



Effects of changes in copayment for obstetric emergency room visits on the utilization of obstetric emergency rooms

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ABSTRACT

In view of the growing proportion of “non-urgent” admissions to obstetric emergency rooms (OERs) and recent changes in copayment policies for OER visits in Israel, we assessed factors contributing to OER overcrowding. The changes investigated were (a) exemption from copayment for women with birth contractions, (b) allowing phone referrals to the OER and (c) exemption from copayment during primary care clinic closing hours.

We analyzed data of a large tertiary hospital with 37 deliveries per day. Counts of women discharged to home from the OER were an indicator of “non-urgent” visits.

The annual number of non-urgent visits increased at a higher rate (3.4%) than the natural increase in deliveries (2.1%). Exemption from copayment for visits during non-working hours of primary care clinics was associated with increases in OER admissions (IRR = 1.22) and in non-urgent OER visits (IRR = 1.54). Younger and first-time mothers with medically unjustified complaints were more likely to be discharged to home.

We showed that the changes in the policy for OER copayment meant to attract new clients to the HMO had an independent impact on OER utilization, and hence, added to the workload of medical personnel. The change in HMO policy regulating OER availability requires rigorous assessment of possible health system implications.

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1. Background

The phenomenon of overcrowded emergency rooms (ERs) is a universal problem found in both high- and

low-income countries [1–6]. A growth in the demand for emergency medical services is usually produced by the “inappropriate use” of emergency medical services for non-urgent visits [7], and it is typically of a multi-factorial nature [6,8]. Overcrowded ERs are associated with increased costs and workload [9], disruption in the continuity of care, and the difficulty of meeting the workload with the manpower available, the last of which may compromise the quality of care in true emergencies and lead to adverse events [7,9]. Indeed, it has been shown that nurses who work more than 40 h per week make more frequent critical mistakes [10].

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During pregnancy and childbirth, routine prenatal management is usually provided by primary health care services, while the range of potentially life-threatening complications may require management and skills that are only available in the obstetric emergency room (OER). A well-functioning referral system to OER, therefore, is crucial to ensure that patients receive appropriate and timely maternal and prenatal care [11,12]. However, concerned pregnant women will often self-refer to the facilities, even in the absence of a threatening obstetric condition [13], depending on availability of transportation, perceived benefit of treatment in the hospital, quality of care and severity of the condition along with demographic characteristics [7,11,14].

Trends in OER referrals may be attributed to several political, legal and financial issues, such as government support and national resource allocation [15]. Thus, according to the Israeli Ministry of Health report (2009–2011), the admissions rate in OERs in Israel was 47 per 1000 women, while the proportion of women discharged to home was as high as 48% [16]. Admissions were higher in peripheral regions, where they are affected by HMO policy, accessibility, socio-demographic characteristics of the population [16] and health services consumption habits among the population. Two studies showed a higher utilization of ERs by Arab–Bedouin compared to Jewish members of the population [17,18]. This outcome may be explained by the patient contacting a health care provider in an advanced stage of disease, poor communication with the primary physician, greater patient confidence in the ER medical staff, low accessibility of primary care services, and low education level [17–19].

Health care in Israel is universal, and as defined by the National Health Insurance Law of 1995, all citizens are entitled to medical insurance and health care from one of the four Health Maintenance Organizations (HMO). The only precondition for receiving such coverage is registration with one of the HMOs, which provide uniform benefits packages (covering all basic and essential care needs) and which receive funding from the National Insurance Institute based on the number of insured patients and their age, sex and geographical location. Among the four HMOs in Israel (Clalit, Maccabi, Meuhedet and Leumit), the majority of the Israeli population is registered with Clalit, whose coverage is as high as 50–70% in some districts in the country. Although policy makers anticipated that the financing mechanism implemented through the National Health Insurance Law would encourage competition between the HMOs for clients (which it did), it was also designed to render the HMOs indifferent to the socio-demographic features of their members, a goal whose success has been questionable [20].

During the period of 2007–2010, the four Israeli HMOs instituted new regulations for OER copayment in attempts to recruit more members. Traditionally, regardless of HMO affiliation, the patient has been required to pay for an OER visit that did not end in delivery unless he/she received a formal referral from a medical practitioner. Under such circumstances, however, patients who have a perceived need for medical attention but who lack the necessary referral may be less likely to seek help if they know they will be

charged for the visit. To address this problem, the Clalit HMO, for example, introduced three specific changes in 2009 and 2010: (a) exemption from copayment for women with birth contractions, (b) introduction of “Clalit CALL”, a phone service for OER referral, and (c) exemption from copayment outside of primary care clinic working hours during primary care clinic off hours. Similar changes were also adopted by the other three Israeli HMOs.

