A Reappraisal in São Paulo, Brazil (2008) of "The Ecology of Medical Care:"
The "One Per Thousand's Rule"

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BACKGROUND AND OBJECTIVES: Medical ecology is a conceptual framework introduced in 1961 to describe the relationship and utilization of health care services by a given population. We applied this conception to individuals enrolled in a private health maintenance organization (HMO) in Sao Paulo, Brazil, with the aim of describing the utilization of primary health care, verifying the frequency of various symptoms, and identifying the roles of different health care sources.

METHODS: This was a cross-sectional telephone survey among a random sample of people enrolled in a private HMO. We interviewed a random sample of non-pregnant adults over age 18 using 10 questions about symptoms and health care use during the month prior to interview.

RESULTS: The final sample consisted of 1,065 participants (mean age 68 years, 68% female). From this sample, 424 (39.8%) reported the presence of symptoms, 311 (29.2%) had a medical office consult, 104 (9.8%) went directly to an emergency medical department, 63 (5.9%) were hospitalized, 22 (2.1%) used complementary medicine resources, seven (0.7%) were referred to home care, and one (0.1%) was admitted to an academic hospital.

CONCLUSIONS: The proportion of study participants referred to an academic care center was similar to that observed in previous "medical ecology" studies in different populations.

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The term "ecology of medical care" refers to the relationship between people and their health care environments. It was first conceptualized in the seminal paper published by White et al in 1961 using data from multiple surveys in the United States and United Kingdom.[1] This framework has influenced ideas regarding the organization of health care systems, including research and specifically medical education.[2-9]

The main results of this paper showed that, among 1,000 adults surveyed over an average month, 750 persons reported symptoms or illness, 250 consulted a physician, nine were hospitalized in a general hospital, and one was referred to a university hospital. This model has been used to justify the importance of changing the focus of medical resources from tertiary to primary care, to recognize primary care as a fundamental part of medical training, and to show the importance of medical research regarding symptoms and illness rather than signs and diseases. Green updated this study in 2001 using data from the 1995 National Health Interview Survey and other surveys; results were very similar to White's data, with less than one person in 1,000 hospitalized in a tertiary medical center.[10] This model of ecology of medical care was repeated in Hong Kong using data from the 2002 Hong Kong Thematic Household Survey with 31,762 people. Analyzing the results per 1,000 people during a 1-month period showed that 567 reported symptoms, of whom 512 considered seeking health care. Of these, 440 people visited Western traditional medical practitioners, 372 (84.5%) primary care, and 68 (15.5%) specialty care. There were 54 visits to traditional Chinese medical practitioners and 16 visits to emergency rooms. Seven people were hospitalized in community hospitals, and a mean of one in 1,000 people were

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hospitalized in a tertiary care medical center.[11]

The population of Brazil has aged rapidly in the past 2 decades. Cardiovascular mortality is the leading cause of death, and chronic diseases are commonplace due to the increased prevalence of overweight, which doubled over the past 3 decades. The current Constitution was adopted in 1988, establishing the public health system with universal coverage and at the same time allowing private practice through direct payment or through management organizations. Although the National Health System has proved successful, particularly in immunization and emergency services used by both high- and low-income populations, almost 25% of Brazil's citizens have coverage through a private health plan.[12,13] In a primary care setting there is little overlap of use between those who seek care in the private versus public systems.

We applied the ecology of medical care model in the city of São Paulo using data from an urban population sample of people enrolled in a specific private health maintenance organization (HMO) in Sao Paulo, Brazil. The aim of this study was to describe utilization of the entire system, verifying the frequency of various symptoms and the roles of different health care sources, and comparing these results with previous evaluations of the ecology of medical care.

Methods

The survey was performed via telephone interview of 1,082 randomly selected adults (five children were excluded). A trained nurse working for the HMO in São Paulo, Brazil performed interviews from May 2008 to February 2009. This medical organization has 1.5 million subscribers in the metropolitan area and until this period did not use a gatekeeper approach, meaning that it is possible for a subscriber to make an appointment directly with any medical specialist without the need for a referral. Telephone numbers were randomly selected and included only when the main contact was a home phone. When office and/or mobile phone were indicated as primary contact, these participants were not included in the random selection process. We used a list of random numbers to select approximately 1,100 persons from the 1.5 million subscribers in the metropolitan area of São Paulo. We estimated that 10% of the selected people would not agree to participate in the study, thus we included an extra 10% in addition to the 1,000 participants we aimed to enroll. Of the 1,082 interviews, 17 were excluded due to incomplete information; thus, the final sample was composed of 1,065 participants.

The Internal Review Board of Hospital Universitario approved this survey. All participants provided authorization for participation according to a standard script prior to the interview. The HMO did not have any input concerning the questionnaire and data analysis.

