

SPECIAL ARTICLES

EFFECT OF A COPAYMENT ON USE OF THE EMERGENCY DEPARTMENT IN A HEALTH MAINTENANCE ORGANIZATION

JOE V. SELBY, M.D., M.P.H., BRUCE H. FIREMAN, M.A., AND BIX E. SWAIN, M.S.

Abstract *Background.* Use of the emergency department for nonemergency care is frequent and costly. We studied the effect of a copayment on emergency department use in a group-model health maintenance organization (HMO).

Methods. We examined the use of the emergency department in 1992 and 1993 by 30,276 subjects who ranged in age from 1 to 63 years at the start of the study and belonged to the Kaiser Permanente HMO in northern California. We assessed their use of various HMO services and their clinical outcomes before and after the introduction of a copayment of \$25 to \$35 for using the emergency department. This copayment group was compared with two randomly selected control groups not affected by the copayment. One control group, with 60,408 members, was matched for age, sex, and area of residence to the copayment group. The second, with 37,539 members, was matched for these factors and also for the type of employer.

Results. After adjustment for age, sex, socioeconomic status, and use of the emergency department in 1992, the decline in the number of visits in 1993 was 14.6 percentage points greater in the copayment group than in either

control group ($P < 0.001$ for each comparison). Visits for urgent care did not increase among subjects in any stratum defined by age and sex, and neither did the number of outpatient visits by adults and children. The decline in emergency visits for presenting conditions classified as "always an emergency" was small and not significant. For conditions classified as "often an emergency," "sometimes not an emergency," or "often not an emergency," the declines in the use of the emergency department were larger and statistically significant, and they increased with decreasing severity of the presenting condition. Although our ability to detect any adverse effects of the copayment was limited, there was no suggestion of excess adverse events in the copayment group, such as increases in mortality or in the number of potentially avoidable hospitalizations.

Conclusions. Among members of an HMO, the introduction of a small copayment for the use of the emergency department was associated with a decline of about 15 percent in the use of that department, mostly among patients with conditions considered likely not to present an emergency. (N Engl J Med 1996;334:635-41.)

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USING emergency departments for nonemergency care contributes to overcrowding¹ and is costly.² Such use is common in urban public hospitals,^{3,4} where a lack of accessible primary care often makes the emergency department a last resort. However, inappropriate use is also found in community hospitals,^{5,6} university teaching hospitals,⁷ and managed-care organizations.^{8,9} Guidelines are available for diverting patients with non-emergency conditions away from emergency departments,¹⁰ but such triage guidelines may lead to the misclassification of many patients.^{11,12}

Sharing costs through the use of copayments is an alternative strategy that reduces the use of outpatient services,¹³⁻¹⁶ including emergency services,¹⁶ among people with health insurance. In the Health Insurance Experiment,¹⁷ however, cost sharing reduced appropriate office visits and preventive care as well as inappropriate visits, with adverse effects on visual acuity,¹⁸ blood-pressure control,¹⁹ and survival among high-risk patients.²⁰ Reductions in the appropriate use of services are of particular concern in the emergency department, where even brief delays may be harmful. In the Health Insurance Experiment, cost sharing reduced the use of the

emergency department more among patients with less severe diagnoses, suggesting a selectively greater effect on inappropriate visits.²¹ Possible adverse effects of copayment for emergency department use could not be studied in isolation, nor could the question of whether service use simply shifted to other departments be examined.

At the start of 1993, a copayment was introduced for using the emergency department that affected more than 30,000 members of the Kaiser Permanente health maintenance organization (HMO) in northern California. We studied changes in the use of the emergency department and other outpatient services and in clinical outcomes during 1993 for these members and for two comparison groups.

METHODS

Setting

The Kaiser Permanente Medical Care Program, Northern California, is a group-model HMO serving about 2.4 million people, who are enrolled primarily through employer-sponsored plans. A total of 15 medical centers in the HMO provide 24-hour emergency care. Urgent (or same day) outpatient care, generally administered by the departments of adult medicine and pediatrics, is also available from 9 a.m. to 9 p.m. at each center. During these hours, registered nurses perform triage, sending patients whose conditions present less of an emergency to urgent care or to appointments for treatment at a later date. After 9 p.m., there is no such triage.

