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Predictors of health care utilization in the chronically ill: a review of the literature

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Abstract

The objective of this paper is to identify predictors of health care utilization in the chronically ill. This paper reviews 53 studies on hospitalizations and physician visits, published between 1966 and 1997 and identified by MEDLINE and ClinPSYCH databases. Studies with both univariate and multivariate analyses were included. On the basis of the Andersen–Newman model of health care utilization, the effects of predisposing, enabling and need variables are examined. Most studies reviewed indicate that predisposing factors such as age, sex, and marital status are *not* predictors of hospital utilization in the chronically ill. The enabling factors income, insurance and social support have not been shown to affect health care utilization, but characteristics of the hospitals could have an effect. Need factors such as disease severity, symptom severity and complications adversely affected health care utilization in the chronically ill, while disease duration and comorbidity do not have such an effect. Quality of life and perceived health might affect hospital utilization and physician use. Finally, depression and psychological distress proved to be among the strongest predictors of hospitalizations and physician visits. In conclusion, both disease severity and psychological well-being are most important in health care utilization. Intervention programs to support depressed or psychologically distressed patients should be considered. These could both help the patient and reduce health care utilization costs. © 1997 Elsevier Science Ireland Ltd.

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1. Introduction

The costs of health services in both Europe and North America have been increasing during the last two decades. In the USA the costs rose from 9.2% of the Gross National Product (GNP) in 1980 to 14.1% in 1993. In Europe the increase of health care costs was less dramatic but still substantial. For example, the UK has seen an increase in the cost of health care from 5.8% of the GNP in 1980 to 7.1% in 1993, in the Netherlands from 8.1% to 8.7% and in France from 7.6 to 9.8% [1].

Chronically ill patients are consistently high users of health care services [2]. Since the number of elderly people in the population is growing in an ageing society, the number of chronically ill patients in the community will increase as well [1]. As a result, the demands for health care services will expand and the costs of health care are expected to continue to increase far into in the future. In order to minimize these costs, we should be seeking ways to influence health care utilization. One solution is health care reform [3]. Another solution would be to identify factors that predict health care utilization. Such factors could then be minimized by planned interventions carried out by the governing bodies. In 1973, Andersen and Newman proposed a framework to evaluate health care utilization [4]. It assumes that a sequence of conditions contributes to the type or volume of health services a person uses. Use is dependent on: (1) predisposing factors: the predisposition of the individual to use services; (2) enabling factors: his ability to secure services; and, (3) need factors: the illness level. The predisposing factors include demographic characteristics such as age, sex, race, education and marital status. Even though individuals may be predisposed to use health care services, some means must be available for them to do so. A condition which permits a person to satisfy a need regarding health service utilization is defined as an enabling factor. Enabling factors include factors such as income, health insurance, social support and characteristics of the health care system. Assuming the presence of predisposing and enabling conditions, the individual must perceive illness as a need for the utilization of health services. In general, there are two broad categories of need factors: professionally assessed health status and subjectively assessed health status. Professionally assessed health status categories include disease severity, disease duration and symptom severity. Perceived health status includes overall quality of life, perceived health, activities of daily living (ADL), depression, psychosocial distress and other psychological variables.

Andersen and Newman's model of health care utilization has been mainly used for explaining health care utilization by the elderly or by the general population [5–11]. In this review, we use the model as a framework to evaluate factors that predict health care utilization in the chronically ill.

2. Methods

2.1. Operationalizing utilization

A standard measure of utilization has never been developed. More than 100 different indexes have been used to measure utilization [12]. We have focused on hospital utilization and physician visits which are the principal sources of utilization [12,13]. The two most important measures of hospital utilization are: volume of use (admissions, length of stay) and type of service (inpatient, outpatient, emergency room). We focus on volume of use, and we regard outpatient visits as physician visits. Emergency room visits are more likely associated with acute illness and are therefore not included in this review. The major types of physician utilization are: volume of visits (rates of visits, % of population visiting), type of visit (medical, surgical, obstetric) and type of provider. As data on the type of visit and type of provider are usually not available, we focus on the volume of physician visits (rates of visits) in this review.

