

《 Original Article 》

Drug Number and Cost Reduction through Pharmacist Participation in Medication Decision Making

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In Japan, there are few studies of the role of pharmacists in National Health Insurance-registered pharmacies (hereinafter called "insurance pharmacies") in reducing the number and cost of drugs through collaborations with other healthcare professionals in the community healthcare setting. In this study, we investigated whether the participation of pharmacists in medication decision making would lead to a reduction in the number and cost of drugs, in the case where pharmacists accompanied physicians who made visits for medical examinations to the special elderly nursing home Seikouen in Yubari City, Hokkaido, Japan.

The results showed that in July 2008 (the month before pharmacists participated in medication decision making), the number of drugs prescribed per resident per month was 8.1; after pharmacist participation (the period from August 2008 to November 2009), the number of drugs prescribed per resident per month decreased significantly to 6.0–6.8. The percentage decrease (%) in the number of drugs prescribed per resident per month also showed a significant decline relative to that in July 2008.

Drug cost per resident per day was 342.1 yen in July 2008 (before pharmacist participation), whereas it was significantly decreased from August 2008 to November 2009 (after pharmacist participation). Similarly, the percentage decrease (%) in drug price per resident per day declined significantly after pharmacist participation, relative to that in July 2008.

A stratified analysis of antihypertensive drugs revealed that whereas the number of antihypertensive drugs prescribed per resident per month was 2.2 in July 2008, the number decreased significantly to 1.7–1.8 from August 2008 to November 2009. The cost of antihypertensive drugs prescribed per resident per day was 93.0 yen in July 2008, and a significant decrease in the cost of antihypertensive drugs was observed as well after pharmacist participation.

Together, these results suggest that the involvement of pharmacists in medication decision making by physicians could potentially reduce the number and cost of drugs.

Key words; drug number, drug cost, pharmacist, community health care

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1. Introduction

In the United States, the Asheville Project¹⁻³⁾ is in place, which mandates monthly interviews with pharmacists and in return provides patients free medication under agreements with participating insurance companies. This project has resulted in improved medication adherence and reduced medical expenses as a whole, although no drug cost reduction.

Meanwhile, in Japan, comprehensive medical care has been promoted with an eye to achieving not only drug efficacy and safety but also cost reduction and cost-effectiveness in the light of medical economics, in particular, pharmacoeconomics.

Insurance pharmacies in Japan are expected to be actively involved in efforts to reduce social welfare expenses. Such efforts include the promotion of use of generic drugs and the elimination of overprescription, in addition to playing the main role of dispensing drugs and serving as the base for providing medications and medical and hygiene products (including home medical care) as medical provision facilities, in accordance with the Medical Care Act.

In order to evaluate in a more objective manner the contribution of pharmacists to medical care, it is necessary to quantify drug cost reduction as a measure of the economic contribution of pharmaceutical intervention.

From the perspective of reducing social welfare expenses, we examined how the participation of pharmacists in insurance pharmacies in medication decision making would change prescribing behavior and thereby reduce the number and cost of drugs prescribed per resident at a special elderly nursing home.

2. Methods

During the period between August 2008 and November 2009, we examined the number and cost of drugs prescribed per resident per month and per day at the special elderly nursing home Seikouen in Yubari City, Hokkaido, Japan. We expressed the cost of drugs by calculating drug price. During this period, pharmacists from Yubari branch of AIN Pharmacy accompanied physicians from Yubari Medical Center in visits to the nursing home for medical examinations, and participated in medication decision making for individual residents.

All data are shown as means \pm S.E. and statistical analysis was performed using Student's t-test. Values were considered significant at $P < 0.05$ versus the value of July 2008.

As the present study used only existing unlinked anonymized data, it was deemed unnecessary to consult with the Ethics Committee of Yubari Medical Center.

3. Results

We surveyed the number of drugs prescribed per resident per month. In July 2008, the month before the pharmacists participated in medication decision making, the number of drugs prescribed per resident per month was 8.1; after pharmacist participation (the period from August 2008 to November 2009), significant decreases in the number of drugs were observed, to 6.3 in August and September 2008, 6.5 in October 2008, 6.6 in November 2008, 6.4 in December 2008, 6.3 in January 2009, 6.7 in February 2009, 6.6 in March 2009, 6.4 in April 2009, 6.8 in May 2009, 6.0 in June and July 2009, 6.5 in August 2009, 6.0 in September 2009, 6.1 in



Figure 1. Influence of pharmacist participation in medication decision making on number of drugs