While intended to attract clients to the HMO, such changes in copayment may have also increased the numbers of visits to OERs, especially for issues considered “inappropriate use” of OER services. We therefore aimed to describe the effect of the recent changes in copayment on the number of OER admissions and the proportion of visits that ended in discharge to home, the latter of which could be considered inappropriate or non-urgent use of OERs. We hypothesized that the changes in copayment introduced by the Israeli HMOs have had an independent impact on the OER. To test this hypothesis, we examined the OER at Soroka University Medical Center (SUMC), a tertiary medical center in Beer-Sheva that provides obstetrical services to the entire population of southern Israel and that has been coping with growing numbers of OER admissions each year.

2. Methods

2.1. Population

We investigated all admittances of pregnant women beyond 22 weeks of gestation to the SUMC OER during the period of January 2006 to December 2011 on the basis a formal referral from a primary medical care provider or as a result of an independent decision of the women. The investigation was limited to women insured by Clalit, one of the largest HMOs in Israel with 70% coverage in the south of the country.

2.2. Data

We used the Admission-Transfer-Discharge (ATD) computerized system of SUMC for the information about the visit to OER and the subsequent delivery at the end of pregnancy during the period of 2006–2011.

2.3. Variables

A non-urgent OER visit was the main dependent variable in the analysis, and was defined as a visit followed by discharge to home, which could potentially indicate an inappropriate use of OER. We also predicted the overall count of OER visits where relevant.

The analysis focused on two levels of data collection: (1) aggregated daily counts of the number of OER visits and (2) each individual visit of a pregnant woman to ER.

The main dependent outcome in the *first approach* was daily counts of non-urgent and overall OER visits. The independent variables included the three periods of time that followed the main changes in copayment, as defined earlier in the text: (a) January–May 2009, (b) June–December 2009 and (c) after January 2010. We adjusted the analysis to time trend (defined as consecutive days of the study

follow-up included in the analysis throughout the study period), seasonality, weekends and holidays.

This investigation was supplemented by the *second approach*, which focused on the individual level of the study population to assess the impact of the changes in copayment on the likelihood of a patient seeking a non-urgent OER visit.

The main exposure assessed comprised the periods of time following the copayment changes, as defined earlier. The analysis of the association was adjusted to demographic, behavioral and clinical characteristics of the study population, indicators of weekends and holidays, time of a visit (e.g., during working hours of the primary clinics, etc.) and the women's complaints at the OER, which were classified into three groups according to urgency. If immediate medical treatment or hospitalization was required (e.g., due to bleeding, vomiting, heart rate fibrillation, changes in vision, seizures, any sign of the onset of delivery, etc.), the complaints were defined as more justified. Complaints for which no proper ambulatory response could be provided by the OER were considered less justified (e.g., changes in fetus movements, diarrhea, etc.). All other visits, including follow-up referrals, were classified as not justified for the purposes of the analysis.

2.4. Statistical analysis

A univariate analysis of individual visits was performed using a *t*-test and the Mann–Whitney test for continuous variables and Chi-Square and Fisher exact test for categorical variables.

2.4.1. Multivariate analysis of data aggregated on a daily basis

We used generalized additive models (GAM) with Poisson distributed outcomes to analyze the association of changes in copayment for OER with population behavior. We modeled the number of admissions to OER as the dependent variable in a time series analysis, where natural splines were used to control for seasonality, holidays, weekends and daily increasing trend of birth rate. Degrees of freedom were chosen by minimizing the sum of the partial autocorrelation function (PACF) [21]. The model estimated incidence relative risk (IRR), showing the multiplicative effect of the changes in copayment on the number of visits to OER.

2.4.2. Multivariable analysis of data collected for each woman

The generalized linear model (GLM) model with a Poisson-distributed outcome was used for a multivariable analysis of the probability of an OER admission not being followed by delivery (non-urgent visit), which accounted for clusters created by women who visited the OER multiple times before giving birth and her deliveries during the study period. The Poisson distribution assumptions were confirmed for the dichotomous outcome used in the model. The model was adjusted to the steadily increasing trend during the study period in the number of deliveries per day in the study hospital as well as to day of the week, holidays and seasons. The effect of changes in copayment was

presented in terms of relative risk (RR), i.e., the multiplicative difference in the number of non-urgent visits.

