu Lai,[2] and Gau-Tzu Chen[3]

Background and Purpose: The high cost of drugs, particularly those used to treat upper respiratory tract infections, is an increasingly important problem for the National Health Insurance system in Taiwan. This study proposed a new classification scheme for reimbursing drug cost and estimated its impact on expenditures and health care utilization.
Methods: Data were obtained from the National Health Research Institutes' year 2000 computer file of the National Health Insurance Academic Research Database in Taiwan. Two factors were used to classify medications: 1) urgency of medications required; and 2) patient's self-care ability.
Results: Among the 10 diseases with the highest number of outpatient department (OPD) visits, 7 were upper respiratory diseases. Acute upper respiratory infections (URIs) and acute nasopharyngitis were the 2 diseases with the highest number of OPD visits. Drug expenditure for acute URIs is about 6% of total expenditure for drugs. Medications suitable for URIs patients' self-care accounted for 42.8% of the total cost of prescribed drugs for these illnesses, and treatment medications unsuitable for patients' self-care accounted for 48.6%. Other medications used for URIs could not be grouped into these categories. The total expenditure for acute nasopharyngitis was about 1.3% of total expenditure for drugs. Medications suitable for self-care in patients with nasopharyngitis accounted for 51.8% of the total cost of medication prescribed for this illness, and medications unsuitable for patients' self-care accounted for 36.8%.
Conclusions: Reducing the medications suitable for patients' self-care and enforcing different levels of payment rates on medications unsuitable for patients' self-care may reduce the excessive use of OPD drugs, improve the appropriateness of utilization for acute URIs and the common cold, and allow medical resources to be distributed more efficiently.

Key words: Economics, pharmaceutical; Health expenditure; Health insurance; Respiratory tract infections

J Formos Med Assoc 2004;**103**:280-5

Expenditures by the National Health Insurance (NHI) system in Taiwan have increased each year since its inauguration on March 1, 1995. Based on the 2002 report of NHI statistics for the year 2001,[1] drug expenditures for health care in 2001 reached 82,400,000,000 New Taiwan Dollars (NTD) [equivalent to US$2,459,701,493, where 1 NTD = 33.5 US$]. Drug expenditures accounted for 26% of these costs and the costs for drugs distributed at clinics accounted for 30% of the total medical costs for outpatient service department (OPD) expenditures. These percentages for drug costs are significantly higher than those in European countries.[2] Therefore, OPD medical care utilization, especially the appropriateness of OPD drugs prescribed with regard to control of their quality and costs, is an important factor in determining the feasibility of the continuation of the NHI program.

Upper respiratory diseases are among the most important and the most frequent disease categories responsible for OPD visits. Although they are rarely fatal, upper respiratory diseases have a great impact on the patient's quality of life and often lead to patients taking time off from work or school because of physical discomfort; thus, the social costs of upper respiratory diseases are fairly high.[3] Upper respiratory tract infections (URIs) are usually self-limiting and subside with time. According to evidence-based medicine, few URIs can be cured effectively by prescription drugs. Nevertheless, prescription drugs are often overused for the treatment of URIs,[4] and sometimes may

---

cause serious side effects.[5,6] Clinical reports have cited the overuse of antibiotics, which do not shorten the course of acute infections due to viruses or prevent subsequent bacterial infections.[7,8]

A study[9] found that people in Japan averaged 16.0 OPD visits per person in 1998, while visits for URIs (International Classification of Diseases, 9th edition, Clinical Modification [ICD-9-CM]: 460-465 or A-code: A312) accounted for only 6.0% of the total number of OPD visits, and the cost of drugs for URIs accounted for only 2.6% of the total costs of OPD drugs. In comparison, year 2000 data in Taiwan showed a lower average number of visits per person (13.6 *vs* 16.0), but the average OPD visit for URIs accounted for 30.5% of the total number of OPD visits, far more than that in Japan. The cost of drugs prescribed for URIs accounted for 13.5% of the total OPD drug costs, with up to 94% of patients receiving prescriptions for URIs. This suggests an inadequate understanding of upper respiratory diseases in Taiwan, and that little importance is attached to self-care, with heavy reliance on the use of drug treatment.

