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# Understanding the Impact of Health Policy: 10% Co-payments for Medical Services Reduce Compliance with Necessary Care Among Elderly Patients with Chronic Disease in Japan

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## Abstract

Co-payments help determine how expensive an individual health service is both to payers and to enrollees. The Japanese government had provided its elderly with first dollar coverage, including pharmaceuticals, until January 2001 when it introduced 10% co-payments in an effort to contain costs. We evaluated whether the Japanese increase in co-payments reduced compliance with necessary care, including prescription pharmaceuticals, in elderly patients with chronic illness. Subjects were members of the *Health Care System for the Aged* (persons age 70 or older) who belonged to a health insurance society located in Fukuoka Prefecture continuously from January 2000 to December 2001. We defined 234 highly compliant patients with hypertension and 35 with diabetes mellitus who visited physicians at least once per month during every month of the 6-month period from January to June 2000. We used time series analyses to compare medical service use during 6 months before and 12 months after the 10% co-payments were introduced. During this study, medical visits were necessary to obtain prescriptions for pharmaceuticals in Japan. Compliance decreased significantly for both hypertension and diabetes mellitus patients after the introduction of 10% co-payments, controlling for the possible impact of secular trends. The impact on necessary pharmaceutical use was likewise affected. However, the impact on costs was not as marked. Co-payments have a major impact on patient compliance and recommended medical service use (but perhaps not on costs), especially in the elderly with chronic diseases.

**Key words:** co-payments, health policy, hypertension, diabetes mellitus

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## Introduction

The Japanese system of universal health insurance was established in 1961. During the subsequent period of great economic growth, elderly patient co-payments for

services were consistently negligible: In January 1973, the elderly enjoyed full coverage for visits to physicians, without co-payments of any kind, including for pharmaceuticals. In 1983, however, the *Health Service*

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*Law for the Aged* imposed patient co-payments on the elderly in the hopes of curbing increasing costs of health care. Patient co-payments were limited to small fixed amounts until January 2001 when they increased to 10%.<sup>1)</sup> At the time of the increase in co-payments, monthly maximum out of pocket expenses were capped at 3,000 yen (\$25) for primary care clinic visits, 5,000 yen (\$42) for outpatient visits to specialists in hospitals, and 37,200 yen (\$310) for admissions to the hospital.

Enrollees in the *Health Care Plan for the Aged* increased from 4,237,000 in 1973, to 14,778,000 in 2000. The number of visits to physicians increased from about 4.0 per year in the 1960s, to about 8.0 per year in the 1970s. Medical costs for the aged, 428,900,000,000 yen (\$3,574,000,000) in 1973, jumped to 11,199,700,000,000 yen (\$93,331,000,000) in 2000.<sup>1)</sup>

Life expectancy at birth in Japan is the highest in the world.<sup>2)</sup> In 1970, mean life expectancy at birth was 69.8 years in males and 75.2 years in females, while in 2000, it was 77.6 years and 84.6 years, respectively. These improvements stemmed from a decrease in mortality from circulatory diseases in aged people, which, in turn, can be traced to excellent access to preventive medical care without financial duress.

The Japanese government decided to increase co-payments to contain health care costs because of its increasing aged population and its recent economic malaise. In the *Employee Health Insurance System* (EHI) in Japan (a system to pay for workers as opposed to the retired and elderly), negligible fixed payments were also the standard from its inception until 1984, when similar revisions introduced 10% patient co-payments.<sup>3)</sup> In September 1997, the patient co-payments in EHI were increased from 10% to 20%<sup>4)</sup>, and then 30% in 2003. We previously reported that the influence of the introduction of 10% co-payments in EHI on outpatient visits to physicians in patients with hypertension were transient<sup>5)</sup>, but the later introduction of 20% co-payments significantly affected visits in both patients with hypertension and those with diabetes mellitus.<sup>6)</sup>

Many studies have shown marked influences from an increase in patient co-payments on illnesses with few symptoms,<sup>7-14)</sup> such as hypertension and diabetes mellitus. These have a high prevalence and require frequent visits

to physicians for treatment and prescriptions. However, other studies show that increasing patient co-payments would not substantially affect medical services<sup>15-17)</sup>.