2.2. Data sources, study selection, data extraction

A series of literature searches was conducted on MEDLINE and ClinPSYCH databases for the period 1966–1997. Chronic disease was defined as being permanent, leaving residual disability, being caused by a non-reversible pathological alteration and needing special training of the patients for rehabilitation or a long period of supervision, observation or care (MEDLINE). Key words used for the search included health care utilization, health care use, medical care utilization, medical care use, hospitalization, hospital use, length of stay, physician utilization, physician use and health services research, each in combination with the key word predictor. In total, 759 studies were identified. We have excluded chronic psychiatric patients from this review, since their problems are fundamentally different from those experienced by physically ill patients. We have also excluded studies involving paediatric patients for the same reason. Chronic disease type, country of investigation, design, sample size and type of analysis used were not considered valid reasons for exclusion of studies. After checking for non-chronic illnesses, psychiatry, paediatrics, double inclusion, and predictors other than for health care utilization, 53 studies were identified. Although we could have restricted our review to multivariate analyses, such as regression analysis, and disregard studies using t-tests or other univariate approaches, we chose to include all analyses. Both univariate and multivariate techniques have their own advantages and disadvantages. For instance, regression analysis will only select a small number of variables in the equation depending on sample size and correlation with other research variables, while univariate analyses have the advantage of explicit testing of each variable with the dependent variable.

Table 1 gives a chronological summary of the reviewed studies [14–66]: (1) the author and the year of the study, (2) the country in which the study was performed, (3) measures of health care utilization, (4) sample size, (5) the type of analysis

Table 1
Studies assessing the influence of predisposing, enabling and need factors on the health care utilization of chronically ill patients

Study	Country	Utilization	*n*	Analysis	*p*-value
Feigenson (1977) [14]	USA	Length of stay	318	Anova	nr
Numan (1981) [15]	USA	No. hospitalizations	74	Anova	<0.01
Van der Zee (1982) [16]	Netherlands	No. of MD visits	4157	Mult. linear regression	<0.05
Jensen (1983) [17]	USA	Hospitalization	64	Discriminant analysis	nr
Yelin (1983) [18]	USA	No. hospitalizations; no. of MD visits	189+399+471 +718	Mult. logistic regression	<0.05
Goldfarb (1983) [19]	USA	Length of stay	200+144	Mult. structural equations	<0.05
Berki (1984) [20]	USA	Length of stay	113+88+152	Mult. linear regression	<0.05
Herman (1984) [21]	USA	Length of stay	117	Correlations	<0.01
Wade (1985a) [22]	GB	Length of stay	161	Correlations	<0.05
Lubeck (1985) [23]	USA	MD visits in 6 months	241	Mult. linear regression	<0.01
Wade (1985b) [24]	GB	No. hosp. in 6 months	976	*T*-test, chi-square	<0.05
Cox (1986) [25]	USA	No. MD visits	300	Mult. linear regression	<0.05
Nevitt (1986) [26]	USA	No. hospitalizations	754	Mult. logistic regression	<0.01
Wolfe (1986) [27]	USA & Canada	No. hospitalizations	816	Logistic regression	<0.05
Epstein (1988) [28]	USA	Length of stay	402	Mult. Linear regression	<0.05
Traver (1988) [29]	USA	Hospitalizations	30	*T*-test	<0.025
Meyers (1988) [30]	USA	No. hospitalizations; no. MD visits per month	205	Mult. linear regression	<0.05
Burton (1989) [31]	GB	No. hosp. days	227	Mult. linear regression	<0.01
Quesenberry (1989) [32]	USA	No. hosp. in 7 years	863	Chi-square	<0.05
Maeland (1989) [33]	Norway	No. hospitalizations; no. MD visits	383	Mult. linear regression	<0.05
Davidoff (1990) [34]	USA	No. hospitalizations	88	*T*-test, chi-square	<0.05
Tielsch (1990) [35]	USA	Length of stay	4406	Chi-square	<0.0001
Browne (1990) [36]	Canada	No. of hosp. days; no. MD visits	215	Mult. linear regression	<0.01
Panser (1990) [37]	USA	No. hospitalizations	974	Cox proportional hazards	<0.05
Strogatz (1990) [38]	USA	No. MD visits	219	Mult. linear regression	<0.05
Drossman (1991) [39]	USA	No. hosp. in 2 years; no. MD visits	997	Mult. linear regression	<0.05