In many countries, drugs covered by insurance systems are divided into prescription drugs and non-prescription (over the counter [OTC]) categories. Generally, payment for OTC drugs is not covered by health plans. In terms of prescription drugs, few insurance systems or providers cover full payment of all prescription drugs. Some insurance plans cover costs of prescription drugs, some cover part of the costs, and some do not cover them at all. In general, insurance companies' formularies are based on the safety, cost, and efficacy of the drugs. Many private health insurance plans now offer incentive-based formularies, in which drugs are placed into different tiers. Under these plans, most drugs are covered, but enrollees pay different copayments depending on the tier to which a drug is assigned. Two-tier plans are commonplace, with a higher copayment for brand name drugs than generic drugs. However, an increasing number of employers are offering 3-tier benefits with 3 copayment levels. These plans typically set the lowest copayment for generic drugs, the middle copayment for formulary or preferred brands, and the highest copayment for non-formulary brands.

Four plans have been proposed for NHI drug payments by the Benefit Plan for NHI Drugs subcommittee of the Medical Care Resource Allocation Group, Second Generation NHI Research Team in Taiwan.[10] The first plan follows the current policy which does not cover any expenditure for OTC drugs. The second plan reduces the benefit coverage of NHI drugs gradually. The third plan classifies health care drugs according to the character and the type of treatment and then sets different coinsurance rates.

The fourth plan sets 3-tier beneficiary deduction plans for all OPD drugs.

This study grouped medications according to the classification methods adopted by the second and third plans listed above to access doctors' current prescribing habits for diseases with high OPD utilization in Taiwan and to predict the possible benefits of each of the different payment policies after this classification method is adopted.

Theoretically, use of the 2 plans that reduce the range of drugs paid for by NHI or setting different copayment rates according to the character and type of treatment may reduce the possibility of problems such as medical accessibility and the progression of minor ailments into fatal diseases if only hospitalization cases, but not OPD visits, are covered by insurance (that is, a policy which insures for catastrophic but not minor illnesses). It may also lead to more efficient use of medical resources, so that drug expenditures for health care will be reduced.

The specific aims of this study were as follows. First, we aimed to determine the 10 clinical diseases accounting for the highest number of OPD visits. Then, using the 2 diseases with the highest number of OPD visits as examples, we estimated the possible impact on costs if the policy proposed above — that is, gradually reducing the scope of payment of NHI drugs and setting different copayment rates according to the type of treatment — was adopted.

Methods

Data in this study were obtained from National Health Research Institutes' year 2000 records of the National Health Insurance Academic Research Database. The database includes files on ambulatory care expenditures by visit and details of ambulatory care orders. Both files were systematically sampled using data from 1 in every 500 cases. The 2 files were merged by identification codes. Then, the files were combined according to NHI drug constituent reimbursement category and Anatomical Therapeutic Chemical (ATC) code.

However, because the file of ambulatory care expenditures by visits and the file of details of ambulatory care orders were obtained by systematic sampling (i.e., 1/500), and because combination variables such as the ATC code had missing values, it was difficult to accurately estimate the actual totals in this study. Therefore, percentages were adopted to show the estimated results. Totals were obtained by multiplying 500 by the sum in the details of ambulatory care orders file, and the amount of expenditure for each category was obtained by multiplying the totals by the percentage. Because ICD-9-CM was adopted as the disease

classification system in the year 2000, payment cannot be made by the NHI if classification is done by the A-code; thus, only a few records still use the A-code (a simplified patient classification system that is only used in Taiwan). Compared with the ICD-9 codes, the A-code classification system is rather imprecise and may include several ICD-codes in a single A-code (for example, A-code A321 covers ICD-9 codes 460, 461, 462, and 465), making it impossible to calculate the incidence of the individual diseases. According to our calculations, 5% of patients were claimed with an A-code. In this study, files that used the A-code were not included in the final calculations, and consequently, the total expenditures estimated in this study may be lower than the real expenditures.