On January 1, 1993, at the request of 20 large employers, a copayment of \$25 to \$35 was instituted for use of the emergency depart-

From the Division of Research, Permanente Medical Group, Kaiser Permanente Medical Care Program, 3505 Broadway, Oakland, CA 94611, where reprint requests should be addressed to Dr. Selby.

Supported by the Permanente Medical Group.

ment by employees of the firms and their dependents. Copayments are collected when a patient registers for treatment and are payable by cash, check, or credit card, with billing also an option. This study was not conducted as part of the copayment-implementation process but was undertaken by the Permanente Medical Group. No approval was sought from an institutional review committee, because the change would have occurred with or without the study. Affected enrollees were informed by their employers in advance of the change and had the opportunity to switch insurance plans.

Study Groups

The copayment group was selected from a group of 33,528 people who were either employees of the 20 companies or their covered family members and who were insured continuously throughout 1992. We excluded 2263 enrollees who became eligible for Medicare by December 1993; 596 people with double coverage in the HMO through a spouse whose insurance coverage did not require the copayment; and 393 children who were under one year of age on January 1, 1992 (because the first year of life is a period of high use of services that, by design, was not studied in 1993, the follow-up year). The copayment group included the remaining 30,276 members, who ranged in age from 1 to 63 years on January 1, 1992.

To control for secular changes in utilization, a control group (control group 1) containing 60,408 people was selected by 2:1 random sampling, and stratified according to age (in 10-year groups), sex, and area of residence. In preliminary analyses, base-line use of the emergency department was nearly 20 percent higher in control group 1 than in the copayment group. There were also more provision of urgent care and more visits to medical offices in this control group. Because the employers instituting the copayments were predominantly firms in the computer and electronics industries, we hypothesized that among the employees in the copayment group, relatively high socioeconomic status led to better health and less use of health services than among the membership of the HMO generally. Therefore, a second control group (control group 2) was selected from employees in other electronics and computer firms that did not institute copayments; this group contained 37,539 people matched to the members of the copayment group with respect to age, sex, and area of residence. There were not enough HMO members to permit 2:1 sampling in this group at older ages (Table 1).

Approximately 98 percent of the copayment group, but only 53 percent and 62 percent of control groups 1 and 2, respectively, were subject to copayments of \$5 or \$10 for other types of outpatient visits, in-

cluding those for urgent care, during 1992 and 1993. These copayments did not change during this period for any group.

Measures of Socioeconomic Status

Proxy measures of a person's socioeconomic status were obtained by linking that person's current residential address to his or her census-block group (that is, to official subdivisions of the census tracts, each containing an average of 1000 inhabitants). The socioeconomic status of approximately 6 percent of the subjects in each group could not be determined in this way because their addresses were missing. We created three dichotomous indicators of poverty based on the 1990 data on census-block groups. A census-block group was considered to be poor if 10 percent or more of its residents had household incomes below the federal poverty level; if 25 percent or more of the residents at least 25 years old had less than a high-school education; and if 66 percent or more of employed residents more than 16 years old reported an occupation categorized as working class.^{21,22} Although the federal definition of an impoverished block group requires that at least 20 percent of residents have incomes below the poverty level, we chose a lower cutoff because the number of HMO members from such block groups was extremely low. Indicators of socioeconomic status derived from census-block-group data have been previously validated and used²³ to study the interactions between poverty and copayments.

Emergency Department Use and Severity of Presenting Conditions

Numbers of visits were obtained from the registration data bases corresponding to four categories of care: visits to the emergency department; visits for urgent care, pediatric and adult; pediatric office visits made by appointment; and office visits for adult medicine made by appointment. We noted the time of registration in the emergency department in order to be able to tell whether triage was being performed (9 a.m. to 9 p.m.) or not being performed (9 p.m. to 9 a.m.) when the subject registered.