Analyses were performed using SPSS version 18 (SPSS Inc., Chicago, IL), SAS 9.2 and the R statistical package, version 2.15.1.

2.5. Sensitivity analyses

We were unable to precisely distinguish between the type of visits by women for routine prenatal care in order to separate those from the analysis. To validate the results, we repeated the main analysis only on the population of women who self-referred to the OER, thus excluding women referred by their OB/GYN physicians for ultrasound procedures.

3. Results

The overall number of admissions to the OER in SUMC during 2006–2011 was 141,773, out of which 106,662 visits (75.2%) were by women registered with the Clalit HMO. This proportion did not change substantially during 2006–2011, when it was consistently within the range of 75–77%. During this period, on average, the daily birth count in the hospital was 34.8 deliveries, the number of admissions per day to the OER was 65.4, and 30.6 women (46.8% of all OER admissions) were discharged to home on a daily basis. The number of deliveries per day in the hospital increased by 12.6% from 32.9 deliveries a day in 2006 to 36.7 in 2011, with an average annual increase of 2.1%. During the same period, the increase in the number of women who visited the OER and who were discharged to home was 20.5%, corresponding to an annual increase of 3.4% with a peak in 2009 (8.2%).

The average number of monthly admissions prior to June 2009 (the date of the second change in copayment policy) was 1823.4, which increased to 2143.4 visits per month after that date (*p*-value <0.001) (Fig. 1). The proportion of visits not ending in delivery also increased from 33.7% a day before June 2009 to 36.4% after (*p*-value <0.001).

The exemption from copayment for women with birth contractions (from January 2009) and the change allowing for a phone referral (June 2009) were neither associated with all OER admissions nor with non-urgent OER visits (Table 1). The change implemented in January 2010, however, which exempted women from copayment during the closing hours of the primary care clinics, was associated with a 22% increase in the number of visits (IRR = 1.22, 95% CI 1.07; 1.37 = 1.54) and 54% increase of non-urgent visits (IRR = 1.54, 95%CI: 1.20; 1.96). Sensitivity analysis only within self-referrals showed similar results, just with a higher magnitude of an effect.

Women discharged to home were characterized by a gestational age that was shorter by two weeks, healthier status, higher prevalence of prima gravida, and less likely to lack a prenatal follow-up visit (Table 2).

Women discharged to home from the OER were more likely to arrive with a less medically justified complaint and during the working hours of primary care clinics (Table 3). The proportion of women arriving during the working hours of primary clinics decreased slightly over time (from