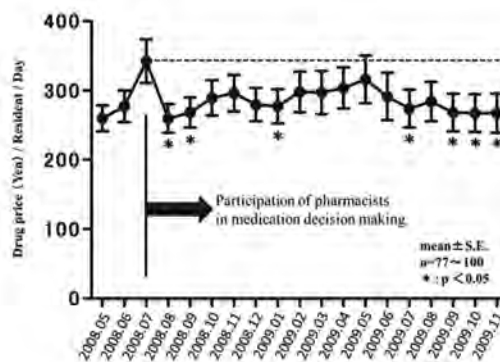


Figure 3. Influence of pharmacist participation in medication decision making on drug cost

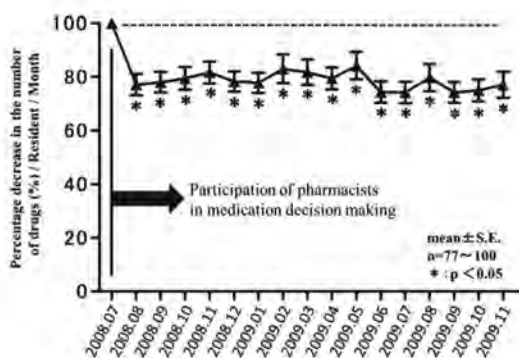


Figure 2. Influence of pharmacist participation in medication decision making on percentage decrease in number of drugs

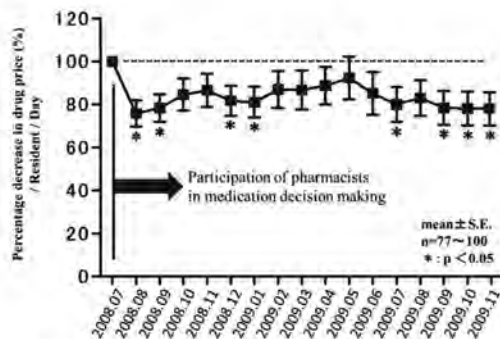


Figure 4. Influence of pharmacist participation in medication decision making on percentage decrease in drug cost

October 2009, and 6.3 in November 2009 (Figure 1). Next, we examined the percentage decrease (%) in the number of drugs prescribed per resident per month relative to that in July 2008, i.e., before pharmacist participation in medication decision making. After pharmacist participation, significant decreases were observed, to 77.2% in August 2008, 78.0% in September 2008, 80.0% in October 2008, 81.7% in November 2008, 78.4% in December 2008, 77.9% in January 2009, 83.0% in February 2009, 81.8% in March 2009, 79.5% in April 2009, 84.2% in May 2009, 74.4% in June 2009, 74.3% in July 2009, 79.8% in August 2009, 74.3% in September 2009, 75.1% in October 2009, and 77.1% in November 2009 (Figure 2).

As pharmacist participation in medication decision making led to a significant reduction in the

number of drugs prescribed per month for individual residents, we examined further how the drug price per resident per day might also be affected.

In July 2008, i.e., before pharmacist participation in medication decision making, drug price per resident per day was 342.1 yen. After pharmacist participation, significant decreases in the drug price per resident per day were observed, to 259.4 yen in August 2008, 268.1 yen in September 2008, 277.3 yen in January 2009, 273.9 yen in July 2009, 268.3 yen in September 2009, 267.5 yen in October 2009, and 267.1 yen in November 2009 (Figure 3). This study showed that of the 355 drugs used, 188 (approximately 53.0%) were proprietary drugs and 167 (approximately 47.0%) were generic drugs.

We also examined the percentage decrease (%) in drug price per resident per day after pharmacist

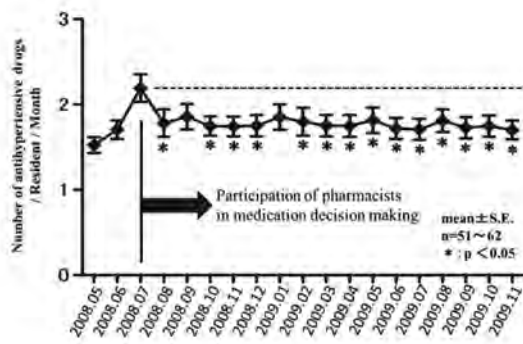


Figure 5. Influence of pharmacist participation in medication decision making on number of antihypertensive drugs

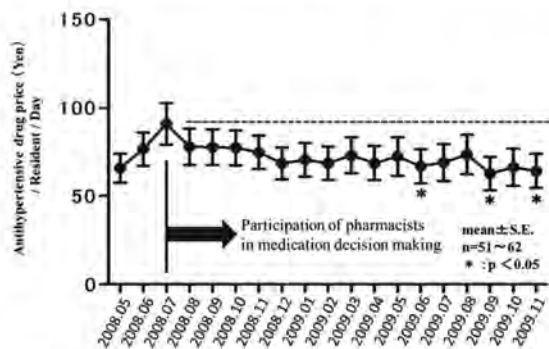


Figure 6. Influence of pharmacist participation in medication decision making on cost of antihypertensive drugs

participation in medication decision making, relative to that in July 2008, i.e., before pharmacist participation. Significant decreases were noted after pharmacist participation, to 75.8% in August 2008, 78.4% in September 2008, 81.7% in December 2008, 81.1% in January 2009, 80.1% in July 2009, 78.4% in September 2009, 78.1% in October 2009, and 78.2% in November 2009 (Figure 4).