A diagnosis-based system for the classification of the severity of the presenting condition for emergency department visits was developed from the physicians' diagnoses at the subjects' discharge, as recorded in the registration data base. Diagnoses were available for approximately 90 percent of visits by members of the copayment group, 88 percent of visits by members of control group 1, and 86 percent of visits by members of control group 2. These proportions remained constant during the two years of the study. Samples of the diagnoses as recorded were reviewed by one of the authors before the study groups were selected. Key words were used to denote diagnostically similar entries. For example, "paroxysmal atrial tachycardia," "PAT," "PSVT," "paroxysmal supraventricular tachycardia," and variant spellings of these were grouped together. After we reviewed more than 25,000 entries, the classification system consistently assigned 85 to 87 percent of the entries in the records to 1 of 143 key words. The conditions indicated by the key words were ranked a priori in four levels of severity: those that were always an emergency, those often an emergency, those sometimes not an emergency, and those often not an emergency (see the Appendix). As the descriptions of these levels imply, this system was not intended to classify individual visits as emergency or nonemergency visits, but rather to create four categories in which there were increasingly large proportions of inappropriate visits to the emergency department. Admission to the hospital resulted from 33.4 percent of visits for conditions that were always an emergency, 4.2 percent of visits for conditions that were often an emergency, 3.4 percent of visits for conditions that were sometimes not an emergency, and 0.9 percent of visits for conditions that were often not an emergency.

Measures of Health Outcome

Hospitalizations for reasons other than childbirth were identified from the hospital discharge files and from claims submitted by non-Kaiser hospitals. From a longer list proposed by Weissman et al.²⁴ of diagnoses associated with "avoidable hospitalization," we selected six discharge diagnoses that are particularly likely to be prevented by

Table 1. Base-Line Characteristics of the Copayment Group and the Control Groups.

| CHARACTERISTIC | COPAYMENT GROUP | CONTROL GROUP 1 | CONTROL GROUP 2 |
|---|-----------------|-----------------|-----------------|
| No. of subjects | 30,276 | 60,408 | 37,539 |
| No. of emergency department visits in 1992 | 4,830 | 12,543 | 6,490 |
| Age on Jan. 1, 1992 — no. (%) | | | |
| 1–5 yr | 1,741 (5.8) | 3,623 (6.0) | 2,818 (7.5) |
| 6–18 yr | 6,744 (22.3) | 13,217 (21.9) | 8,884 (23.7) |
| 19–44 yr | 13,522 (44.7) | 27,148 (44.9) | 18,287 (48.7) |
| 45–63 yr | 8,269 (27.3) | 16,420 (27.2) | 7,550 (20.1) |
| Female sex — % | 48.4 | 48.4 | 49.4 |
| Percent from block groups with ≥10% of residents below poverty level* | 14.6 | 24.1 | 18.1 |
| Percent from block groups with ≥66% of residents >16 yr old in working-class occupations* | 23.0 | 36.2 | 28.9 |
| Percent from block groups with ≥25% of residents with <high-school education* | 13.6 | 24.5 | 18.3 |

*The addresses of 1722 subjects in the copayment group, 4110 subjects in control group 1, and 2434 subjects in control group 2 were missing or uncodable.