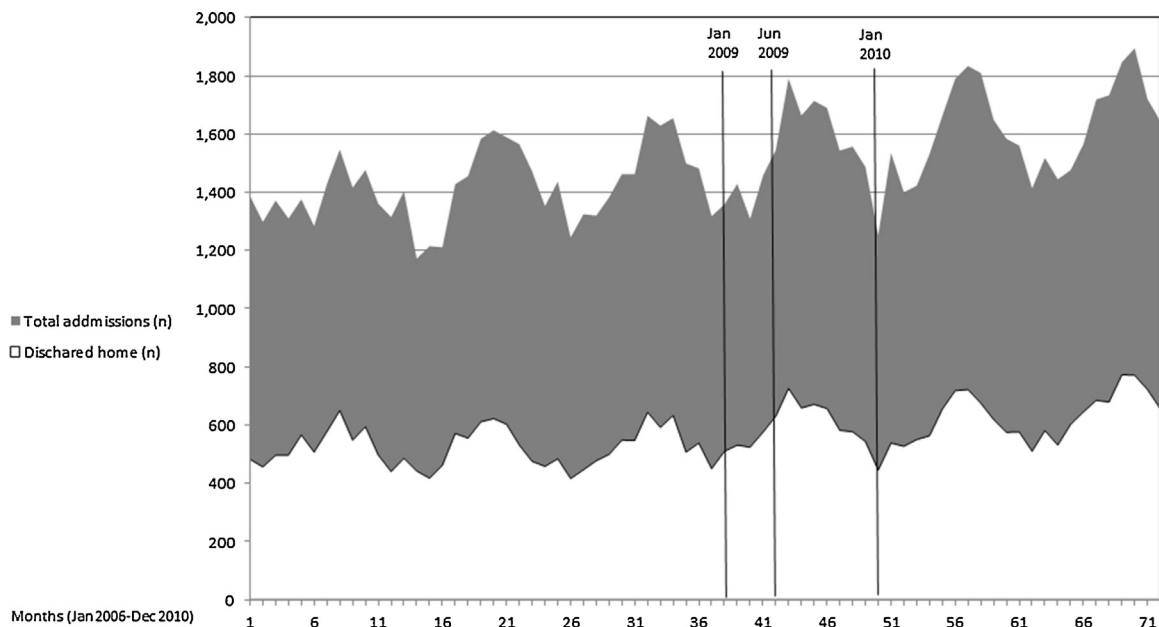


Fig. 1. Total numbers of monthly OER admissions and of women discharged to home during the period 2006–2011 among women insured by the “Clalit” HMO. Changes in the referral issuing process: (1) January, 2009—exemption from co-payment for women with birth contractions; (2) June, 2009—“Clalit CALL” implemented allowing for a phone referral to the OER; (3) January, 2010—exemption from co-payment during the closing hours of the primary clinics.

70.5% before January 2009 to 68.2% after January 2010) due to the growing proportion of women arriving when clinics were closed (22.0% before January 2009 to 23.6% after January 2010).

A multivariable analysis (Table 4) indicated that the second and third changes in copayment had independent impacts on the probability of a non-urgent OER visit after adjusting for individual patient factors. The change (introduced in January 2009) exempting women with birth contractions from copayment was not associated with non-urgent admissions (p -value = 0.348).

Women at more advanced gestational ages who had given birth at least once before and who had a history of infertility treatment or pregnancy related or chronic morbidity, or women arriving at night who had a complaint justifying an ER visit had more chance to stay until their delivery rather than to be discharged to home (Table 4). These findings are consistent with the results of the analysis of the visit counts.

4. Discussion

We investigated the impacts of changes in the management of OER referrals on a large regional hospital in southern Israel. Counts of women discharged to home from OER indicated non-urgent visits, the number of which increased at a higher rate (3.4% annually) compared with the annual natural increase in deliveries (1.9%). This relatively moderate increase can be translated into five additional, unnecessary visits per day within a span of only 5 years.

We hypothesized that changes allowing wider excess to OER aiming to attract new insurance clients to the Clalit HMO may have led to an increase in the numbers of non-urgent visits. In support of our hypothesis, we found a significant increase in the overall OER admissions (IRR = 1.22) and an increase in non-urgent OER visits (IRR = 1.54 and RR = 1.07, as estimated on counts and individual data, respectively) following an exemption of

Table 1

An effect of Changes in Copayment Policies on Obstetric Emergency Room admissions between 2006 and 2011, based on time-series analysis^a.

Changes in copayment and referral system to OER	All admissions		Admissions not ending with delivery	
	IRR (95% CI)	<i>p</i> Value	IRR (95% CI)	<i>p</i> Value
Exemption from co-payment for women with birth contractions (Jan 2009)	0.99 (0.93;1.04)	0.739	0.95 (0.84;1.09)	0.527
“Clalit CALL”—allowing for a phone referral to the OER (June 2009)	1.01 (0.93;1.08)	0.724	1.01 (0.88;1.14)	0.902
Exemption from co-payment during the closing hours of the primary clinics on week days (Jan 2010)	1.22 (1.07;1.37)	<0.01	1.54 (1.20;1.96)	<0.01

^a The table shows results of generalized additive models (GAM) with the number of admissions to OER as the dependent Poisson distributed variable, where natural splines were used to control for trend in days, day of the week, seasons, holidays and seasonality. The model estimated incidence relative risk (IRR), showing the multiplicative effect of the changes in copayment on the number of visits to OER.

Table 2

Demographic and medical backgrounds of women—106,662 OER visits.