We analyzed the impact on medical service indicators in patients with hypertension or diabetes mellitus after the introduction of 10% patient co-payments to the health care system for the aged in Japan in January 2001. Any reduction in visits would necessarily also reduce prescription drug use in these patients because patients could not acquire prescriptions without a visit to the physician and the prescriptions were limited to one month supply, prior to March 2002.

## Methods

### Subjects

Subjects included enrollees in the *Health Care System for the Aged* (persons aged 70 or over) who belonged to a health insurance society located in Fukuoka Prefecture between January 2000 and December 2001 (24 months). Subjects were dependents of workers of an agricultural co-operative located in Fukuoka Prefecture. Because they were retired, the workers themselves covered under a different health insurance system.

As of January 2000, 274 patients with hypertension and 38 with diabetes mellitus met our inclusion criteria. We included only highly-motivated patients with hypertension (n=234) and diabetes mellitus (n=35). 'High motivation' was defined as patients who visited their physicians at least monthly during every month of the 6-month period from January to June 2000, which was the six month period preceding the change in co-payments.

### Outcomes of Interest

Outcomes of interest included the visit rate (the percentage of patients who visited their physician at least once every month after the introduction of the co-payments), the mean number of all visits per month (including primary care visits and specialist visits), and the mean medical cost per month. Because at the time of the study physicians could not prescribe a supply of pharmaceuticals for periods longer than one month for any reason, patient use of prescription pharmaceuticals was regarded as poor unless they showed high

compliance with their visits to physicians (i.e., they visited their physicians every month to acquire a one-month supply of prescription medication). In Japan, unless patients require medication, they generally do not visit physicians every month. Patients cannot acquire medications for hypertension and diabetes mellitus through any channel other than obtaining a prescription from their physician. Obtaining medications through other channels is illegal and, of course, insurers do not pay for them.

Indicators were calculated from the bills issued by medical facilities to the *Medical Fee Payment Fund* which reimburses monthly medical costs. Outpatient medical costs per month reflected all costs including patient co-payments. The presence of a centralized billing system for all health insurance societies in Japan allowed us to follow all subjects, even if they changed medical facilities or physicians.

### Statistical analysis

We evaluated the impact of co-payments in three ways. First, we used time-sequential analyses to compare the outcomes of interest for six months before (July – December 2000) and 12 months after (January – December 2001) the introduction of 10 percent co-payments. We used the t-test to analyze the monthly indicators. However, because this approach did not account for the possible influence of unmeasured secular trends on the outcome variables, it may have overestimated the impact of the change in co-payments.

Second, to further evaluate trends, the 18-month follow-up period was divided into 3-month intervals (see table 3). We assumed that changes in indicators between Stage I and Stage II before the introduction would continue constantly as secular trend. Changes in indicators between adjacent stages were compared to those between Stage I and Stage II by paired t-test.

Third, we controlled for the possible influence of secular trends by using Analysis of Covariance (ANCOVA) to estimate the mean effects of the increased co-payments on use of medical services. We used a dummy variable (0, 1) to represent the change in co-payments (before and after) and a linear variable to represent the number of months since the beginning of study period (July, 2000). We report p-levels and estimate 95% confidence intervals for each analysis. Of course, randomized controlled trials were not possible as the

co-payments were introduced as state policy.

### Costs and limitations

We did not discount medical costs in 2000 and 2001 (to account for alternative uses of resources) because the federal lending rate was very low at that time due to the economic malaise in Japan. In addition, the medical cost for each service changed negligibly during this period. We set the exchange rate at 120 yen per \$1.

In Japan, medical facilities or pharmacies charge patients for pharmaceuticals, however, the costs for drugs charged by pharmacies were not included in the database. However, this bias represents a non-differential misclassification<sup>21)</sup> that similarly occurred both before and after the intervention and, therefore, likely did not markedly affect our findings.

### Results

Table 1 show the age and gender distribution of the 269 study subjects. Two hundred thirty four patients had hypertension (30% male) and 35 had diabetes mellitus (46% male). The age distribution of patients with hypertension was: 70-79 years, 69 %; 80-89 years, 31%. The age distribution of patients with diabetes mellitus was: 70-79 years, 74%; 80-89 years, 26%. These characteristics reflect the general population of elderly people in Japan, where females survive longer than males and most people enrolled in the *Health Service Law for the Aged* program are eighty to ninety years old.