Table 2. Use of the Emergency Department and Other Services in 1992 and 1993.*

| TYPE OF VISIT AND AGE GROUP | VISITS IN 1992 | | | VISITS IN 1993 | | | CHANGE IN COPAYMENT GROUP, 1992 TO 1993 | |
|-----------------------------|------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|---|---------------------------------------|
| | COPAYMENT GROUP | CONTROL GROUP 1 | CONTROL GROUP 2 | COPAYMENT GROUP | CONTROL GROUP 1 | CONTROL GROUP 2 | RELATIVE TO CHANGE IN CONTROL GROUP 1 | RELATIVE TO CHANGE IN CONTROL GROUP 2 |
| | no. of visits/1000 person-yr | | | | | | percent (95% confidence interval) | |
| Emergency department | | | | | | | | |
| 1-5 yr | 226 | 260 | 195 | 168 | 219 | 168 | | |
| 6-18 yr | 171 | 186 | 151 | 140 | 181 | 148 | | |
| 19-44 yr | 152 | 203 | 157 | 128 | 198 | 149 | | |
| 45-63 yr | 145 | 185 | 158 | 130 | 194 | 171 | | |
| Adjusted | 162 | 206† | 173‡ | 135 | 202† | 169† | -14.6 (-19.4 to -9.5) | -14.6 (-19.9 to -8.9) |
| Urgent care | | | | | | | | |
| 1-5 yr | 153 | 200 | 139 | 157 | 164 | 147 | | |
| 6-18 yr | 233 | 229 | 225 | 232 | 245 | 218 | | |
| 19-44 yr | 286 | 340 | 274 | 282 | 345 | 265 | | |
| 45-63 yr | 269 | 282 | 244 | 246 | 278 | 237 | | |
| Adjusted | 262 | 292† | 247 | 254 | 294† | 239‡ | -4.0 (-8.6 to +0.9) | 0.1 (-5.4 to +5.9) |
| Office, pediatric | | | | | | | | |
| 1-5 yr | 4394 | 4127 | 4230 | 3507 | 3451 | 3501 | | |
| 6-18 yr | 1602 | 1428 | 1458 | 1348 | 1292 | 1316 | | |
| Adjusted | 2209 | 2031‡ | 2070‡ | 1815 | 1774 | 1792 | -6.1 (-8.8 to -3.2) | -5.2 (-8.2 to -2.2) |
| Office, adult medicine | | | | | | | | |
| 19-44 yr | 1273 | 1400 | 1339 | 1189 | 1383 | 1333 | | |
| 45-63 yr | 2012 | 2164 | 2115 | 1939 | 2154 | 2111 | | |
| Adjusted | 1531 | 1664† | 1625‡ | 1463 | 1652† | 1628† | -3.7 (-6.1 to -1.3) | -4.6 (-7.2 to -2.0) |

*Adjusted rates and percentages of change have been adjusted for age, sex, socioeconomic status, and study group by Poisson regression.

†P<0.001 for the comparison with the copayment group.

‡P<0.05 for the comparison with the copayment group.

timely emergency care. These were ruptured appendicitis (codes 540.0 and 540.1 of the *International Classification of Diseases, 9th Revision, Clinical Modification*), asthma (code 493), uncontrolled hyperglycemia in diabetes (codes 250.0 through 250.3), pneumonia (codes 480 through 487), pyelonephritis (code 590), and congestive heart failure (code 428).

Deaths occurring in the study groups during 1993 were ascertained by linking the data base to death certificates for the state of California. Because early emergency treatment may avert some deaths from myocardial infarction, we identified all infarctions listed as the underlying cause of death on the death certificates and all infarctions, fatal or nonfatal, that led to hospitalization, in order to calculate case fatality rates for 1993.

Statistical Analysis

Our initial analyses compared annual rates of emergency department use during 1992 and 1993 among the three groups in four age strata: subjects 1 to 5, 6 to 18, 19 to 44, and 45 to 63 years old. Although the data for 1992 were complete, the extent of follow-up in 1993 varied because of changes in copayment status, withdrawals from the health plan, and deaths. Rates were therefore calculated with person-years used as denominators.

Poisson regression was used to model the independent effects of study group, age, sex, and socioeconomic status (with poverty defined as present if at least 10 percent of block-group residents had household incomes below the federal poverty level) on use of the emergency department, with adjustment for the duration of follow-up. Emergency department use in each year studied decreased sharply from the age of 1 year to the age of 5 years and increased after the age of 50. Therefore, age was categorized and treated as nine indicator variables, corresponding to persons with base-line ages of 1, 2, 3, 4, 5 through 19, 20 through 29, 30 through 39, 40 through 49, and 50 through 59 years, with subjects 60 through 63 years old used as the reference group. A term was added to the model to include people for whom addresses were missing and for whom block-group data were therefore lacking.

The primary outcome — the effect of the copayment on use of the emergency department — was defined as the percent change in rates of visits in the copayment group as compared with the percent change

in the two control groups, after adjustment for differences in use in 1992, age, and other covariates. Poisson regression was used to model the number of visits in 1993 as a function of study group, age, sex, socioeconomic status, the number of visits in 1992, and the ratio of the duration of follow-up in 1993 to that in 1992.²⁵ The product of the last two of these variables may be considered to represent the number of visits that would have been expected in 1993 had there been no introduction of copayment or other changes. The log of this variable was included in the model as the offset — that is, the coefficient of the variable was constrained to be 1. Thus, the fitted models yielded estimates of the percent change in the visit rates in each control group relative to the change in the copayment group (the reference group). Ninety-five percent confidence intervals and results of significance tests (all of which were two-tailed) were adjusted for overdispersion by multiplying the standard errors of the regression coefficient by the square root of the ratio of the deviance to the degrees of freedom.²⁶