Patients characteristics	Hospitalized for delivery N = 66,043 visits	Discharged home N = 40,619 visits	Total N = 106,662 visits	p-Value
Maternal Age at following delivery, years				
Mean \pm SD (n)	28.6 \pm 5.7	28.5 \pm 5.6	28.6 \pm 5.7	0.489
Median	28.0	28.0	28.0	
Gestational Age at ER admission, weeks				
Mean \pm SD (n)	37.9 \pm 3.7	35.9 \pm 4.9	37.1 \pm 4.3	<0.001
Median	39.0	38.0	39.0	
Jewish origin	38.6%	56.1%	45.3	<0.001
Gravidity				
1st delivery	21.3%	27.4%	23.6%	<0.001
2–5th delivery	55.3%	56.0%	55.6%	
6th+ delivery	23.3%	16.6%	20.6%	
Parity				
1st delivery	25.7%	33.5%	28.7%	<0.001
2–5th delivery	56.8%	55.3%	56.2%	
6th+ delivery	17.5%	11.2%	15.1%	
Medical history				
Past obstetrical problems	3.7%	2.8%	3.3%	<0.001
Infertility treatment	2.7%	3.2%	2.9%	<0.001
Repeated abortion	6.1%	6.4%	6.2%	0.097
Gestational diabetes	3.1%	3.1%	3.1%	0.731
Diabetes mellitus	0.9%	0.5%	0.7%	<0.001
Chronic hypertension	1.3%	0.9%	1.1%	<0.001
Mild or moderate PET	3.2%	2.9%	3.1%	<0.019
Severe PET	1.2%	0.6%	0.9%	<0.001
Lack of prenatal care	9.3%	5.1%	7.7%	<0.001

copayment if a visit was during non-working hours of primary care clinics.

It is important to note that an adjustment to the increased workload following increased utilization of OER is difficult, and in fact, practically impossible in the Israeli system, as the funding of OER personnel is based on the number of deliveries rather than on the total number of OER visits. If the staff-to-patient calculation would have been based on the number of patients in OER, the system would be immediately affected by the change in copayment, but would adjust itself at a long term follow-up.

The effect of the implementation of a phone referral system was not consistent in our analyses between the different models used, mainly due to the small number of women who actually used this option for the referral. The effect of the phone referral recorded in the patient-based multivariable analysis (RR = 1.06) most likely reflected the changes in copayment introduced previously.

In contrast to our expectations, the change exempting women with birth contractions (issued on January 2009) from obligatory copayment did not increase the probability of any type of visit, including those classified as non-urgent visits. This finding may be partially explained by the temporary relocation of many families from the Beer-Sheva region to other Israeli towns during the military operation “Cast Lead” (December 27, 2008–January 18, 2009), resulting in the observed decrease in birth rates at the SUMC. The real effect of this change may have been reflected later.

- The likelihood of a non-urgent visit was individually affected by the maternal age, morbidity, ethnicity and

the time of the visit. Specifically, Young first-time mothers were more often discharged home, whereas mothers with chronic or pregnancy-related problems and women with medically justified complaints were more likely to be hospitalized. This finding is consistent with other studies on the behavior of patients in general ERs [22,7].

- In contrast to the findings by Libnat et al. and Cohen et al. [17,18], who reported excessive utilization of the general ER by the Arab–Bedouin population, we found that women of Arab–Bedouin origin were more likely to be hospitalized following the OER visit, possibly due to the higher proportion of repeated deliveries in this population (77.2% vs. 64.6% in Jewish mothers), which implies that Arab–Bedouin women were more experienced in matters related to their pregnancies.
- Similar to findings by Carret for a general ER [7], women visiting the OER during the morning hours were more likely to be discharged to home, whereas visits during the weekend usually ended in delivery.

The balance between the availability of medical services and the extent to which OER visits are urgent should be approached with caution, as was suggested in a review by Simonet [23]. On the one hand, the burden imposed on medical staff by an excessive workload has frequently been shown to be a risk factor for medical mistakes [9], and as such, it may have negative implications for the quality of care provided to women whose OER visits were justified [10]. On the other hand, better availability of emergency care may prevent unnecessary delays in patients receiving medical services, a fact that must be taken into account

Table 3
Characteristics of the ER visits—106,662 visits¹.

