

Determinants of Hospital Utilization: the Situation in Israel and Selected countries

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Abstract

Background: In 1995 hospital costs constituted about 42% of the health expenditures in Israel. Although this proportion remained stable over the last decade, hospital discharge rates per 1,000 population increased, while hospitalization days per 1,000 population and average length of stay declined.

Objective: To gain an insight into the forces behind these changes, we compared the trends in hospital utilization in Israel with those in 21 developed countries with available data.

Materials and Methods: Our data were derived from The "Hospitals and Day Care Units, 1995" report by the Health Information and Computer Services of the Israel Ministry of Health, and the Organization for Economic Cooperation and Development Health Data, 98. We examined the numbers of acute care hospital beds, of patients on dialysis and of doctors' consultations, health expenditures and age structure of the population in 1995 or closest year with available data, as well as changes in DRs, HDs and ALOS between 1976 and 1995.

Results: In Israel the DRs increased from 130 in 1976 to 177 in 1995 (36%), HDs declined from 992 to 818 (18%), and ALOS declined from 7.60 to 4.51 days (41%). Relative to other countries, in 1995 Israel had the lowest ALOS; low HDs similar to those in the UK, Portugal, Spain, the USA and Sweden; and intermediate DRs similar to those in Belgium, Germany, Sweden and Australia. The number of acute care beds per 1,000 population was directly related to HDs ($r=0.954$, $P=0.000$) and to DRs ($r=0.419$, $P=0.052$). Health expenditures (% of the gross national product) correlated with the number of patients on dialysis per 1,000,000 population ($r=0.743$, $P=0.000$). Between 1976 and 1995, HDs and ALOS declined in most countries, however the trends in DRs varied from an increase by 119% in the UK to a decline by 29% in Canada.

Conclusions and hypotheses: The increase in DRs in Israel from 1976 to 1995 was shared by many but not all

countries. This variability may be related to differences in trends in local practice norms and in available hospital beds. If the number of patients on dialysis is a valid index for use of expensive treatment modalities, the correlation of health expenditures with the number of patients on dialysis suggests that the use of expensive technology is a more important determinant of health care costs than the age of the population or hospital utilization. Since the use of expensive technology is highest during the first few days in hospital, decisions about health care policy should consider the possibility that the savings incurred by a further decline in HDs and ALOS may be offset by a possible *increase* in per diem hospital costs and in health care expenditures after discharge from hospital.

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Israel has an 80-year-old tradition of social health insurance through voluntary health maintenance organizations (sick funds), and in 1995 this insurance was implemented through the National Health Insurance Law. Like all other countries [1], the Israeli health care system has to meet the rising expectations of the population and to cope with pressures to contain costs. Health care expenditures rose from 6.6% in 1985-86 to 8.6% of the national product in 1995 [2]. In 1985-86 the proportion of hospital costs from all health expenditures was 45%. Since the mid-1980s it declined with a subsequent leveling off, and between 1987-88 and 1995 this proportion has remained relatively stable at 42-43% [2]. However, there has been a steady increase in discharge rates from acute care hospitals per 1,000 population, and a decline in both hospitalization days per 1,000 population and the average length of stay in hospital [3].

The overload in hospital wards continues to be a source of concern for health policy makers in Israel. Similar to England, there seems to be a perception that hospitals are experiencing difficulties in coping with emergency pressures [4]. A possible way to gain an insight into the forces behind hospital utilization is to look for variations in the utilization of acute care hospitals across countries. Such variations may be viewed as a natural "experiment" and may

DRs = discharge rates

HDs = hospitalization days

ALOS = average length of stay

help us *generate* hypotheses regarding their causes. In this report we compare the crude (non-adjusted by age) rates of DRs, HDs, ALOS and other selected health care indicators in Israel between 1976 and 1995 with those in 21 countries during the same period.

Materials and Methods

Data sources

• **Israel:** DRs and HDs in acute care hospitals (excluding extended, mental and chronic care facilities) in Israel were obtained from the "Hospitals and Day Care Units, 1995" report by the Health Information and Computer Services of the Ministry of Health [3].

• **Other countries:** The source of information was the OEPD Health Data, 98 [5], which are provided by the health ministries or other institutions for health information and statistics of 29 member countries. Of these, we selected a total of 21 countries with available data. Data on hospital utilization were available for 1976–95 in 16 of these countries (Australia, Canada, Czech Republic, Denmark, France, Germany, Hungary, Italy, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Sweden, Switzerland, the UK and the USA). For the remaining five countries (Austria, Belgium, Finland, Spain and Switzerland), data were available for 1980–95 only. Crude data (unadjusted for age)

on hospital utilization in these countries were originally reported in terms of hospital admissions per 100 population and of acute care bed days per person. They are presented in this report as DRs and HDs per 1,000 population.