The 10 OPD diseases with the highest number of OPD visits in NHI were determined by referring to the first 3 digits of ICD-9-CM codes for diseases in the ambulatory care expenditures by visits file. The second and the third plans proposed by the Medical Care Resource Allocation subcommittee of the second-generation NHI were then applied, which respectively aim to reduce the benefit coverage of NHI drugs gradually and set different copayment rates according to the character and the type of treatment, and then classify health care drugs. The following 2 factors are considered in the classification:[11] urgency of medications required and the patient's self-care ability. In terms of urgency of medications, there are 3 levels: A) medications used when life is threatened; B) medications used to treat and control common diseases; and C) medications mainly used to eliminate symptoms. In terms of the patient's self-care circumstances, there are 2 levels: 1) medications unsuitable for patients' self-care; and 2) medications suitable for patients' self-care. Taking these 2 classification factors together, medications can be grouped into 1 of 6 types — A1, B1, C1, A2, B2, and C2, with an additional group for medications that cannot be grouped or with evident controversy. In this study, classification was done by an experienced clinical pharmacist. The percentage of each type of medication and the total

medical care expenditure were then calculated. Based on the 2 diseases with the highest number of OPD visits, this study estimated the possible impacts of instituting the new policy mentioned in this study (gradually reducing the scope of payment of NHI drugs and setting different copayment levels according to the type of treatment).

Results

Diseases with the highest number of OPD visits

Among the 10 diseases with the highest number of OPD visits, 7 were upper respiratory diseases. These included, in rank order, acute URIs (first; ICD-9: 465), acute nasopharyngitis (common cold; second; ICD-9: 460), acute bronchitis and bronchiolitis (third; ICD-9: 466), acute laryngitis and tracheitis (fifth; ICD-9: 464), acute sinusitis (sixth; ICD-9: 461), acute tonsillitis (seventh; ICD-9: 463), and acute pharyngitis (tenth; ICD-9: 462) [Table 1].

Drug cost distributions for acute URI and common cold

In this study, we analyzed the 2 diseases with the highest OPD utilization rate, that is, acute URIs and acute nasopharyngitis (common cold). Table 2 shows the total costs and drug costs alone of URIs and common cold. As expected, health care costs were significantly different among hospital levels, departments and patients of different ages. Primary care clinics had the lowest claims for URIs in both total cost (range, 319 to 564 NTD) and drug cost (range, 91 to 247 NTD) per visit. Similar results were found for common cold in total cost (range, 316 to 605 NTD) and drug cost (range, 92 to 230 NTD) per visit. In terms of department and patient age, although significant differences were found within departments and patient age groups, these cost differences were much smaller compared with the effect of hospital level.

Table 1. Diseases with the highest number of outpatient department visits for the year 2000.

Rank order	ICD-9-CM Code	Disease	Number of visits
1	465	Acute upper respiratory infections of multiple or unspecified sites	103,656
2	460	Acute nasopharyngitis [common cold]	21,793
3	466	Acute bronchitis and bronchiolitis	21,453
4	372	Disorders of conjunctiva	14,991
5	464	Acute laryngitis and tracheitis	13,305
6	461	Acute sinusitis	11,977
7	463	Acute tonsillitis	11,838
8	401	Essential hypertension	11,451
9	250	Diabetes mellitus	10,219
10	462	Acute pharyngitis	8549

ICD-9-CM = International Classification of Diseases, 9th edition, Clinical Modification.