Patients characteristics	Hospitalized for delivery N = 66,043 visits	Discharged home N = 40,619 visits	Total N = 106,662 visits	Jan 2009–Dec 2008		Jan 2009–May 2009 (after exemption from co-payment for women with contractions)		Jun 2009–Dec 2009 (after introducing the referral to OER by phone)		Jan 2010–Dec 2011 (after exemption from co-payment during closing hours of clinics)	
				Hospitalized N = 31,828	Discharged N = 18,765	Hospitalized N = 4201	Discharged N = 2567	Hospitalized N = 6868	Discharged N = 4482	Hospitalized N = 23,146	Discharged N = 14,805
With referral	26.8%	60.8%	39.7%	29.0%	67.5%	27.9%	62.9%	28.2%	60.7%	23.0%	52.1%
Number of ER visits including this visit											
Mean \pm SD (n)	1.95 \pm 1.40	2.04 \pm 1.49	1.98 \pm 1.44	1.92 \pm 1.39	2.04 \pm 1.51	1.96 \pm 1.46	2.12 \pm 1.48	2.02 \pm 1.48	2.10 \pm 1.51	1.96 \pm 1.39	2.01 \pm 1.45
Median	1.00	2.00	1.00	1.00	2.00	1.00	2.00	1.00	2.00	1.00	2.00
Patients complaint justifying ER visit											
At a high extend ²	87.4%	66.1%	79.3%	86.8%	64.3%	87.5%	64.3%	87.6%	67.5%	88.1%	68.3%
At a moderate extend ³	0.1%	0.4%	0.2%	0.2%	0.3%	0.2%	0.3%	0.1%	0.4%	0.1%	0.4%
Not justifying complaints	12.4%	33.4%	20.4%	13.0%	35.3%	12.1%	35.2%	12.2%	31.8%	11.7%	31.2%
Arrived											
At Night (0–7am)	25.1%	6.2%	17.9%	24.6%	5.7%	24.6%	5.6%	24.8%	6.8%	25.9%	6.8%
During the day (7am–7pm on Weekday or 7–12am on Friday/Holiday Eve)	48.7%	71.8%	57.5%	49.5%	73.2%	48.5%	73.2%	49.5%	72.2%	47.5%	69.6%
Evening (7–12pm on weekday or 1pm–12am on Friday/Holiday Eve)	26.2%	22.0%	24.6%	26.0%	21.1%	26.9%	21.2%	25.7%	21.0%	26.6%	23.6%
Arrived during open hours of clinics	46.3%	70.5%	55.5%	47.0%	72.0%	46.0%	71.9%	47.2%	70.6%	45.1%	68.2%
Work day	75.8%	83.6%	78.7%	76.1%	84.0%	75.3%	83.5%	76.4%	83.8%	75.3%	82.9%
Half day	12.4%	9.8%	11.4%	12.2%	9.9%	12.9%	9.9%	12.0%	9.5%	12.7%	9.7%
Saturday or holiday	11.8%	6.6%	9.8%	11.7%	6.0%	11.7%	6.6%	11.6%	6.7%	12.0%	7.4%
Source of referrals											
Referral by phone	0.1%	0.5%	0.3%	0.0%	0.0%	0.1%	0.4%	0.8%	2.2%	0.1%	0.6%
Nurse	2.9%	8.4%	5.0%	3.8%	11.1%	3.0%	8.7%	2.6%	7.0%	1.6%	5.3%
Other ER	0.9%	1.1%	1.0%	1.0%	1.1%	1.1%	1.3%	0.8%	1.2%	0.8%	1.1%
Medical Institute	0.4%	0.1%	0.3%	0.5%	0.1%	0.7%	0.2%	0.3%	0.0%	0.3%	0.1%
Non-Medical Institute	0.1%	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
OBGYN, Primary MD or other	21.9%	50.4%	32.7%	23.2%	54.7%	22.7%	51.9%	23.3%	50.4%	19.5%	44.6%
Self referral	72.9%	38.7%	59.9%	70.6%	32.0%	71.5%	36.5%	71.5%	38.8%	76.6%	47.5%

¹ All comparisons were significant at the level of 0.001, except for referral by non-medical institute, where the p-value was equal 0.060.

² Complaints were classified as justified with higher extent if they required immediate and urgent care or hospitalization, e.g. bleeding, vomiting, heart rate fibrillation, changes in vision, seizures, all signs of an onset of delivery, etc.

³ Complaints for which there is no proper ambulatory response were classified as justified at a moderate extent, e.g. changes in fetus movements, diarrhea, etc.

Table 4

Effects of changes in copayment policies on probability of non-urgent OER admissions during the study period 2006–2011 in the study population based on a multivariable model of patient-based data.