Thorngren (1991) [40]	Sweden	Length of stay	258	Anova	nr
Burns (1991) [41]	USA	Length of stay	1803 + 5708 + 4395	Mult. linear regression	<0.05
Lundeen (1991) [42]	USA	No. MD visits and no. hospitalizations	68	Correlations	<0.05
Jones (1991) [43]	USA	No. hospitalizations in 6 months	527	Mult. logistic regression	<0.05
Hurwicz (1991) [44]	USA	Physician use	413	Mult. logistic regression	<0.05
Von Korff (1991) [45]	USA	No. MD visits	242	Mult. linear regression	<0.05
Brown (1992) [46]	New Zealand	No. hospitalizations	1089	Correlations	<0.05
Mor (1992) [47]	USA	No. hospitalizations; no. MD visits	939	Mult. linear regression	<0.05
Von Korff (1992) [48]	USA	No. of MD visits	790	Correlations	<0.05
Weir (1992) [49]	Canada	Physician use	222	Chi-square, F-test	<0.05
Gil (1992) [50]	USA	No. hosp. in 9 months	89	Mult. hierarchical regression	<0.05
Mayers (1992) [51]	USA	Length of stay	112	T-test, chi-square	<0.05
Petri (1992) [52]	USA	Hospitalizations	261	Univariate odds	<0.05
MacDowell (1992) [53]	USA	Length of stay	2374	Mult. linear regression	<0.05
James (1992) [54]	New Zealand	No. of MD visits	42	Anova	<0.05
Mor (1993) [55]	USA	No. of MD visits in 3 months	259	Correlations	<0.05
Massad (1993) [56]	USA	Length of stay	155	Mult. linear regression	<0.05
Chen (1994) [57]	Canada	Length of stay	11 411	Mult. linear regression	<0.05
Rosenthal (1994) [58]	USA	Length of stay	5421	Mult. linear regression	<0.01
Villarreal (1995) [59]	USA	Hospitalization	433	Odds ratios	<0.05
Szpalski (1995) [60]	Belgium	Physician visits	2660	Mult. logistic regression	<0.05
Cronan (1995) [61]	USA	Physician visits	60	Mult. linear regression	<0.05
Gottlieb (1995) [62]	USA	Hospitalization	25 578	Correlations	<0.0001
Levine (1996) [63]	USA	Hospitalization	210	Mult. linear regression	<0.05
Johnston (1996) [64]	GB	Physician visits	177	Mult. linear regression	<0.05
Konstam (1996) [65]	USA	Hospitalization	5025	Cox regression	<0.05
Monane (1996) [66]	USA	Length of stay	745	Mult. logistic regression	<0.05

nr, not reported; mult., multiple; Anova, analysis of variance.

performed, and (6) p-value. In four studies, separate analyses for different chronic diseases were performed [18–20,41]. These separate analyses have been treated as separate 'studies'.

Studies came from eight different countries: USA, Canada, UK, Norway, Sweden, Netherlands, New Zealand and Belgium, with the sample size varying from 30 to 25 578. Of the 53 reviewed studies, 33 are concerned with hospital use alone, 13 with physician visits and 7 with both hospitalizations and physician visits. In 31 studies, multivariate analyses were performed: 21 multiple linear regression, 6 multiple logistic regression and 4 other types of multivariate analyses. In 22 studies, univariate analyses were performed: 7 correlations, 4 t-test, 3 anova, 3 chi-square and 5 other types of univariate analyses. All studies used a p-value of $p < 0.05$ or less.

3. Results

The most frequently studied chronic diseases were heart disease, (rheumatoid) arthritis, stroke and diabetes. Most studies reported the amount of variance that was explained by the significant predictors. This varied from 6.3% to 54% for hospital utilization and from 5% to 37.4% for physician visits. A summary of the results is presented in Table 2.

The table reports the number of studies in which a predictor was either significant or not significant, and how many of those studies performed multivariate or univariate analyses. The overall evaluation represents whether the majority (> 60%) of studies indicated that a predictor was significant or not significant. When 40–60% of the studies showed a positive or negative relationship, the overall evaluation was unclear.