To assess the robustness of these methods, we also used logistic regression. Conditioning the analysis on the total number of events in each subject in both years, we modeled the proportion of the total number of events that occurred in 1993 as a function of the study group, the covariates, and the proportion of the total follow-up that occurred in 1993. The results obtained in this manner were very close to those obtained with Poisson regression for the grouped data after adjustment for overdispersion.

Changes in use of the emergency department according to category of severity, in the use of other outpatient services, and in the total numbers of hospitalizations and potentially avoidable hospitalizations were examined in similar models. In an analysis restricted to the copayment group, the size of the effect of copayment was assessed according to age, sex, socioeconomic status, and copayment amount (\$25 or \$35).

RESULTS

The base-line characteristics of the three study groups are shown in Table 1. Measures of socioeconomic status indicated that all three groups had relatively high status, but the copayment group scored significantly higher (P<0.001) than control group 1 (the group

matched for age, sex, and area of residence but not for type of employer) on each measure. Control group 2 (the group matched for the type of employer in addition to age, sex, and area of residence) had socioeconomic-status indicators closer to those of the copayment group.

Use of the Emergency Department

At base line, the copayment group used the emergency department less than did control group 1 in every age group (Table 2). The difference in such use between the copayment group and control group 2 was much smaller. After adjustment for age, sex, and socioeconomic status, emergency department use in 1992 was 27 percent greater in control group 1 than in the copayment group ($P < 0.001$) and 7 percent higher in control group 2 ($P = 0.04$). When the three groups were considered together, residents of poor neighborhoods had 22 percent more visits to the emergency department than did residents of other neighborhoods ($P < 0.001$). Male study subjects had 5 percent fewer visits than female study subjects ($P = 0.04$).

Members of the copayment group in each age group used the emergency department less in 1993 than in 1992. The reduction was greatest among children one through five years old; as expected, there were smaller but still significant decreases in use among children of these ages in both control groups. For the other three age strata, there was no appreciable change in emergency department use from 1992 to 1993 in either control group.

After adjustment for age, sex, socioeconomic status, and 1992 emergency department use, the decline in the number of visits in 1993 was 14.6 percentage points greater in the copayment group than in either control group ($P < 0.001$ for each comparison). The number of claims received for emergency department treatment outside the HMO did not change from 1992 to 1993 in any study group.

Use of Other Outpatient Services

At base line, the use of urgent care and the number of office visits by adults were higher in control group 1 than in the copayment group in all age groups (Table

2). In control group 2, the use of urgent care was slightly less and the number of office visits somewhat more than in the copayment group. The copayment group had higher rates of pediatric office visits at base line than did either control group.

The use of these outpatient services by the copayment group was relatively unchanged in 1993 (Table 2). As expected, the rate of pediatric visits decreased markedly in all three groups, particularly among young children. Members of the copayment group continued to visit pediatricians at a slightly higher rate than did members of the control groups, but the decrease from 1992 to 1993 was greater in the copayment group. The rate of office visits by adults decreased by 4.4 percent in the copayment group, with almost no change in either control group.

Predictors of the Magnitude of the Copayment-Related Decrease in Emergency Department Use

We examined the effects of age, sex, socioeconomic status, and copayment amount on changes in emergency department use in the copayment group. The magnitude of the decrease in use did not differ according to sex and was not related to age, except for the steeper decline among children one through five years old. Residents of poor neighborhoods reduced their emergency department use by 22.5 percent (from 205 to 159 visits per 1000 person-years), as compared with a reduction of 14.7 percent (from 152 to 129 visits per 1000 person-years) among residents of other neighborhoods who also belonged to the copayment group ($P = 0.13$).