Table 1. Age and gender distribution of study population.

	70 - 79 n (%)	80 - 89 n (%)	Total n (%)
Hypertension			
Males	44 (63.8)	25 (36.2)	69 (29.5)
Females	118 (71.5)	47 (28.5)	165 (70.5)
Total	162 (69.2)	72 (30.8)	234 (100)
DM			
Males	13 (81.3)	3 (18.8)	16 (45.7)
Females	13 (68.4)	6 (31.6)	19 (54.3)
Total	26 (74.3)	9 (25.7)	35 (100)

Figure 1 shows monthly visit rates, defined as the percentage of total study patients who visited the outpatient clinic at least once during the month under study. The visit rates for both diseases dropped just after January 2001, when the co-payments were introduced. As compared to our previous studies involving the EHI, the reductions in the *Health Care System for the Aged* did not return to baseline levels during the 12 months follow-up period.

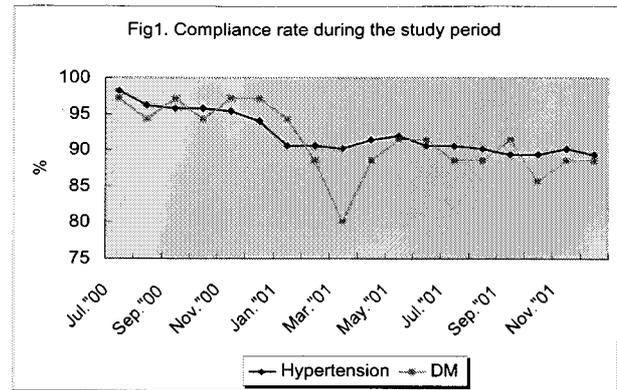


Table 2. Medical service indicators before and after change in co-payments

Parameter	Before (SD)	After (SD)	Difference (95% CI)
<b>Disease</b>			
Visit rate, %			
Hypertension	95.9 (1.4)	90.4 (0.8)	-5.5 (-6.6 ~ -4.4) ***
Diabetes mellitus	96.2 (1.5)	88.8 (3.5)	-7.4 (-10.6 ~ -4.1) ***
<b>Number of visits</b>			
Hypertension	2.8 (0.1)	2.5 (0.2)	-0.3 (-0.4 ~ -0.1) ***
Diabetes mellitus	2.6 (0.3)	2.2 (0.2)	-0.4 (-0.6 ~ -0.1) *
<b>Medical costs, 1000 yen</b>			
Hypertension	18.8 (0.2)	18.3 (0.7)	-0.4 (-0.9 ~ 0.0)
Diabetes mellitus	28.1 (2.3)	27.2 (4.0)	-0.9 (-4.6 ~ 2.7)

p<0.05, \*\*\* p<0.001, by t-test

Table 2 shows medical service indicators before and after change in co-payments. The visit rate for hypertension dropped from 95.9% before the increase in co-payments to 90.4% after, a reduction (95% CI) of 5.5% (-6.6 ~ -4.4%),  $p < 0.001$ ; similarly, the visit rate for diabetes mellitus dropped from 96.2% to 88.8%, a reduction (95% CI) of 7.4% (-10.6 ~ -4.1%),  $p < 0.001$ . The mean number of visits per month for hypertension dropped from 2.8 before the increase in co-payments to 2.5 after, a reduction (95% CI) of 0.3 visits (-0.4 ~ -0.1),  $p < 0.001$ ; similarly, the mean number of visits per month for diabetes mellitus dropped from 2.6 to 2.2, a reduction (95% CI) of 0.4 visits (-0.6 ~ -0.1),  $p < 0.05$ . The mean medical cost per month for hypertension dropped from 18.8 thousand yen (\$158) before the increase in co-payments to 18.3 thousand yen (\$142) after, a reduction (95% CI) of 0.4 thousand yen (-0.9 ~ 0.0 thousand yen) or \$3 (-\$8 ~ \$0), while the mean medical

cost per month for diabetes mellitus dropped from 28.1 thousand yen (\$238) to 27.2 thousand yen (\$227), a reduction (95% CI) of 0.9 thousand yen (-4.6 ~ 2.7 thousand yen) or \$8 (-\$38 ~ \$23). There was no significance in the reduction of the mean medical costs for hypertension and diabetes mellitus.