Variables

The variables of interest were the trends in DRs, HDs and ALOS in 1976–95 (or 1980–95) in terms of percent increase or decline from the 1976 (or 1980) value [Table 1]. In addition, we retrieved the health expenditures and percent of the population aged 65 years or older. The number of acute care beds per 1,000 population served as a rough measure of availability of inpatient services, and the number of doctors' consultations per capita as a measure of accessibility to primary care [Table 2].

We used the number of patients on dialysis per 1,000,000 population as a measure of availability of expensive modern treatment modalities. We did so for the following reasons: First, even today it is one of the most expensive treatment modalities; second, data on the number of patients on dialysis in 1994 are available for all 22 countries; and third, the number of patients on dialysis in 1994 correlated with the number of magnetic resonance imaging facilities per 1,000,000 population, the latter correlating with the number of scanners per 1,000,000 population (data not shown).

Table 1. Changes in discharge rates per 1,000 population from acute care hospitals, average length of stay (in days), and hospital days per 1,000 population in 22 countries, 1976–1995

Country	DRs (per 1,000) in 1995	% change in DRs 1976–95	HDs (per 1,000) in 1995**	% change in HDs 1976–95	ALOS in 1995	% change in ALOS 1976–95
UK	212	+118.6	800	-11.1	4.8	-51
Luxembourg	184	+52.1	1,800	+20.0	9.8	-22
Israel	177	+36.2	818	-17.5	4.5	-41
Portugal*	111	+35.4	800	-11.1	7.9	-37
Hungary	205	+34.0	1,800	+5.9	8.6	-25
Austria*	231	+33.5	1,800	-30.8	7.9	-46
France	203	+32.7	1,300	-27.8	5.9	-50
Belgium*	180	+26.8	1,300	-23.5	7.8	-28
Finland*	200	+22.0	1,100	-21.4	5.5	-49
Germany	180	+18.4	2,100	-12.5	12.1	-23
Spain*	105	+15.4	800	-11.1	8.8	No data
Switzerland*	142	+9.2	1,700	-15.0	12.0	-20
Denmark	192	+9.7	1,200	-29.4	6.1	-40
Sweden	162	+5.9	800	-42.9	5.2	-43
Czech Republic	196	+2.1	2,000	-20.0	10.2	-22
Norway	145	+1.4	1,000	-37.5	6.5	-48
Netherlands	103	-4.6	1,000	-40.2	9.9	-36
Ireland	148	-8.6	1,000	-41.2	6.7	-40
Italy	158	-9.7	1,300	-40.9	8.4	No data
Australia	166	-14.4	1,100	-31.3	6.7	-18
USA	117	-25.0	800	-33.3	6.5	-16
Canada	114	-28.8	1,300	-18.8	7.5	-20

Data were derived from the OECD 98 database. Data for Israel were derived from reference 3.

* Data available since 1980 only.

** The estimated HDs per 1,000 population for all countries except Israel are rough approximations derived from the OECD data, which were originally presented as acute care bed days per person.

Table 2. Health care indicators in 22 countries derived from the OECD 98 database

Country	Acute care beds, per 1,000,000, 1994	Patients on dialysis per 1,000,000, 1995	% older than 65, 1995	Expenditures on health, % GNP, 1995	Expenditures on health, per capita, 1995	Doctors' consultations per capita, 1991*
UK	2.0	147.3	15.6	6.9	1,313	5.8
Luxembourg	6.7	337.5	13.9	6.7	2,807	No data
Israel	2.4	401.0	9.5	8.6	1,386	10.0
Portugal	3.3	303.3	14.6	8.2	828	3.1
Hungary	6.4	124.9	14.0	7.1	306	11.7
Austria	6.6	302.9	14.7	8.0	2,290	5.9
France	4.6	369.5	15.2	9.9	2,614	6.0
Belgium	5.3	329.4	15.8	7.9	2,125	7.9
Finland	4.0	169.3	14.2	7.6	1,884	4.0
Germany	6.9	489.1	15.5	10.4	3,080	5.3
Spain	3.2	389.3	15.1	7.3	1,045	No data
Switzerland	5.7	264.5	14.7	9.6	4,195	11.0
Denmark	4.0	247.2	15.5	8.0	2,632	5.8
Sweden	3.0	253.7	17.4	8.5	2,223	2.7
Czech Republic	7.2	385.7	12.5	7.5	364	No data
Norway	3.3	60.9	15.8	8.0	2,674	3.8
Netherlands	3.9	263.8	13.2	8.8	2,252	5.4
Ireland	3.3	98.6	11.4	7.0	1,262	No data
Italy	5.1	316.4	16.0	7.7	1,466	No data
Australia	4.4	229.0	11.9	8.4	1,687	6.3
USA	3.4	730.9	12.7	14.1	3,767	5.6
Canada	3.6	329.4	11.9	9.7	1,836	6.9

Data for Israel were derived from reference 3.