Diagnoses to which a key word could be assigned were available for 78 percent of visits in the copayment group, 75 percent of visits in control group 1, and 76 percent of visits in control group 2. These proportions remained constant between 1992 and 1993. For visits involving diagnoses categorized as "always an emergency," the decline in emergency department use in the copayment group between 1992 and 1993 was small and did not differ significantly from the changes in the control groups (Table 3). For visits involving diagnoses in the less severe categories, the declines were greater in the copayment group than in the control groups, and

Table 3. Changes in Use of the Emergency Department from 1992 to 1993, According to Severity of Diagnosis.*

| SEVERITY OF DIAGNOSIS | VISITS IN 1992 | | | VISITS IN 1993 | | | CHANGE IN COPAYMENT GROUP, 1992 TO 1993 | |
|----------------------------|------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|---|---------------------------------------|
| | COPAYMENT GROUP | CONTROL GROUP 1 | CONTROL GROUP 2 | COPAYMENT GROUP | CONTROL GROUP 1 | CONTROL GROUP 2 | RELATIVE TO CHANGE IN CONTROL GROUP 1 | RELATIVE TO CHANGE IN CONTROL GROUP 2 |
| | no. of visits/1000 person-yr | | | | | | percent (95% confidence interval) | |
| Always an emergency | 14.6 | 15.9 | 13.5 | 13.1 | 15.9 | 11.3 | -9.6 (-25.1 to +9.0) | 7.3 (-14.1 to +34.1) |
| Often an emergency | 49.6 | 54.7 | 44.7 | 41.2 | 53.6 | 42.7 | -14.8 (-23.3 to -5.4) | -12.7 (-22.4 to -1.7) |
| Sometimes not an emergency | 33.9 | 38.9 | 31.1 | 27.4 | 39.6 | 31.5 | -20.7 (-29.4 to -10.8) | -20.1 (-29.9 to -8.8) |
| Often not an emergency | 32.0 | 38.2 | 28.3 | 22.7 | 34.5 | 28.7 | -20.8 (-29.3 to -11.2) | -29.2 (-37.7 to -19.7) |

*Rates and estimated percentages of change were obtained from Poisson regression models that included age, sex, socioeconomic status, and study group. Data are based on 78 percent of visits to the emergency department in the copayment group, 75 percent of visits in control group 1, and 76 percent of visits in control group 2 — that is, the visits for which a physician's diagnosis was available and to which one of the 143 key words could be assigned (see the Appendix).

Table 4. Rates of Hospital Admission for Reasons Other Than Childbirth, Potentially Avoidable Hospitalizations, and Overall Mortality.*

| VARIABLE | ADMISSIONS IN 1992 | | | ADMISSIONS IN 1993 | | | CHANGE IN COPAYMENT GROUP, 1992 TO 1993 | |
|-----------------------|---|-----------------|-----------------|--------------------|-----------------|-----------------|--|---------------------------------------|
| | COPAYMENT GROUP | CONTROL GROUP 1 | CONTROL GROUP 2 | COPAYMENT GROUP | CONTROL GROUP 1 | CONTROL GROUP 2 | RELATIVE TO CHANGE IN CONTROL GROUP 1 | RELATIVE TO CHANGE IN CONTROL GROUP 2 |
| | <i>no. of admissions/1000 person-yr</i> | | | | | | <i>percent (95% confidence interval)</i> | |
| Hospitalizations | | | | | | | | |
| All | 47.8 | 56.3 | 52.3 | 52.9 | 62.0 | 61.1 | 1.4 (-9.3 to +13.3) | -4.6 (-15.7 to +7.9) |
| Potentially avoidable | 2.2 | 2.2 | 2.2 | 2.1 | 2.6 | 2.5 | -28.7 (-59.0 to +24.0) | -28.6 (-61.7 to +33.3) |
| Deaths in 1993 | — | — | — | 1.6 | 2.2 | 2.6 | — | — |

*Rates and estimated percentages of change were obtained from Poisson regression models that included age, sex, socioeconomic status, and study group.

they became greater as the severity of the condition decreased. The amount of the copayment (\$25 vs. \$35) had no significant effect on changes in use ($P=0.75$).