Table 3 shows medical service indicators for each Stage of the analysis. The difference between Stage I and Stage II represents the secular trend before the change in co-payments. The period before (Stage II) and after (Stage III) represents the periods before and after the change in co-payments. The visit rate for hypertension dropped from 95.0% in Stage II to 90.5% in Stage III, a reduction of 4.6%, and the differences (95% CI) from the reference were -2.9% (-5.5 ~ -0.2%),  $p < 0.05$ ; similarly, the visit rate for diabetes mellitus dropped from 96.2% to 87.6%, a reduction of 8.6%, and the differences (95% CI) from the reference were -8.6% (-16.1 ~ -0.1%),  $p < 0.05$ .

The visit rate for hypertension increased from 90.5% in Stage III to 91.3% in Stage IV, an increase of 0.9%, and the differences (95% CI) from the reference were 2.6% (0.4 ~ 4.7%),  $p < 0.05$ . The mean number of visits per month for hypertension dropped from 2.7 in Stage II to 2.5 in Stage III, a reduction (95% CI) of 0.2 visits; and the differences (95% CI) from the reference were -0.1 visits (-0.3 ~ -0.1), similarly, the mean number of visits per month for diabetes mellitus dropped from 2.7 to 2.3, a reduction (95% CI) of 0.4 visits, %, and the differences (95% CI) from the reference were -0.7 visits (-1.0 ~ -0.3),  $p < 0.01$ . The mean number of visits per month for hypertension increased from 2.5 in Stage III to 2.6 in Stage IV, an increase of 0.1 visits; and the differences

(95% CI) from the reference were 0.3 visits (0.0 ~ 0.5),  $p < 0.05$ . The mean medical cost per month for hypertension dropped from 18.6 thousand yen (\$158) in Stage II to 17.9 thousand yen (\$142) in Stage III, a reduction of 0.8 thousand yen (\$7), and the differences (95% CI) from the reference were -0.5 thousand yen (-1.4 ~ 0.4 thousand yen) or -\$4 (-\$12 ~ \$3), while the mean medical cost per month for diabetes mellitus dropped from 27.4 thousand yen (\$228) to 25.0 thousand yen (\$208), a reduction of 2.4 thousand yen (\$20) and the differences (95% CI) from the reference were -0.9 (-3.5 ~ 1.6 thousand yen) or -\$8 (-\$29 ~ \$13). There was no significance in the difference of the mean medical costs from the reference for hypertension or diabetes mellitus.

Table 3. Medical service indicators over time.