Factor	Relative risk (RR), (95% CI)	p-Value
Changes in copayment		
Before January 2009— <i>reference period</i>	1.00	
Exemption from co-payment for women with birth contractions (January 2009)	1.01 (0.98; 1.06)	0.348
“Clalit CALL”—allowing for a phone referral to the OER (June 2009)	1.06 (1.03; 1.10)	0.001
Exemption from co-payment during the closing hours of the primary clinics on weekdays (January 2010)	1.07 (1.03; 1.11)	0.002
Gestational age at ER admission, weeks	0.96 (0.96; 0.96)	<0.001
Parity		
1st delivery	1.00	
2–5 deliveries	0.88 (0.86; 0.89)	<0.001
6+ deliveries	0.71 (0.69; 0.73)	<0.001
Medical history		
Infertility treatment at the current delivery	0.85 (0.81; 0.89)	<0.001
Gestational diabetes	0.88 (0.84; 0.93)	<0.001
Diabetes mellitus	0.58 (0.51; 0.66)	<0.001
Hypertension	0.73 (0.67; 0.81)	<0.001
Mild or moderate preeclampsia	0.76 (0.72; 0.80)	<0.001
Severe preeclampsia	0.45 (0.40; 0.51)	<0.001
Patients complaint justifying ER visit at a high extent	0.72 (0.71; 0.74)	<0.001
Time of arrival		
Night	1.00	
Day	2.33 (2.23; 2.44)	<0.001
Evening	2.05 (1.96; 2.15)	<0.001
Referral issued by		
Nurse	1.23 (1.21; 1.26)	<0.001
Medical institute	0.31 (0.23; 0.42)	<0.001
Self-referral	0.63 (0.62; 0.65)	<0.001
Time trend, in days ¹	1.00	0.018

¹ Time trend is measured as consecutive days of the study period.

when reviewing the long-term trends of the HMO policy changes. In addition, the OER visit can potentially reduce the anxiety and fears of OER visitors, particularly of first-pregnancy women, and as such, it contributes to increased quality of life. As outlined below, the current study did not fully address this complex question.

4.1. Limitations

- Defined as “non-urgent”, the main outcome of the analysis is an efficiency-driven notion that ignores the potentially positive impact that the OER visit could have on the quality of life of pregnant women. We can assume that the increased availability of the OER may have improved the quality of care in urgent cases. However, the study population may have been adversely affected by the increased number of women waiting in the overcrowded OER. Additionally, the analysis focused on the population of women who showed up at the OER, but it did not include those who decided not to come to the hospital and who may have had more urgent needs.
- A health efficiency estimate of the change was outside the scope of the current analysis, as the low rates observed of the possible birth complications precluded a meaningful statistical analysis of their association with HMO policy changes during the study period. We did not detect any

trends in complications, e.g., peripartum death, uterine rupture, etc.

- Additionally, we could not accurately identify the number of visits to the OER for the purposes of routine prenatal care, and therefore, the proportion of non-urgent visits (38.2% in 2011) overestimated their actual number. Assuming that roughly 20% of the non-urgent visits were due to prenatal diagnostic procedures, the proportion of inappropriate visits is 18.2%, markedly similar to the figure of 17% reported for an OER in an American hospital [5] and within the range of 20–40% indicated by other researchers [22,7,24]. Such misclassification in the definition of a non-urgent visit diminishes the effects of the changes in copayment, as confirmed by the sensitivity analysis performed only on self-referrals, the results of which showed that the changes had a greater impact.
- The current analysis is prone to selection bias in view of the limited study population, which comprised patients of one HMO who used the OER of the same medical center. In addition, the geographical district of southern Israel is unique in its demographic distribution, which entails a high proportion of Arab–Bedouin residents. The district is characterized by a generally low socio-economic level, a factor known to substantially influence the utilization patterns of health services.

All the above-mentioned factors may preclude the immediate generalizability of the study's conclusions.

To conclude, this research showed that the changes in copayment policy had independent and almost immediate impacts on the utilization of OER services. While meant to draw new HMO clients, the changes invariably increased the workload of the medical personnel. The change in the HMO policy regulating OER availability requires a rigorous assessment of its possible implications for the health system, especially on the adjustment of the manpower in OERs.

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The life of the principal investigator of this study, Dr. Lora Warshawsky-Livne, ended prematurely on April 11, 2013, after a battle with lymphoma when she was just 42. This manuscript depicts the results of Lora's last research, which she did not live to see published. We, Lora's co-authors, see this manuscript as a tribute to her academic aspirations, her endless energy and amiable character.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.healthpol.2015.08.006>.