Questionnaire

The questionnaire was used to interview only the individual who answered the telephone call. No proxy data were considered. Participants who were pregnant or delivered during the previous year were not included. The questionnaire consisted of 10 questions: (1) In the last month, did you have any symptoms? (2) If "yes," please describe all of them (we considered only the first four symptoms in the study), (3) Did these symptoms disappear without any kind of treatment during the last month? (4) Did you go to a physician's office? If yes, was he/she a specialist? (5) Did you go to any alternative (complementary) medical practitioner? (6) Did you search for a pharmacy adviser? (7) Did you go to an emergency room? (8) Were you hospitalized? If "yes," how many days? (9) If you were hospitalized, was it a university medical center hospital? (10) Did you receive home care?

Results

Study participants were predominantly female (68%) with a mean age of 68 years; the majority lived in the city of São Paulo (41%) or in surrounding towns. Table 2 shows that less than half of participants reported any symptom, 33% sought care in a regular medical office, 10% went directly to an emergency department, 6% were hospitalized, and one person was admitted to an academic hospital. In Brazil there is clear criteria for academic hospitals, which are those where students and residents practice. In the survey there was one specific question addressing admission to an academic medical center.

Adjusting for 1,000 participants, 398 (39.8%) reported one or more symptoms in the previous month; 148 (14.8%) reported two symptoms, 49 (4.9%) reported three symptoms, and 10 (1%) reported four symptoms. The 10 most prevalent symptoms were extremity pain (10%), fatigue (10%), back pain (8%), headache (6%), joint pain (6%), miscellaneous (5%), acute upper respiratory infection (5%), dyspepsia (5%), vertigo/dizziness (4%), and chest pain (4%). The miscellaneous category included a variety of complaints such as shaking, cold sweats, irritating audible sensations, diminished strength in hands, apathetic behavior, difficulty in concentrating, dealing with loss of a spouse, sensitivity to noise, fainting, drowsiness, cold hands, mental fatigue, and feeling overcommitted.

The most visited specialists were cardiologists (17.4%) and geriatricians (12.2%), followed by primary care (10.6%), orthopedics (9.3%), internal medicine (7.1%), gastroenterologists (5.8%), rheumatologists (5.1%), neurologists (5.2%), gynecologists (3.9%), urologists (3.9%), vascular surgeons (3.5%), pulmonologists (3.2%), and others (13.8%). Only 22 (2.2%) patients reported using complementary medicine. However, 98 participants (9.2%) presented directly to an emergency room, and

30 (2.8%) reported that symptoms disappeared spontaneously.

Table 1 compares our data with three previous studies on medical ecology (per thousand participants). Some important differences include a low rate of symptoms in our survey, a high rate of direct use of medical specialists and emergency departments, and the highest rate of hospitalization. We found a comparable rate of routine medical office use and a very small proportion of hospitalized patients in an academic heath care setting, similar to previous studies.

Discussion

Our data evaluating a sample of non-pregnant adults living in greater São Paulo, Brazil and using a single private HMO revealed some differences in medical care delivery in comparison to previous studies in different populations,[1,10,11] including greater use of medical specialists and emergency rooms and a higher rate of hospitalization. However, our results were very similar to the original study on medical ecology in terms of the number of people hospitalized at an academic tertiary care hospital, ie, one per thousand.

There are important differences among studies evaluating medical ecology. Although these data were not strictly analogous because of differences in time, place, and criteria, the main outcome data should be compared. White and colleagues evaluated a population of adults ages greater than 16 years. Data from the "Survey of Sickness" with a population representative of England and Wales were combined with reports of the Committee on the Costs of Medical Care and the United States National Health Survey and others to construct their ecology model using data from the United Kingdom and the United States.[1] Green and coworkers in 2001 used data from several previous surveys, including

Table 1: Comparison of Our Data With Three Others Papers Applying the Same Concept of Medical Care Ecology*

	White et al, 1961[1]*	Green et al, 2001[10]	Leung et al, 2005[11]	Our Study
Source of data	Survey of sickness (England and Wales)[12] The United States National Health Survey[13]	MEPS: household component event files[14] Family medical care: prevalence of physician visits among adults and children[15]	2002 Hong Kong Thematic Household Survey[11]	Survey of users of a specific Health Maintenance Organization (HMO)
Number of subjects	Survey of Sickness: not informed The US National Health Survey: not informed	MEPS: not informed Family Medical Care: 1,001 adults	31,762	1,065
Sample	Survey of sickness: representative sample of England and Wales The US National Health Survey: representative sample of the white population of US	MEPS: representative sample of US Family Health Care: representative sample selected by random-digit dialing (phone)	Representative sample of institutional and non-institutional residents	Random sample of users of a private HMO
Reported an illness (per 1,000)	750	800	567	398
Number of subjects Consider seeking medical care (per 1,000)	—	327	512	—
Visit a physician's office (per 1,000)	250	217	494	292
Visit a primary care physician's office (per 1,000)	—	113	372	34
Visit a specialist's office (per 1,000)	—	104	68	258

(continued on next page)