Stage	Hypertension (N=234)			DM (N=35)		
	Visit rate (%)	Marginal difference(%)	Difference from reference (95%CI)	Visit rate (%)	Marginal difference(%)	Difference from reference (95%CI)
I (Jul-Sep2000)	96.7	-	-	96.2	-	-
II (Oct-Dec2000)	95.0	-1.7	Reference	96.2	0	Reference
III (Jan-Mar2001)	90.5	-4.6	-2.9 (-5.5 ~ -0.2)*	87.6	-8.6	-8.6 (-16.1 ~ -0.1)*
IV (Apr-Jun2001)	91.3	0.9	2.6 ( 0.4 ~ 4.7)*	90.5	2.9	2.9 (-2.9~ 8.7)
V (Jul-Sep2001)	90.0	-1.3	0.4 (-0.9~ 1.8)	89.5	-1.0	-1.0 (-8.0~ 6.1)
VI (Oct-Dec 2001)	89.0	-0.4	1.3 (-0.1 ~ 2.7)	87.6	-1.9	-1.9 (-9.7 ~ 5.9)
	Number of visits (S.D.)	Marginal difference(S.D.)	Difference from reference (95%CI)	Number of visits (S.D.)	Marginal difference(S.D)	Difference from Reference (95%CI)
I (Jul-Sep2000)	2.9 (2.8)	-	-	2.4 (1.9)	-	-
II (Oct-Dec2000)	2.7 (2.5)	-0.2 (1.4)	Reference	2.7 (2.1)	0.3 (0.8)	Reference
III(Jan-Mar2001)	2.5 (2.5)	-0.2 (1.4)	-0.1 (-0.3~ 0.1)	2.3 (2.2)	-0.4 (1.1)	-0.7 (-1.0~ -0.3) **
IV (Apr-Jun2001)	2.6 (2.5)	0.1 (1.9)	0.3 (0.0 ~ 0.5) *	2.2 (1.6)	-0.2 (1.2)	-0.4 (-0.9 ~ 0.0) *
V (Jul-Sep2001)	2.6 (2.4)	0.0 (1.2)	0.2 (0.0 ~ 0.3)	2.2 (1.8)	0.0 (1.0)	-0.3 (-0.6~ 0.1)
VI (Oct-Dec 2001)	2.5 (2.3)	0.0 (1.2)	0.1 (0.0 ~ 0.3)	2.3 (2.0)	0.1 (0.8)	-0.2 (-0.5 ~ 0.1)
	Medical cost (S.D.)	Marginal difference(S.D.)	Difference from reference (95%CI)	Medical cost (S.D.)	Marginal difference(S.D)	Difference from reference (95%CI)
I (Jul-Sep2000)	18.9 (9.9)	-	-	28.9 (19.9)	-	
II (Oct-Dec2000)	18.6 (11.1)	-0.3 (7.8)	Reference	27.4 (16.1)	-1.4 (17.7)	Reference
III(Jan-Mar2001)	17.9 (12.1)	-0.8 (6.8)	-0.5 (-1.4~0.4)	25.0 (18.2)	-2.4 (7.4)	-0.9 (-3.5~1.6)
IV (Apr-Jun2001)	18.7 (14.5)	0.9 (7.9)	1.2 ( 0.1~2.2)	29.3 (26.0)	4.3 (21.7)	5.7 (-1.7~13.2)
V (Jul-Sep2001)	18.3 (13.4)	-0.4 (6.1)	-0.1 (-0.9~0.7)	29.4 (26.1)	0.1 (6.7)	1.5 (-0.8~ 3.8)
VI (Oct-Dec 2001)	18.4 (13.4)	0.1 (6.1)	0.4 (-0.4~11.5)	25.1 (16.9)	-4.4 (15.2)	-2.9 (-8.1~ 2.3)

\*:  $p < 0.05$ , \*\*:  $p < 0.01$

There were small additional significant changes between stages that supported the hypothesis that increasing co-payments would impact service use, although the rebound effect was observed among subjects with hypertension.

Table 4 shows the results of ANCOVA for patients with hypertension and diabetes mellitus. Controlling for secular trends reduced the impact on the outcome variables for both diseases, but all models remained statistically significant and accounted for a large amount of variance except for the medical costs of diabetes mellitus. For hypertension, the estimate (95% CI) of the

reduction in visit rate before and after the increase in co-payments was 3.7% (-5.3% ~ -2.2%),  $p < 0.001$ . The estimate (95% CI) of the reduction in number of visits was 0.4 visits (-0.6 ~ -0.2),  $p < 0.01$ . The reduction in medical costs before and after the increase in co-payments was not statistically significant. For diabetes mellitus, the estimate (95% CI) of the reduction in visit rate and number of visits before and after the increase in co-payments was 7.0% (-12.8% ~ -0.1%),  $p < 0.05$ . The estimate (95% CI) of the reduction in number of visits and medical costs before and after the increase in co-payments was not statistically significant.

Table 4. Results of ANCOVA, controlling for a secular trend

Disease/Parameter	Estimates (95%CI)	R <sup>2</sup>
<b>Hypertension</b>		
Visit rate, %		
Increased co-payments	-3.7 (-5.3 ~ -2.2)***	0.92***
Secular trend, per year	-2.4 (-3.6 ~ -1.2)**	
Number of visits		
Increased co-payments	-0.4 (-0.6 ~ -0.2)**	0.42*
Secular trend, per year	-0.1 (-0.4 ~ 0.2)	
Medical costs, 1000 yen		
Increased co-payments	-0.6 (-1.7 ~ 0.5)	0.14
Secular trend, per year	0.2 (-1.0 ~ 1.4)	
<b>Diabetes Mellitus</b>		
Visit rate, %		
Increased co-payments	-7.0 (-12.8 ~ -0.1) *	0.60***
Secular trend, per year	0.0 (-0.4 ~ 0.5)	
Number of visits		
Increased co-payments	-0.4 (-0.8 ~ 1.2)	0.31
Secular trend, per year	0.2 (-0.5 ~ 0.6)	
Medical costs, 1000 yen		
Increased co-payments	-1.0 (-7.7 ~ 5.6)	0.02
Secular trend, per year	0.1 (-7.1 ~ 7.4)	