Approximately 57 percent of the emergency department visits in each group in 1992 occurred during the hours when triage was available (that is, they were "daytime" visits). Visits involving diagnoses categorized as "sometimes" or "often" not emergency conditions constituted a smaller proportion of daytime visits (49.0 percent) than of nighttime visits (54.5 percent), when there was no triage. The overall decrease in emergency department use in the copayment group was twice as great at night as during the day: the adjusted decreases associated with visits at night were 20.2 percent (95 percent confidence interval, 13.7 to 26.1 percent) relative to control group 1 and 19.7 percent (95 percent confidence interval, 12.4 to 26.2 percent) relative to control group 2. The relative decreases associated with daytime visits were 8.1 percent (95 percent confidence interval, 1.8 to 13.9 percent) and 10.2 percent (95 percent confidence interval, 3.3 to 16.7 percent), respectively. For visits involving conditions categorized as "often not an emergency," the differences between day and night were greater. In the copayment group, the reductions were 36.2 percent (95 percent confidence interval, 23.5 to 46.7 percent) relative to control group 1 and 44.0 percent (95 percent confidence interval, 31.9 to 54.0 percent) relative to control group 2 at night, and 8.8 percent (95 percent confidence interval, -3.8 to 20.6 percent) and 15.6 percent (95 percent confidence interval, 1.3 to 27.8 percent), respectively, during the day.

Adverse Effects on Health

The adjusted rates of hospital admission for reasons other than childbirth increased slightly between 1992 and 1993 in each group (Table 4); the percentages of change were similar. Admissions for potentially avoidable hospitalizations decreased slightly in the copayment group and increased slightly in each control group, but these differences were not significant. The mean hospital stay after such admissions decreased slightly in the copayment group (from 5.7 to 5.2 days).

In the three study groups, a total of 272 people died in 1993. The adjusted mortality rate was lower in the copayment group than in either control group 1 ($P=0.001$)

or control group 2 ($P=0.06$). Only 7 of the 272 deaths were attributable to conditions previously identified as associated with a potentially avoidable hospitalization. There was one death (from diabetes) in the copayment group, four deaths in control group 1, and two deaths in control group 2. The case fatality rates associated with myocardial infarction were similar: 17 percent (4 of 24) in the copayment group, 17 percent (11 of 65) in control group 1, and 12 percent (4 of 32) in control group 2.

DISCUSSION

In this group of employees and their insured family members, the institution of a copayment of \$25 to \$35 for the use of the emergency department led to a 15 percent reduction in such use, with no offsetting increase in the use of other outpatient services. The fact that most members of the copayment group were already being required to pay small copayments (\$5 or \$10) for those services may help explain the absence of such increases.

Before the copayment for emergency department visits was introduced, approximately 25 percent of such visits involved diagnoses classified as "often not an emergency." The copayment reduced emergency department use more for these visits than for those involving conditions of greater severity. Like another study,¹⁶ our study suggests that cost sharing selectively reduces inappropriate use of the emergency department.

Although there were more visits to the emergency department during daytime hours, a smaller proportion of these visits were classified in the two less severe categories, a fact that suggests that triage and the availability of alternative referral sites helped reduce inappropriate use. The reductions in use associated with copayments were twice as great at night, when triage was unavailable, as during the day. The day-night differential for the reduction in visits for conditions that were "often not an emergency" was even larger. These data suggest that triage and copayment may be alternative methods of controlling inappropriate use; they provide further evidence that copayments act selectively to decrease care for conditions that are not emergencies.

Our findings contrast with those of some studies of cost sharing for other outpatient services. Relatively large copayments (in the form of deductibles or coinsurance) have been shown to reduce the use of appropriate forms

of care, such as preventive services,¹⁷ and to impede the use of screening mammography by Medicare recipients.²⁷ However, small copayments (\$5 per office visit) reduced the number of office visits but did not lower the use of preventive care among employed persons enrolled in an HMO.²⁸ Patients may make better decisions about their medical care when emergencies arise than they do for chronic problems or the use of preventive services, but the amount of the copayment is also important.

Our ability to detect possible adverse effects of the copayment was limited. The number of adverse events in each group was relatively small. With regard to the outcomes examined, however, there was no suggestion of excess adverse events in the copayment group. The small increases in the overall number of hospitalizations between 1992 and 1993 in all three groups were primarily due to the exclusion of all deaths (and the related hospitalizations) that occurred in 1992, a reflection of the study design. We cannot tell whether the presence of the copayment increased suffering by causing delays in seeking care.