Table 1: Continued

Visit a complementary or alternative medical care provider (per 1,000)	—	65	54	22
Visit an emergency department (per 1,000)	—	13	16	104
Receive home health care (per 1,000)	—	14	—	7
Were hospitalized (per 1,000)	9	8	7	63
Hospitalized in an academic medical center (per 1,000)	1	1	1	1

All proportions are reported per 1,000 participants

* The study of White et al used other sources of data: Committee on the Costs of Medical Care,[20] The Demand for Medical Care: A Study of the Case-load in the Barrow and Furness Group of Hospitals,[21] Health and Care in New York City: a Report by the Committee for the Special Research Project in the Health Insurance Plan of Greater New York,[22] Analytical Study of North Carolina General Practice,[23] Study of Patterns of Patient Referral to Medical Clinic in Rural States: Methodology.[2]

the 1996 Medical Expenditure Panel Survey, Gallup Survey, and diaries.[10] Leung and colleagues used data from the 2002 Hong King Thematic Household Survey that evaluated 31,762 non-institutional and institutional residents representing 6,504,255 persons, applying population weight. We used data from a sample of 1,065 users of a HMO by direct phone interview. Our data and that reported by Leung et al was obtained from similar populations with the difference that we used a telephone interview while Leung performed face-to-face interviews. All of these studies estimated outcome values based on a sample of 1,000 individuals and evaluated the number of individuals that reported symptoms, considered seeking medical care, or were hospitalized in general hospitals or tertiary academic medical centers over 1 month. Despite the wide variation in date of study performance (1961, 2001, 2005, and 2009, respectively) and location (United Kingdom, United States, China, and Brazil),

in all studies a mean of one person in 1,000 required hospitalization at an academic or tertiary care medical center, suggesting this to be a universally applicable finding.

One important issue now, 30 years after the first application of the concept of medical ecology, is to verify the distribution of medical care delivery in a middle-income country, such as Brazil, to determine if the medical ecology is similar to that previously reported in different cultures and health care systems. The schools of medicine in Brazil, as elsewhere, historically used 10% or less of educational time for clinical disciplines teaching ambulatory and

primary care, although important changes have been made in recent years.[13-16]

This study has several limitations. Our data were based on a self-reported questionnaire with a potential memory bias, while Green et al used references based on diaries of self-reported symptoms. Moreover, our sample is restricted to individuals enrolled in a private HMO in Sao Paulo and thus may not be representative of the general Brazilian population. However, it is likely representative of the working and middle class populations living in a large metropolitan area in Brazil, who largely use the private health

Table 2: Breakdown of Study Participants

1,000 Patients Recruited
• 424 reported symptoms
• 311 had a medical office consult
• 104 went directly to an emergency unit
• 63 were hospitalized
• 7 were referred to home care
• 1 was hospitalized in an academic tertiary-care hospital

care system. In Sao Paulo, half of inhabitants are covered either by an HMO (funded by the employer) or by a health insurance policy. Almost all HMO participants are workers with a regular job in industry or commerce, and for each index participant, there are an average of three additional persons classified as "dependent" (children, spouse, parents). In contrast, clients of health insurance plans are primarily professionals with a higher income.

Another important source of possible bias in our data is that users of private systems can also access public health care resources. This is especially true concerning hospitalization in academic hospitals, which are mostly public, and private systems deliver for procedures that needs high density technology as transplants. This bias is minimized because the main aim of this study was to differentiate the use of ambulatory, general hospital, and academic hospital care.

Green et al considered primary care physicians to be general internists, family physicians, general practitioners, and general pediatricians. In this study we considered only family physicians within the HMO to represent primary care physicians. It would be difficult to use Green's criteria because in Brazil each doctor might have up to two specialties registered in the Federal Medical Council. It is common to use a cardiologist as a general internist, for example, and the surveys were not set up to detect this.

One point of concern is that medical education in Brazil, and elsewhere, is centered in tertiary-care academic hospitals. A survey of 14 of the 80 Brazilian medical schools in 1999 showed that 86% of training in inpatient medicine occurs in major university hospitals. Only 14% of medical training was at primary care or community-based clinics.[17] An underlying assumption in medicine is that health problems presenting as subjective symptoms are always accompanied by objective findings that would provide straightforward evidence of an accurate medical diagnosis based on a clear biological pathway. However, symptoms are not always associated with clinical signs, and signs frequently are not present, as in a functional somatic syndrome. It is necessary to provide medical students with the knowledge and skills necessary to evaluate symptoms.[18] In 2005 in the United States, 14.8% of visits to outpatient clinics were demanded by patients with only symptoms as a major complaint; 29.3% of these patients reported at least one complaint in the previous month.[19]

In conclusion, we performed a reappraisal of an "old" concept of health care delivery initially reported four decades ago in another culture, with a different methodology. We found several differences but also identified a major similarity in the proportion of people hospitalized at an academic center. Provocatively, we suggest this fraction of people referred to an academic hospital be referred to as "White's Law."

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