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## Discussion

### 1) The effect of 10% co-payments.

The introduction of 10% co-payments among initially highly-compliant elderly outpatients with two important, primary chronic diseases reduced these patients compliance with their monthly visits to medical facilities, reduced overall visits, but reduced costs in only one case. Since only a visit to a physician allowed patients to acquire the potentially life-saving prescriptions they required, one may assume that compliance with pharmaceuticals was likewise reduced.

Previously, we used time series analysis to study the introduction of 10% patient co-payments in the *Employee Health Insurance* (EHI) system in October 1984.<sup>5)</sup> (Before the introduction of 10% co-payments, patients paid only 600 yen (\$5.00) per visit.) The visit rate increased during the 6-month period before the introduction of 10% co-payments (perhaps due to anticipation of the onset of co-payments by patients), decreased during the 6-month period after the introduction, and then subsequently recovered, suggesting only transient influences.

However, the impact of the introduction of 10% co-payments in the *Health Insurance System for the Aged* was different. Visit rates decreased significantly and permanently in patients with the chronic diseases hypertension or diabetes mellitus. These results show that the effects of 10% co-payments are more profound in the elderly, who are weaker and have fewer financial resources.

We observed a larger impact on the visit rate for patients with diabetes mellitus than that for those with hypertension, perhaps due to the higher costs of diabetes mellitus. For hypertension, the mean medical costs per month were about 18,300 yen (\$153), compared to 27,200 yen (\$227) in patients with diabetes mellitus, making net co-payments, and therefore the impact on the patient, much larger for the latter.<sup>6)</sup> In both diseases, the preventive effects of prescription drug treatment are hidden – patients generally don't feel better as a result of swallowing a pill.

The effect of 10% co-payments on medical costs was less significant than the effect on visit rates. The Japanese government could not decrease medical costs

as effectively as they cut necessary medical care! We posit the following explanation: The Japanese medical system pays medical facilities on a fee-for-service basis. An increase in co-payments resulting in a lower rate of visits by patients also influences physician practice patterns. Doctors have increased the rate of medical examinations perhaps to compensate for the effect of decreased visits.<sup>18)</sup> This would explain why we found lower visit rates, but less impact on total costs. However, we could not test this hypothesis because of limitations in the data.

### 2) Health and policy implications among health care for the elderly.

The aging of the population in Japan has progressed faster than in any other country in the world, with the United States not far behind. The population aged 65 years or over was 17.2% in 2000, and is estimated to be 32.3% in 2050.<sup>2)</sup> Therefore, and, especially in the setting of economic malaise, the Ministry of Health and Welfare chose to introduce policies to contain these costs.<sup>18-21)</sup>

Despite these measures, medical costs for the aged continue to increase. Due to the recession, an increase in insurance premiums could not be introduced. The entire Japanese health insurance system is facing a structural crisis, just as it is in the United States.

Increasing patient co-payments is one way to try to stem the tide of rising health care costs. It decreases pharmaceutical cost and usage.<sup>22-23)</sup> For example, the supply of anti-hypertensives was shown to decrease by 10% and that of anti-diabetic therapy by 25% after co-payments were doubled.<sup>22)</sup> But at what price? Co-payments may reduce the quality of care among elderly patients with chronic disorders. Among the aged, inpatient medical costs are higher than outpatient costs. A small number of patients require vast medical resources, such as for terminal care. In contrast, the outpatient medical cost per case is not expensive for chronic disorders, and preventive measures have marked positive effects on these diseases. Policy makers should understand the adverse influences of the policies they enact (e.g., increasing outpatient co-payments), and should carry out cost-effective medical policies, rather than simply cost-cutting ones.

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