The results of a stratified analysis of antihypertensive drugs revealed that in July 2008, the month before pharmacists participated in medication decision making, the number of antihypertensive drugs prescribed per resident per month was 2.2. However, after pharmacist participation, significant decreases were observed, to 1.8 in August 2008, 1.7 in October and November 2008, 1.8 in December 2008 and February and March 2009, 1.7 in April 2009, 1.8 in May 2009, 1.7 in June and July 2009, 1.8 in

August 2009, and 1.7 in September through November 2009 (Figure 5).

In July 2008, the month before the pharmacists participated in medication decision making, the price of antihypertensive drugs prescribed per resident per day was 93.0 yen; however, significant decreases were observed after pharmacist participation, to 66.9 yen in June 2009, 62.8 yen in September 2009, and 64.2 yen in November 2009 (Figure 6).

4. Discussion

The Asheville Project was launched in 1996 targeting city employees of Asheville, North Carolina, USA, a town with a population of roughly 80,000, to help diabetic patients better control their disease through pharmacist-directed counseling and patient compliance instructions. The project mandates monthly interviews with pharmacists and in return provides patients free medication under agreements with participating insurance companies. This program has resulted in improved medication adherence, and although drug cost reduction was not achieved, medical expenses as a whole was decreased, accompanied by a wide range of outcomes, including fewer absences due to treatment.

Many studies overseas have examined the role of pharmacists in clinical practice or evaluated their economic contribution⁴⁻¹¹). In contrast, in Japan, there are few reports of drug number and cost reduction through participation of pharmacists in insurance pharmacies who collaborate with other health professionals in the community healthcare setting, and only a handful of studies of the participation of hospital pharmacists in medication decision making¹²⁻¹⁴).

In June 2008, the attending physician at Seikouen was changed from a physician at a clinic in Yubari City to a physician at Yubari Medical Center. In addition to outpatient treatment and home visits, the physician, being newly assigned to Seikouen, increased the number of drugs prescribed in response to the various symptoms and medical conditions of the residents. As a result, the number of drugs prescribed per resident continued to increase until July 2008. After discussions among the physician, a pharmacist at an NHI-registered pharmacy, a hospital pharmacist at Yubari Medical Center, and a nurse at Seikouen, it was decided that the drugs prescribed be re-evaluated and that the pharmacist accompany the physician in medication decision making from August 2008. Therefore, we compared the number and cost of drugs prescribed in July 2008 with those from August 2008 onwards when pharmacist participation in medication decision making was started.

In the present study, we found reductions in the number and cost of drugs prescribed per resident at a special elderly nursing home in Yubari City, Hokkaido, after participation of pharmacists in medication decision making. Moreover, the number and cost of antihypertensive drugs prescribed per resident were also reduced, which differed from the results of the Asheville Project. Prior to the physician's visit to Seikouen, the pharmacist and the hospital pharmacist at Yubari Medical Center studied the blood pressure data of residents and the antihypertensive drugs prescribed. During the actual visit, the physician, the pharmacist, and the nurse at Seikouen determined which drugs could be deleted. As a result, the number of drugs prescribed decreased and the cost of antihypertensive drugs also decreased. In the Asheville Project, medication adherence was improved by enhancing patient's

knowledge of his/her own illness and the drugs prescribed through interviews with a pharmacist who provided instructions after receiving a prescription from a physician. Due to the efforts of the pharmacist, the patient felt cared for and medication adherence improved. Although no drug cost reduction was noted, medical expenses other than drug cost, such as emergency visits and hospitalization, were reduced. Medical expenses were successfully reduced as a whole. Meanwhile, in the case of Yubari City, the pharmacist at an NHI-registered pharmacy and the hospital pharmacist at Yubari Medical Center studied blood pressure data of the residents and the antihypertensive drugs prescribed prior to the physician's visit and this enabled them to decide which drugs were unnecessary and could be deleted.

In the present study, pharmacists accompanied physicians in visits for medical examinations and participated in medication decision making. On the other hand, in the Asheville Project, pharmacists provided counseling and patient compliance instructions. Thus, the difference in results might be due to differences in pharmacists' involvement in medical care. This finding suggests that pharmacists play a multifaceted role.