Table 2. Total costs and drug costs distributions for acute upper respiratory infections and common cold.*

	Acute upper respiratory infections (ICD-9: 460)						Common cold (ICD-9: 465)					
	Total cost (NTD)			Drug cost (NTD)			Total cost (NTD)			Drug cost (NTD)		
	Mean	SD	*p* value	Mean	SD	*p* value	Mean	SD	*p* value	Mean	SD	*p* value
Hospital level												
Medical center	564	306	< 0.0001	247	219	< 0.0001	605	574	< 0.0001	230	369	< 0.0001
Area hospital	503	425		170	186		514	493		163	273	
Local hospital	366	133		112	96		382	187		119	151	
Primary care (clinics)	319	54		91	32		316	56		91	33	
Others	332	68		92	59		345	125		96	60	
Department												
General medicine	320	50	< 0.0001	88	36	< 0.0001	319	63	< 0.0001	91	35	< 0.0001
Family medicine	319	58		93	40		323	73		92	53	
Internal medicine	335	82		94	57		347	133		100	74	
Pediatrics	324	141		99	44		320	117		98	46	
Others	335	123		100	69		331	184		100	125	
Age												
≤ 14 years	320	93	< 0.0001	96	37	0.0003	318	77	< 0.0001	95	37	< 0.0001
15–39 years	332	105		94	62		327	115		93	71	
40–64 years	331	80		92	51		333	137		96	83	
≥ 65 years	339	115		97	82		343	197		102	134	

* Values are in New Taiwan Dollars (NTD), where 1 NTD = 33.5 US dollars.
ICD-9 = International Classification of Diseases, 9th edition.

Table 3. Classification of medications for acute upper respiratory infections.*

	Medications used when life is threatened	Medications used to treat and control common diseases	Medications mainly used to eliminate symptoms	Medications that cannot be grouped	Total (NTD × 1000)
Medications unsuitable for patients' self-care	631,959 (12.8%)	1,707,099 (34.6%)	60,294 (1.2%)	424,246 (8.6%)	2,399,352 (48.6%)
Medications suitable for patients' self-care	5771 (0.1%)	667,996 (13.5%)	1,443,270 (29.2%)		2,117,037 (42.8%)
Total					4,940,000 (100%)

* Values are in New Taiwan Dollars (NTD), where 1 NTD = 33.5 US dollars.

Effect of gradually reducing scope of NHI prescription benefit

We classified drug expenditures (excluding pharmacy service fees) for each disease according to the classification method mentioned above in order to predict the possible impact of adopting different NHI drug benefit plans. The health care data were obtained from the National Health Research Institutes' records for the year 2000.

The results in Table 3 show that drug expenditures for acute URI were about 4,940,000,000 NTD, which was 6.0% of total expenditure for drugs. Among the total, medications unsuitable for patients' self-care accounted for 48.6% (A1 + B1 + C1); medications suitable for patients' self-care accounted for 42.8% (A2 + B2 + C2); and medications that could not be grouped accounted for 8.6%. Among medications unsuitable for patients' self-care, medications used for life-threatening ailments accounted for 12.8% ; medications used to treat and control common diseases accounted for 34.6%; and medications mainly used to eliminate symptoms accounted for only 1.2%. Among medications

suitable for patients' self-care, medications used to treat and control common diseases (B2) accounted for 13.5% and medications mainly used to eliminate symptoms (C2) accounted for 29.2%.

The classification of medications used to treat acute nasopharyngitis (common cold) is shown in Table 4. The total drug expenditure for acute nasopharyngitis was about 1,031,000,000 NTD, which was 1.25% of total expenditure for drugs. Medications unsuitable for patients' self-care accounted for 36.8%, medications suitable for patients' self-care accounted for 51.8%, and medications that could not be grouped accounted for 11.3%. Among medications unsuitable for patients' self-care, medications used for life-threatening events accounted for 12.3%, medications used to treat and control common diseases accounted for 23.1%, and medications used to eliminate symptoms only accounted for 1.4%. Among medications suitable for patients' self-care, medications used to treat and control common diseases accounted for 12.4% and medications mainly used to eliminate symptoms accounted for 39.4%.