3.1. Predisposing factors

3.1.1. Age and sex

The majority of studies investigated the effect of *age* on either hospital utilization (32 studies) or physician visits (15 studies). Approximately half of the studies and analyses (18/32) that investigated hospital utilization by the chronically ill reported no relationship between hospital utilization and age [14,17,20](3), [21,22,27,30,34,40,41](2),[43,46,52,59,66]. Ten studies reported that older patients had a higher hospital utilization [19](1),[20,31,35,37,41,51,56–58] and four studies [24,32,39,50] found that younger patients are higher users of hospital services. Projects concerned with physician visits also found ambiguous results: seven studies reported no relationship between age and physician visits [23,25,38,39,44,54,55], while the other eight studies showed that older patients visit their doctors more often than younger patients [16,30,45,48,49,60,61,64].

The influence of *sex* on hospital utilization was investigated in 29 studies. The majority of these studies (22/29) found no differences between chronically ill men and women with regard to their hospital utilization [17,19](2),[20](2),

Table 2
Significant and non-significant predictors of hospitalizations and physician use

Predictor	Number of hospitalization studies				Number of physician studies				Overall evaluation
	Significant*		Significant (Multi/Uni)	Not significant (Multi/Uni)	Significant		Significant (Multi/Uni)	Not significant (Multi/Uni)	
	Pos.	Neg.			Pos.	Neg.			
Predisposing factors									
age	10	4	14 (7/7)	18 (9/9)	8	0	8 (6/2)	7 (4/3)	?
sex (female)	6	1	7 (4/3)	22 (13/9)	6	0	6 (5/1)	7 (4/3)	No
marital status	0	2	2 (2/0)	5 (2/3)	1	0	1 (1/0)	5 (3/2)	No
education	2	3	5 (3/2)	9 (8/1)	2	0	2 (1/1)	8 (7/1)	No
SES	0	1	1 (0/1)	2 (2/0)	0	1	1 (1/0)	4 (3/1)	No
employment	0	2	2 (2/0)	2 (2/0)	1	1	2 (1/1)	1 (1/0)	?
Enabling factors									
income	0	3	3 (2/1)	6 (6/0)	0	1	1 (1/0)	5 (5/0)	No
insurance	3	1	4 (4/0)	14 (10/4)	0	2	2 (2/0)	4 (4/0)	No
social support	0	1	1 (0/1)	3 (2/1)	0	1	1 (1/0)	2 (2/0)	No
geographic variables	4	2	6 (6/0)	5 (5/0)	2	1	3 (3/0)	3 (3/0)	?
teaching/large hospital	7	2	9 (5/4)	4 (3/1)	0	0	0 (0/0)	0 (0/0)	Yes
physician characteristics	5	0	5 (3/2)	4 (4/0)	0	0	0 (0/0)	0 (0/0)	?
Need factors									
disease severity	11	0	11 (5/6)	4 (1/3)	5	0	5 (4/1)	3 (3/0)	Yes
disease duration	2	0	2 (2/0)	5 (2/3)	1	0	1 (0/1)	3 (1/2)	No
symptom severity	6	0	6 (5/1)	1 (1/0)	4	0	4 (4/0)	1 (1/0)	Yes
comorbidity	7	0	7 (5/2)	9 (4/5)	2	0	2 (1/1)	1 (0/1)	?
complications	6	0	6 (4/2)	2 (2/0)	1	0	1 (1/0)	0 (0/0)	Yes
quality of life	0	2	2 (1/1)	2 (2/0)	0	2	2 (2/0)	1 (1/0)	?
perceived health	0	4	4 (4/0)	4 (4/0)	0	7	7 (5/2)	2 (2/0)	Yes
ADL	0	8	8 (6/2)	4 (2/2)	0	4	4 (3/1)	2 (2/0)	Yes
depression	7	0	7 (4/3)	0 (0/0)	2	0	2 (1/1)	1 (1/0)	Yes
psychological distress	0	0	0 (0/0)	0 (0/0)	6	0	6 (3/3)	1 (1/0)	Yes

*Number of studies with either a positive (+) or negative relation (−) with health care utilization; Multi, multivariate analyses; Uni, univariate analyses.
?, unclear.