* Or closest year with available data.

Results

Hospital utilization trends in Israel and other countries

In 1995 the DRs increased in Israel from 130 in 1976 to 177 (36%), HDs declined from 992 to 818 per 1,000 population (18%), and ALOS declined from 7.60 to 4.51 days (41%) [Table 1]. For the same year (or closest year with available data), the DRs ranged between 103 in The Netherlands to 231 in Austria. The changes in DRs in 1976–95 varied from an increase by 119% in the UK to a decline by 29% in Canada and 25% in the USA. HDs in 1995 ranged between 2,000 (Germany) and 800 (UK, Sweden, Portugal, Spain, USA). The changes in HDs in 1976–95 varied between an increase by 20% and 5.9% in Luxembourg and Hungary, respectively, and a decline in all other countries by 11% (UK) to 43% (Sweden) [Table 1].

In 1995, Germany, Switzerland, Austria, Hungary, the Czech Republic and Luxembourg had a relatively high utilization of acute care hospitals, with HDs above 1,800 and DRs above 150 per 1,000 population. A low hospital utilization was reported by Spain, Portugal, The Netherlands and the USA, with HDs of 1,000 or less and DRs of 120 or less per 1,000 population [Table 1, Figure 1]. Relative to other countries, Israel in 1995 had the lowest ALOS, intermediate DRs similar to those in Belgium, Germany, Sweden and Australia, and low HDs similar to those in the UK, Portugal, Spain, the USA and Sweden.

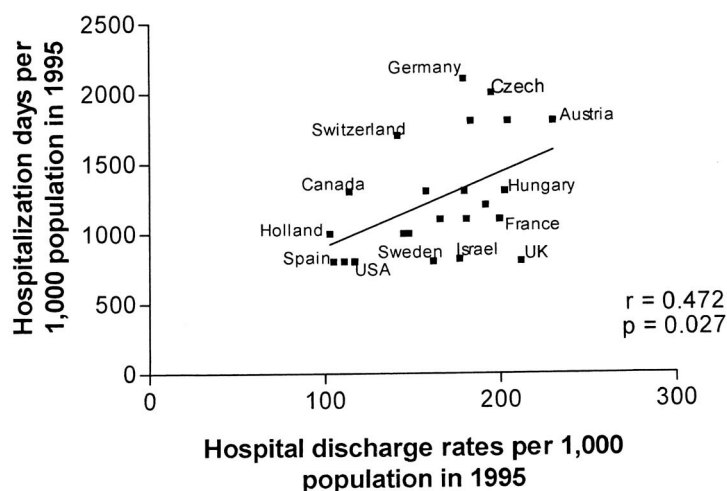


Figure 1. Hospital discharge rates vs. hospitalization days per 1,000 population in 22 developed countries in 1995. Data derived from references 3 and 5.

Other health-related data

Table 2 presents a comparison between various parameters of health care in countries with available data. The choice of the years (1995, 1994 and 1991) was forced by the availability of reported data by the OECD. Relative to other countries, Israel had the lowest proportion of elderly in the population in 1995; ranked last but one (UK) in number of acute care beds per 1,000 population in 1995; was third

OECD = Organization for Economic Cooperation and Development

Table 3. Correlation matrix among selected health care data in 22 countries

	DRs (per 1,000), 1995	HDs (per 1,000), 1995	ALOS in hospital, 1995	Acute care beds per 1,000, 1995	Patients on dialysis per million, 1994	% older than 65, 1995	Expenditures on health, % GNP, 1995
HDs (per 1,000), 1995	.472*						
ALOS in hospital, 1995	-.194	.706**					
Acute care beds per 1,000, 1995	.419*	.954**	.725**				
Patients on dialysis per million, 1994	-.227	.081	.211	.151			
% older than 65, 1995	.167	.063	.092	.113	-.160		
Expenditures on health, % GNP, 1995	-.347	-.081	.054	-.075	.743**	-.129	
Expenditures on health, \$ per capita, 1995	-.113	.109	.199	.094	.343	.227	.621**
Doctors' consultations per capita, 1991	.185	.435	.290	.365	.001	-.420	-.048

Numbers in boldface indicate significant correlations.

* Correlation significant at the 0.01–0.05 level (two-tailed)

** Correlation significant at less than 0.01 level (two-tailed)

(after the USA and Germany) in the number of patients on dialysis per 1,000,000 population in 1994; had an intermediate expenditure on health in terms of % of the GNP in 1995; and ranked high in doctors' consultations per capita in 1991.