Table 4. Classification of medications for acute nasopharyngitis (common cold).*

	Medications used when life is threatened	Medications used to treat and control common diseases	Medications mainly used to eliminate symptoms	Medications that cannot be grouped	Total (NTD × 1000)
Medications unsuitable for patients' self-care	126,756 (12.3%)	238,120 (23.1%)	14,739 (1.4%)	116,164 (11.3%)	379,615 (36.8%)
Medications suitable for patients' self-care		128,259 (12.4%)	406,602 (39.4%)		534,861 (51.8%)
Total					1,031,000 (100%)

* Values are in New Taiwan Dollars (NTD), where 1 NTD = 33.5 US dollars.

Discussion

Hospital level, department, and patient age are important factors determining the cost of treatment for acute URIs and the common cold. There is no enforced referral system in Taiwan. This study provides information which may be useful in determining whether different classes of drugs should be covered by insurance, or whether different classes of drugs should differ in their coinsurance or copayments.

In many countries, health care drugs are divided into prescription drugs and OTC drugs. For example, in the United States, early in 1951, the Durham-Humphrey Amendment[12] set forth the basis for distinguishing between prescription and OTC medications. The amendment specified that 3 classes of drugs be available by prescription: habit-forming drugs; drugs that were unsafe for use except under expert supervision because of toxicity or other possible harmful effects; and drugs limited to prescription under a manufacturer's new drug application.[13]

Approval of OTC status for a drug requires an assessment by the Food and Drug Administration that the drug is safe and effective. Unfortunately, the information needed to evaluate how drugs will actually be used by consumers if approved for OTC status is not always available.[14] The decision to make a drug available OTC and, in particular, to change the status of a drug from prescription-only to OTC raises questions relevant to the quality of health care, patients' access to drugs, patients' autonomy, and the costs of health care.

Using our classification method, in terms of acute URIs, non-payment for C2 medications (used to eliminate symptoms and suitable for patients' self-care) had the least influence on patients' health. In terms of efficiency of resource distribution, this type of medication has the least importance. Therefore, this study suggests that C2 drugs can be listed as non-prescription drugs, and that insurance should not cover these drugs. In this way, nearly 30% (NTD 1,443,270, 000) of the total drug expenditure for acute URIs would be saved per year. If payment for

B2 medications (used to treat and control common diseases and suitable for patients' self-care) is not granted, 43% (NTD 2,117,200,037) of the total drug expenditure for acute URIs would be saved per year.

In terms of acute nasopharyngitis (common cold), if the payment for C2 medications is refused, about 39.5% (NTD 406,602,000) of the total expenditure for treatment of common cold could be saved, and if payments for C2 and B2 medications are not covered, 53% (NTD 534,861,000) of the total expenditure for the common cold could be saved.

In addition, in terms of prescription drugs in categories B1 and C1, different payment rates can be adopted. Most previous studies that have looked at the impact of cost-sharing for prescription drugs have reported a decline in the use of such medications. The impact tended to be greater for the use of non-essential medications than for essential drugs.[15–18] Tamblyn et al[19] recently examined the impact of the reform of the Quebec drug policy on elderly patients and welfare recipients affected by the changes. They found that use of both essential and non-essential drugs decreased after the policy reform. In addition, they found that the decline in the use of essential drugs was associated with an increase in serious health events and visits to the emergency department.

The desire to control health care costs has led to considerable variation in how employers and health insurance providers structure formularies, design benefits, and provide incentives to both physicians and patients. It was found that many of the tools used to influence pharmaceutical use were effective in reducing drug expenditures for working-age enrollees with employer-provided drug coverage. Adding an additional level of copayment and increasing existing copayments or coinsurance rates significantly reduced health insurance plan payments. Doubling patient copayments lowered average drug spending by as much as one-third, reducing both the likelihood of having a claim and the level of spending conditional upon use of the drug.[20]

From the point of view of medical resource distribution, improper use of drugs for URIs is a waste of resources, and theoretically, payment should not

be granted. However, because the public does not have a good understanding of URIs, sudden refusal to pay may have negative effects. In addition, the issue of medical access for disadvantaged patients and the possibility of untreated illnesses becoming more severe if left untreated must be addressed.