[24,27,30,31,33,34,39,41](2),[43,47,50–53,59,66]. Six studies and analyses (6/29) concluded that women had longer lengths of stay or more hospitalizations [20](3),[35,37,46,57,58], while one analysis (1/29) found that men had longer lengths of stay [41](1). The influence of sex on physician visits is uncertain: seven studies found that gender did not affect physician visits [30,38,44,47,49,54,60] and six studies found that women visit their doctors more often than men [16,25,33,39,45,48].

3.1.2. Marital status, education, socio-economic status and employment

The majority of the studies (10/13) showed *marital status* had no impact on health care utilization: it did not affect hospital utilization [19](2),[21,30,34,39] nor physician visits [16,30,39,44,49]. Three (3/13) studies showed more hospitalizations [31,66] and more physician visits [25] by unmarried patients. Three studies indicated that living alone led to more utilization [22,28,47], while two studies did not [31,47].

Education did not affect hospital utilization in nine out of 14 hospitalization studies [18](4),[30,39,43,47,52] and did not affect physician visits in eight out of ten physician studies [18](3),[23,30,39,44,47]. In those inquiries in which education was a predictor of hospital utilization, the direction of the influence was unclear: two studies showed that higher educated patients were more often hospitalized [26,27] but three surveys found that the less educated more frequent users [28,34,46]. Two studies concluded that higher educated patients pay more visits to the MD [18](1),[55]. *Socio-economic status* (SES) was not significant in two hospitalization studies [30,39], but one project did find a relation between lower SES and more hospitalizations [62]. One study (1/5) concluded that lower SES led to more physician visits [16], but four later studies found no relationship [30,39,49,60]. The role of *employment* is less distinct. Being unemployed or having a lower occupational prestige led to more and longer hospitalizations in two projects [47,59], while two studies found no influence of employment [19,29] and a third showed that students had shorter lengths of stay [19](1). Other studies found that jobless AIDS patients paid more visits to their doctor [47], jobless cancer patients paid less visits [55], and that no differences in a group of chronically ill patients could be found [16].

3.2. Enabling factors

3.2.1. Income, insurance, social support and social network

The role of *income* as a predictor of health care utilization was examined in nine hospital and six physician studies. Lower income was shown to be linked with more hospital utilization in three studies [18,28,46], but six studies showed no such relationship [18](3),[26,31,39]. Most (5/6) inquiries that investigated the influence of income on physician visits also failed to find a relationship [18](3),[23,39]. Only lower income emphysema patients showed more doctor visits [18](1). Eighteen inquiries studied the effect of having *insurance* on hospital utilization and six on physician visits. The majority of the analyses (14/18) did not find an effect of insurance on hospital utilization [18](2),[19](2),[20](3),[26,28,30,34,43,47,52]. One

study found that being insured led to less hospitalizations [27] and three studies concluded that having insurance led to more hospitalizations [18](2),[66]. Having insurance was related to fewer physician visits for diabetes and osteoarthritis [18,23], but no relationship was found in four other studies [18](3),[47].

Social support was not a significant factor in most hospital studies (3/4) [24,30,39] and physician visits studies (2/3) [30,39]. Two studies indicated that patients who received less social support were more often hospitalized [17] or visited their doctor more often [64]. Three studies indicated that *social network* does not predict hospitalizations [24,29,30] or doctor visits [30] although social interaction [29] and poor family functioning [36] led to more hospitalizations.

3.2.2. Geographic variables and characteristics of health care system, hospitals, physicians

In five studies and analyses (5/11) on hospitalizations, the *geographic variables* such as site of residence [31], distance to hospital [18](2) and living in a city center [18](2) were not significant. Rheumatoid arthritis and diabetes patients, who lived in a city center had fewer hospitalizations [18](2), and greater distance to the hospital resulted in longer length of stay for diabetes patients [20]. Patients with COPD, myocardial infarction and CVA in hospitals inside a metropolitan area had a significantly longer length of stay [41](3). Living in a metropolitan or city center was no predictor for physician use in three (3/6) studies [16,30,18](1), two other analyses found more visits [18](2) and one analysis less visits [18](1).

The effect of *teaching hospitals or large hospitals* on hospital utilization was investigated in 13 studies, with contradicting results. No relationship between teaching [19,41](2) or large [41] hospitals and length of stay was found in four (4/13) studies. Patients with heart disease stayed shorter in teaching hospitals [19] and in larger hospitals [41]; however seven studies (7/13) reported longer length of stay in teaching [35,41,57] or larger hospitals [35,41,46,57].