Correlates of hospital utilization

Table 3 presents a correlation matrix among the variables, as reported by the selected 22 countries. The strongest direct correlation with significance of 0.001 or less was between HDs, acute care beds and ALOS in 1995. A similar correlation was detected between health expenditures in 1995 (% of GNP) and the number of patients on dialysis per 1,000,000 population in 1994 ($r=0.743$, $P=0.000$). In 1995 the DRs were directly related to HDs ($r=0.472$, $P=0.027$) and to the number of acute care beds ($r=0.419$, $P=0.052$). No correlation was found between health expenditures in 1995, DRs, HDs, ALOS, number of acute care beds and proportion of aged in the population.

Discussion

The presented data should be interpreted with extreme caution. First, in the absence of predefined hypotheses, the results of the multiple comparisons are not proof of an association, but rather a basis for hypothesis generation. Second, as acknowledged by the publishers of the OECD Health Data [5], the differences among the variables of this study [Tables 1 and 2] are partly due to across-country diversity in definitions and in methods of data collection and reporting. For example, day care beds or emergency beds are included into the acute care beds in some countries, but not in others. In some countries, transfers between departments within the same hospital are considered as separate discharges, while in other countries, including Israel, they are not. It is even uncertain whether the methods of data collection remained stable within countries. Finally, it may

be claimed that the importance of the study is limited because it relies on data mostly from 1995.

Still, although imperfect, the presented data are the most complete available. Moreover, despite the diversity in methods of data collection and in age structure of the population across countries, we believe that the variability in hospital utilization and its trends over two decades justifies the following tentative conclusions and hypotheses. These may be tested by a similar analysis when more updated data become available.

There was no correlation of 1995 health expenditures with DRs, HDs, number of acute care beds or proportion of elderly in the population. However, there was a correlation of 1995 health expenditures with the number of patients on dialysis. If this finding is confirmed by a future analysis of updated data, this may suggest that the use of expensive technology is a more important determinant of health care costs than the age of the population or hospital utilization.

Secondly, assuming that the methods of data collection remained relatively stable within countries between 1976 and 1995, the variability in the *changes* of hospital utilization between 1976 and 1995 cannot be dismissed as due primarily to methodological artefacts. Whereas HDs and ALOS declined during this period in almost all countries, the changes in DRs varied from an increase by 119% in the UK to a decline by 29% in Canada. In other words, the increase in DRs in Israel is a phenomenon shared by many countries such as England [1], but not by all countries [Table 1]. We could not detect any decline over time in the differences in DRs across countries. On the contrary, in many cases, the trends in hospital utilization over the last decades increased the across-country differences in DRs even further. Similar variations in hospital utilization have been documented not only among countries, but even among small geographic areas within the USA [6]. These variations probably do not reflect different patients' needs, but rather differences in opinion regarding appropriate practice [7].

Lastly, the direct correlation between the number of acute care beds, HDs and ALOS is consistent with the

GNP = gross national product

repeatedly observed association between availability of hospital beds and hospital utilization [6–9]. It may be hypothesized, therefore, that a further reduction in hospital beds may result in a further decline in HDs and ALOS and thereby reduce health care costs. This hypothesis, however, may be incorrect. It has been claimed that in the USA "the era of easy reductions in the number of inpatient days, with the associated attenuation of rising costs, is largely over" [10]. The reason is that, for the average patient, technology utilization and costs are highest during the first few days in hospital and decline thereafter. This claim may be relevant also to Israel. Decisions about health care policy should consider the possibility that the savings incurred by a further decline in HDs and ALOS may be offset by a possible *increase* in per diem hospital costs and in health care expenditures after discharge from hospital [11]. Regarding Israel, the introduction of the National Health Insurance Law in 1995 may in and of itself induce changes in the patterns of hospital utilization in the future. It follows, therefore, that a comparison of the changes in hospital utilization in Israel between 1976 and 1995 as reported here with those after 1995 will contribute considerably to those responsible for making health policy decisions.

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To each generation, that which preceded it must seem in some measure, according to its expectation of a hopeful futurity, the last age of innocence.

Nathaniel Bigg, in A Discourse on the Faculty of Recollection

Capsule



Malaria and hepatitis B

Hepatitis B virus (HBV) and the parasite that causes malaria both remain health concerns of immense proportion. In certain parts of the world individuals frequently become infected with both pathogens, raising the question of how each disease might influence the course of the other.

In an established mouse model of HBV infection, Pasquetto et al. show that the presence of malarial parasites can profoundly influence the course of HBV infection. Expression of HBV genes in the liver was considerably diminished upon co-infection with the malarial parasite *Plasmodium yoeli*. Infection with both

the liver and blood stages of the malaria parasite resulted in this anti-viral effect, which was closely associated with intrahepatic inflammation. Although the induction of several pro-inflammatory genes was detected within the liver, only interferons alpha/beta and gamma were identified as being critical for inhibiting HBV replication. This study may help to explain some of the protective effects of malaria on the course of HBV infection in humans.

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