References

- [1] Khangura JK, Flodgren G, Perera R, Rowe BH, Shepperd S. Primary care professionals providing non-urgent care in hospital emergency departments. *Cochrane Database of Systematic Reviews* 2012; 14:11.
- [2] Nawar EW, Niska RW, Xu J. National Hospital Ambulatory Medical Care Survey: 2005 emergency department summary. *Advanced Data* 2007;386:1–32.
- [3] American Hospital Association. AHA hospital statistics. Chicago, IL: Health Forum; 2015. Available at: (<http://www.aha.org/research/rc/stat-studies/index.shtml>) [accessed 01.11.15].
- [4] Schafermeyer RW, Asplin BR. Hospital and emergency department crowding in the United States. *Emergency Medicine (Fremantle)* 2003;1:22–7.
- [5] Matteson KA, Weitzen SH, Lafontaine D, Phipps MG. Accessing care: use of a specialized women's emergency care facility for nonemergent problems. *Journal of Women's Health (Larchmt)* 2008;17:269–77.
- [6] Lowthian JA, Curtis AJ, Cameron PA, Stoelwinder JU, Cooke MW, McNeil JJ. Systematic review of trends in emergency department attendances: an Australian. *Emergency Medicine Journal* 2011;28:373–7.
- [7] Carret ML, Fassa AG, Kawachi I. Demand for emergency health service: factors associated with inappropriate use. *BMC Health Services Research* 2007;7:131.
- [8] Moskop JC, Sklar DP, Geiderman JM, Schears RM, Bookman KJ. Emergency department crowding, Part 1—Concept, causes, and moral consequences. *Annals of Emergency Medicine* 2009;53:605–11.
- [9] Sun BC, Hsia RY, Weiss RE, Zingmond D, Liang LJ, Han W, et al. Effect of emergency department crowding on outcomes of admitted patients. *Annals of Emergency Medicine* 2013;61:605–11 (e6).
- [10] Laoz L, Romano S, Shlev E. The association between the obstetric services workload and adverse events. *Harefuah* 2011;150:774–7.
- [11] Jahn A, De Brouwere V. Referral in pregnancy and childbirth: concepts and strategies. ITG Press; 2001. Available online at: (<http://www.jsieurope.org/safem/collect/safem/pdf/s2940e/s2940e.pdf>) [accessed 01.11.15].
- [12] Campbell OMR, Graham-DPhil J. Strategies for reducing maternal mortality: getting on with what works. *Lancet* 2006;368(9543): 1284–99.
- [13] Koblinsky M, Matthews Z, Hussein J, Mavalankar D, Mridha MK, Anwar I, et al. Going to scale with professional skilled care. *Lancet* 2006;368(9544):1377–86.
- [14] Hussein J, Kanguru L, Astin M, Munjana S. The effectiveness of emergency obstetric referral interventions in developing country settings: a systematic review. *PLoS Medicine* 2012;9(7):e1001264.
- [15] Murray SF, Pearson SC. Maternity referral systems in developing countries: current knowledge and future research needs. *Social Science & Medicine* 2006;62:2205–15.
- [16] Ministry of Health. Emergency Room visits-demographic characteristics 2009–2011; 2015. Available online: (http://www.health.gov.il/PublicationsFiles/emergency_geo2011.pdf) [accessed 01.11.15].
- [17] Libnat S, Almog E, Rabinovitch G, Snir Y. Differences in emergency room referral patterns in southern Israel. *Harefuah* 2000;138:631–4.
- [18] Cohen A, Dreier J, Sharf A, Vardy DA. Utilization of emergency department services by the Bedouin Population in Southern Israel. *The Scientific World Journal* 2007;7:330–5.
- [19] Khan Y, Glazier RH, Moineddin R, Schull MJ. A population-based study of the association between socioeconomic status and emergency department utilization in Ontario, Canada. *Academic Emergency Medicine* 2011;18:836–43.
- [20] Reuveni H, Shvarts S, Meyer J, Elhayany A, Greenberg D. Newspaper advertising by health maintenance organizations during the reform of healthcare services in Israel. *Israel Medical Association journal* 2001;3:422–6.
- [21] Katsouyanni K, Samet JM, Anderson HR, Atkinson R, Le Tertre A, Medina S, et al. HEI Health Review, Air pollution and health: a European and North American approach (APHENA). Research Report Health Effects Institute 2009;142:5–90.
- [22] Sempere-Selva T, Peiró S, Sendra-Pina P, Martínez-Espín C, López-Aguilera I. Inappropriate use of an accident and emergency department: magnitude, associated factors, and reasons—an approach with explicit criteria. *Annals of Emergency Medicine* 2001;37:568–79.
- [23] Simonet D. Cost reduction strategies for emergency services: insurance role, practice changes and patients accountability. *Health Care Analysis* 2009;17:1–19.
- [24] Carret ML, Fassa AC, Domingues MR. Inappropriate use of emergency services: a systematic review of prevalence and associated factors. *Cadernos de Saúde Pública* 2009;25:7–28.