Taking the above factors into consideration, the NHI policy for drug benefit might benefit by first working to increase the public's understanding of respiratory diseases, and then gradually reducing the scope of drugs paid for by health insurance. Using the benefit plan for prescribed drugs in the OPD as proposed in this study, our results suggest that the excessive use of drugs in the OPD could be reduced, the clinic medical utilization rate for acute URIs and the common cold could be improved, and that medical resources could be distributed more efficiently. However, a limitation of this plan includes the fact that beginning a new classification system requires resources and is time-consuming. Senior experts' assistance and common understanding are needed, and with the advancement of science and technology, constant adjustment will be needed. Due to data limitations, our study did not explore the impact of different copayments or coinsurance rates. Further analyses are needed for policy decision-making.

References

1. Department of Health, the Executive Yuan, Republic of China: *National Health Insurance Annual Statistical Report, 2001.* Taipei: Bureau of National Health Insurance; June 2002: 314-5.

2. Organization for Economic Co-operation and Development: *OECD Health Data 2002: A Comparative Analysis of 30 Countries.* 4th edition, 2002. Washington, DC: OECD, 2002.

3. West JV: Acute upper airway infections. *Br Med Bull* 2002; 61: 215-30.

4. English JA, Bauman KA: Evidence-based management of upper respiratory infection in a family practice teaching clinic. *Fam Med* 1997; 29: 38-41.

5. Tylenol cold tablets (acetaminophen, chlorpheniramine, pseudoephedrine): Physicians' Desk Reference. 54th ed. Montvale, NJ: Medical Economics Company; 2000: 1676-7.

6. Gaedigk A: Interethnic differences of drug-metabolizing enzymes. *Int J Clin Pharmacol Ther* 2000;38:61-8.

7. Snow V, Mottur-Pilson C, Gonzales R: Principles of appropriate antibiotic use for treatment of nonspecific upper respiratory tract infections in adults. *Ann Intern Med* 2001;143:487-9.

8. Fahey T, Stocks N, Thomas T: Systematic review of the treatment of upper respiratory tract infection. *Arch Dis Child* 1998;79:225-30.

9. Huang SM: URI outpatient utilization. Technical Report of Second Generation National Health Insurance Conference, 2002.

10. Chen GT, Tam YH: The Benefit Plan for NHI Drugs. Report of Second Generation National Health Insurance. Taipei: Executive Yuan; 2003: 197-202.

11. Covington TR: Ed. Handbook of nonprescription drugs. 11th ed. Washington, DC: American Pharmaceutical Association. The National Professional Society of Pharmacists, 1996.

12. Humphrey-Durham Drug Prescription Act, Pub L No. 82-215. 65 Stat 648-649 (October 26, 1951).

13. Gossel EA: Implications of reclassification of drugs from prescription-only to over-the-counter status. *Clin Ther* 1991;13: 200-15.

14. Stuart B, Zacker C: Who bears the burden of Medicaid drug copayment policies? *Health Aff* 1999;18:201-12.

15. Soumerai SB, Ross-Degnan D, Avorn J, et al: Effects of Medicaid drug-payment limits on admission to hospitals and nursing homes. *N Engl J Med* 1991;325:1072-7.

16. Johnson RE, Goodman MJ, Hornbrook MC, et al: The effect of increased prescription drug cost-sharing on medical care utilization and expenses of elderly health maintenance organization members. *Med Care* 1997;35:1119-31.

17. Harris BL, Stergachis A, Ried LD: The effect of drug co-payments on utilization and cost of pharmaceuticals in a health maintenance organization. *Med Care* 1990;28:907-1017.

18. Joyce GF, Escarce JJ, Solomon MD, et al: Employer drug benefit plans and spending on prescription drugs. *JAMA* 2002;288: 1733–9.

19. Tamblyn R, Laprise R, Hanley JA, et al: Adverse events associated with prescription drug cost-sharing among poor and elderly persons. *JAMA* 2001;285:421-9.

20. Brass EP: Changing the status of drugs from prescription to over-the-counter availability. *N Engl J Med* 2001;345:810-6.