A greater impact of cost sharing on low-income patients has been demonstrated.¹⁷ Although poverty was rare in our study group, emergency department use was higher at base line, and the effect of the copayment was somewhat greater for persons from impoverished block groups. Overuse of emergency services in public or community hospitals by the poor is often related to a lack of alternative sources of care.^{3,4,29} The findings in our HMO, which has accessible urgent care and alternative forms of primary care, should not be generalized to apply to low-income groups or the elderly, particularly as regards the possibility that imposing a copayment could lead to adverse effects.

The members of the copayment group differed somewhat from those of the control groups in that they used the emergency department and other services less at base line, had slightly higher socioeconomic status, and more often had cost-sharing arrangements for other types of visits. Nevertheless, the sizable decrease in use of the emergency department in the copayment group persisted after we adjusted for base-line differences. The findings of this and previous studies support the view that the selective use of relatively small copayments can safely reduce inappropriate use of the emergency department among people who are employed and covered by health insurance.

We are indebted to Dr. Charles Quesenberry, Jr., of the Division of Research, Kaiser Permanente, for biostatistical consultation; to Rojean Madsen Willis of the Medical Economics Department, Kaiser Permanente, for consultation on policies regarding copayments in health plans; and to Dr. David Yoon of the Permanente Medical Group, for discussions of emergency department policies and practices.

APPENDIX

The following 143 key words (or phrases) used to describe discharge diagnoses were ranked in four levels of severity, as described in the text. When multiple diagnoses were listed for a single visit, the key word representing the most severe condition was chosen.

Always an emergency (24 key words): cardiac arrest, ventricular

tachycardia or fibrillation, respiratory failure, meningitis, coma, myocardial infarction, stroke or cerebral vascular accident, unstable angina, septicemia, appendicitis, ectopic pregnancy, admitted [to the hospital], bowel obstruction, rule out myocardial infarction, angina, congestive heart failure, poisoning or overdose, seizure, gastrointestinal bleeding, pneumonia, fracture, traumatic amputation, gunshot wound, and atrial fibrillation or flutter.

Often an emergency (39 key words): head trauma, sickle cell crisis, assault, motor vehicle accident, avulsion, hand injury, dislocation, burn, human bite, laceration or open wound, animal bite, puncture wound, nail avulsion, complications of pregnancy, abortion, threatened abortion, pelvic inflammatory disease, pancreatitis, hepatitis, cholelithiasis, urolithiasis, medical consultation, transfusion, triaged, phlebitis, croup, asthma, transient ischemic attack, peptic ulcer disease, hematuria, adverse reaction to medication, pyelonephritis, otitis media, chest pain, esophageal pain, abdominal pain, pelvic pain, urinary retention, and epididymitis.

Sometimes not an emergency (46 key words): dyspnea, other arrhythmia, chronic obstructive pulmonary disease, labyrinthitis, vertigo, abscess, diabetes, hypoglycemia, cancer, dental, Parkinson's, postoperative pain, gout, syncope, migraine, dehydration, anemia, dysfunctional uterine bleeding, gastroenteritis, vomiting, esophagitis, hernia, flu, sinusitis, bronchitis, viral syndrome, varicella, fever, urinary tract infection, insect or spider bite, allergic reaction, corneal abrasion or foreign body, skin infection, abrasion (excluding corneal abrasion), otitis externa, ingrown nail, foreign body, conjunctivitis, hemorrhoid, Bell's palsy, stress, depression, anxiety, psychosis, alcohol-related disease, and substance abuse.

Often not an emergency (34 key words): sprain of ankle, sprain of neck, musculoskeletal strain or pain, other sprain, low back pain, chest-wall pain, epistaxis, chest-wall contusion, soft-tissue injury, contusion, hypertension, arthritis, headache, nausea, dizziness, hyperventilation, vaginitis, rash, cyst, urticaria, edema, cast change, suture removal, dressing, wound check, wound infection, [visit for] injection only, subconjunctival hemorrhage, upper respiratory infection, nasopharyngitis, cough, constipation, [patient] left without being seen, [patient had] no injury.

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