Whether referral was done by a GP or another *physician* did have an effect on hospital utilization in three studies [19,41,46]. Three other analyses however did not find such an effect [41](2),[53]. One project showed that if the patient's physician had been in practice for a long time this resulted in a longer length of stay for patients with COPD or CVA, but this relationship could not be found for patients with MI [41].

3.3. Need factors

3.3.1. Professionally assessed need factors

Eleven of the 15 hospital studies showed that increasing *disease severity* results in more hospitalizations and longer lengths of stay [14,26,27,29,34–36,40,47,52,58,63], but four other studies could not detect such an effect [17,22,24,50]. The relationship between physician visits and disease severity is less evident: five studies found that higher disease severity led to more doctors visits [38,42,45,60,64] and three studies found no such relationship [30,36,47]. *Symptom severity* had an adverse effect on hospital utilization in six out of seven studies [18](4),[37,47] and in four of five MD

studies [18](3),[47]. *Disease duration* does not have any evident effect on hospital utilization: two surveys report more hospital utilization [26,27] but five studies did not detect any effect [37,39,43,51,52]. One study did find that longer disease duration was linked to more physician visits [44], but three results indicate no influence of disease duration [23,54,55]. In most studies (9/16), *comorbidity* did not result in more hospital utilization [14,19](2),[20,32,41](2),[51,56]. The remaining seven studies and analyses reported more hospitalizations and longer lengths of stay [20](2),[21,37,43,57,66]. Two projects revealed a relationship between comorbidity and physician visits [55,61] but one study did not find this effect [44]. *Complications* resulted in more hospitalizations and longer lengths of stay in six of the eight reports [14,24,43,53,56,57], whereas two studies did not find any effect [33,50]. Fatigue [29], weight [37,56] and pain [34,50] were also not predicting hospital utilization, but sensory dysfunction was [14,29]. Pain [42,48,49] and complications [33] resulted in more physician visits, but had no effect in a study on osteo-arthritis [23].

3.3.2. Perceived need factors

Two studies found lower *overall quality of life* causing more hospital utilization [29,65], but no such relationship was found in two others [30,39]. Similar results were found for physician visits: two studies found that lower quality of life resulted in more physician visits [30,61], but another did not [39]. The influence of *perceived health* is not evident: four out of the eight studies found that worse perceived health predicted more hospital utilization [18,30,33,65], the remaining four studies reported that perceived health did not affect hospital utilization [18](3),[39]. In seven of the nine studies worse perceived health or health status resulted in more doctor visits [18,25,30,33,44,45,48], while only one study did not find such a relationship [38]. Eight out of 12 hospital studies found that a lower level of *activities of daily living* (ADL) resulted in more hospital use [24,26,36,39,43,47,52,65], but four studies did not find this relationship [28–30,34]. In four studies, worse ADL resulted in more visits to the doctor [30,36,39,44], whereas in two studies this effect was not shown [23,47].

All seven studies which examined the influence of *depression* on hospital utilization found depressed patients were more often hospitalized than non-depressed patients [15,29,30,33,50,59,63]. Two out of three studies found that depressed patients visited their physician more often than non-depressed patients [33,48] but a third project could not detect any differences [30]. *Psychological distress* led to more doctor visits in six studies [36,39,42,48,49,64] but not in a seventh [45]. *Anxiety*, *alienation*, helplessness, irritability and stress produced higher hospital use in COPD patients [29] but not in coronary artery disease [63]. Poor coping techniques, e.g. negative thinking and denial, caused more hospitalizations in two surveys [39,50] but not in another [39]. Cognitive dysfunction [14], mental status [31], locus of control [33], and poor memory [29] did not affect hospitalizations or length of stay. For physician visits, an effect for coping [42,46], stress [42] and locus of control [33] was found, but in one study coping was not significant [33]. Neither were perceived need for care and satisfaction with care predictors of hospital [30] nor physician utilization [30,44].