Overall, there were fewer significant differences in the data for the cost of drugs (drug prices) than the data for the number of drugs. We speculate that the large variation in data might have been a contributing factor as drug prices vary markedly depending on the drug.

We also performed stratified analysis of anti-ulcer drugs, dyslipidemia drugs, analgesics (nonsteroidal anti-inflammatory drugs, etc.), and central nervous system drugs. A significant decrease or a tendency for decrease in the number of drugs per resident per month was observed for all of the above-mentioned

drugs. Moreover, a significant decrease or a tendency for decrease in drug price per resident per day for anti-ulcer drugs and analgesics (data not shown) was observed.

Our findings revealed that collaboration with other healthcare professionals in the community healthcare setting, particularly the collaboration between pharmacists and physicians in medication decision making, could effectively reduce the number and cost of drugs. As no adverse effects resulting from the reduction in the number of drugs were observed, the suppression of drug cost was likely achieved while maintaining the quality of medical care.

In the future, we will conduct a quantitative analysis of other important roles of pharmacists that cannot be calculated in monetary terms, such as prevention of adverse drug reactions and interactions, improvement of medical care and patient QOL, and treatment outcomes of a medical team with pharmacist participation.

References

- 1) Carole WC, Barry AB, Dale BC, The Asheville Project: Long-term Clinical and Economic Outcomes of a Community Pharmacy Diabetes Care Program, *J Am Pharm Assoc.*, 2003: 43: 173-184.
- 2) Barry AB, Carole WC, The Asheville Project: Long-term Clinical, Humanistic, and Economic Outcomes of a Community-based Medication Therapy Management Program for Asthma, *J Am Pharm Assoc.*, 2006: 46: 133-147.
- 3) Barry AB, Benjamin HS, Susan ES, The Asheville Project: Clinical and Economic Outcomes of a Community-based Long-term Medication Therapy Management Program for Hypertension and Dyslipidemia, *J Am Pharm Assoc.*, 2008: 48: 23-31.
- 4) Morrison A, Wenheimer AI, Evaluation of Studies Investigating the Effectiveness of Pharmacists' Clinical Services, *JHP*, 2001: 58: 569-577.
- 5) Gandhi PJ, Smith BS, Tataronis GR, Maas B, Impact of a Pharmacist on Drug Costs in a Coronary Care Unit, *JHP*, 2001: 58: 497-503.
- 6) Mumick AH, Sterba KJ, Peroutka JA, Sloan NE, Beltz EA, Sorenson MK, Cost Savings and Avoidance from Clinical Interventions, *JHP*, 1997: 54: 392-396.
- 7) Leape LL, Cullen DJ, Clapp MD, Burdick E, Demonaco HJ, Erickson JI, Bates DW, Pharmacist Participation on Physician Rounds and Adverse Drug Events in the Intensive Care Unit, *JAMA*, 1999: 282: 267-270.
- 8) Alderman CP, Farmer C, A Brief Analysis of Clinical Pharmacy Interventions Undertaken in an Australian Teaching Hospital, *J Qual Clin Pract.*, 2001: 21: 99-103.
- 9) Bond CA, Raehl CL, Franke T, Clinical Pharmacy Services, Pharmacist Staffing, and Drug Costs in United States Hospitals, *Pharmacother.*, 1999: 19: 1354-1362.
- 10) Bond CA, Raehl CL, Franke T, Clinical Pharmacy Services and Hospital Mortality Rates, *Pharmacother.*, 1999: 19: 556-564.
- 11) Bond CA, Raehl CL, Pitterle ME, Franke T, Health Care Professional Staffing Hospital Characteristics, and Hospital Mortality Rates, *Pharmacother.*, 1999: 19: 130-138.
- 12) Ito Y, Ando T, Arakawa T, Nabeshima T, Itatsui T, Role of the Clinical Pharmacist in Pharmaceutical Care, *Jpn J Pharm Health Care Sci.*, 2005: 31: 113-120.

- 13) Okazaki N, Sakata Y, Matsumoto S, Miyamori S, Iwamoto Y, Ninomiya M, Hiraki K, A Survey of G-CSF Chemotherapy for Cancer and Promotion of It's Proper Use, *J Jpn Soc Hosp Pharm.*, 2013: 49: 55-58.
- 14) Kitazawa F, Ueda K, Takara K, Yokoyama T, Sugii H, Shimazaki C, Approach to Standardization of Usage of Drugs for Cancer Chemotherapy, *J Jpn Soc Hosp Pharm.*, 2011: 47: 1289-1293.