4. Conclusion

In this review, we evaluated the effects of predisposing, enabling and need factors on hospital utilization and physician visits. The 53 studies described are characterized by a high degree of heterogeneity with respect to the patient samples employed (e.g. patients with different diseases, and patients with different stages of disease), the health care utilization measures, the instruments used, and the procedures followed. Additionally, there is a wide variety in research methodologies and statistical tests that have been employed. Most studies reported multivariate analyses such as multiple (logistic) regression analysis and the standardized regression coefficient (beta).

Despite the heterogeneity with respect to patient samples employed, the countries of origin, the methods and analyses used, there are some results that are similar in all studies. Firstly, most reviewed studies indicate that *predisposing factors* such as age, sex, education and marital status do not predict health care utilization, especially not hospital utilization among the chronically ill. These results were found in both univariate and multivariate studies.

Andersen assumes that people in different age groups have different types and levels of illness, and consequently they are thought to have different patterns of health care utilization [4]. Also, earlier studies on health care utilization in the general population [12] showed that the elderly consume more health resources than younger persons. However, this review shows that if a population of chronically ill people is considered, no definite influence of age on health care use is apparent. Likewise, women are also thought to visit the physician more often and to have higher rates of hospitalization [12]. These findings were also not supported in this review. It is possible that higher utilization by women in previous studies was caused by case-mix due to hospitalizations or physician visits related to the reproductive system or preventive care.

The *enabling factors* proved to be of even less predictive value. The vast majority of both multivariate and univariate studies investigating income and insurance showed no relationship with health care utilization. An earlier review aimed at the general population found that lower income groups did have higher utilization rates [12]. Furthermore, public health studies showed that people with lower income are in general less healthy than people with a higher income [67–70]. Thus, people with a lower income may have a greater chance of becoming chronically ill, but among chronically ill patients there are no differences in rates of health care utilization based on income. The impact of social variables on health care utilization seems to be insignificant, as social support and social network proved to be unimportant in the explanation of both hospital utilization and physician visits.

No conclusions about the effect of living conditions such as living in a city center, site of residence and distance to hospital can be drawn as more research into the effect of this is needed. Hospital characteristics such as located in a metropolitan area, being a teaching hospital and being a large hospital do cause longer lengths of stay and more hospitalizations, although results are contradictory. The role of (characteristics of) the physician in health care utilization also needs thorough investigation.

Finally, the *need factors* should be most important [4,70]. The results of this review do indeed show that not only the physical but also the psychological need factors are major predictors of health care utilization. Professionally assessed disease severity, symptom severity and complications correlate with health care utilizations. To a certain degree they lead to more hospitalizations, longer lengths of stay and more doctor visits. However, disease duration and comorbidity do not seem to affect health care utilization in the chronically ill. The effects of perceived health or quality of life on health care utilization are challenging. The results regarding hospital utilization seem to imply that perceived health is a predictor of hospital use, and worse perceived health leads to more physician visits. Depression and psychological distress are among the strongest predictors of health care utilization. All studies which examined the influence of depression on hospital utilization and the vast majority of studies analyzing effects of depression and psychological distress on physician visits found those factors to be significant. These results were found in both univariate and multivariate studies which controlled for patient's professionally assessed need.

We acknowledge that this review is restricted in some ways. The Andersen–Newman model is a widely accepted framework, but the model stresses individual factors while less emphasis is put on societal and system delivery factors. Such factors could become more important as managed care becomes dominant in the US and Europe. Furthermore, this review is restricted by the patient selection carried out in some studies. Many chronic illnesses go untreated and under-treated. The samples in many studies were patients already using health care and thus high users could be over-represented. Nevertheless, similar results were found in numerous studies. Finally, all studies included in this review are either from the English-speaking world or from Northern Europe. Therefore, it is difficult to determine the extent to which the results can be generalised to South-American, African and Asian countries.

In conclusion, predisposing and enabling factors seem to have little impact on health care utilization among the chronically ill. This suggests that emphasis should be put on need factors to control health care budgets of for instance managed care organizations. As expected, disease severity is an important factor, but so is psychological well-being. Depression and psychological distress are among the strongest predictors of health care utilization. Consequently, investing in mental health may be more productive and cost-effective than spending budgets on organization or management of special subpopulations. Intervention programs to help psychologically distressed patients should be considered to relieve depression and psychological distress. Those interventions could not only benefit the patient, but also reduce health care utilization costs.

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