Variation in ECT Use in the United States

Richard C. Hermann, M.D., Robert A. Dorwart, M.D., M.P.H., Claudia W. Hoover, M.A., and Jeremy Brody, B.A.

Objective: The authors measured the variation in ECT utilization rates across 317 metropolitan statistical areas of the United States and determined to what degree this variation is associated with health care system characteristics, demographic factors, and the stringency of state regulation of ECT. Method: Data from APA's 1988–1989 Professional Activities Survey were used to estimate ECT utilization rates for the metropolitan statistical areas. Multiple regression analysis was used to determine the relative influence of provider, demographic, and regulatory factors on variation in ECT use across areas. Results: Among the psychiatrists surveyed, 17,729 reported treating 4,398 patients with ECT during the study period. No ECT use was reported in 115 metropolitan statistical areas. Among the remaining 202 metropolitan statistical areas, annual ECT use varied from 0.4 to 81.2 patients per 10,000 population. The strongest predictors of variation in ECT use across metropolitan statistical areas were the number of psychiatrists, number of primary care physicians, number of private hospital beds per capita, and stringency of state regulation of ECT. Conclusions: Rates of ECT use were highly variable, higher than for most medical and surgical procedures. In some urban areas, access to ECT appears limited. Predictors of variation in ECT rates have implications for expanding access to the procedure. The extent of variation suggests psychiatrists continue to lack consensus regarding the use of ECT. Better data on the effectiveness of psychiatric treatments may lead to a broader professional consensus and may narrow variations in clinical practices.

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Variation in physician practices has been a primary impetus for what Ellwood called the "outcomes management" movement in health care (1). Studies have repeatedly shown wide geographic variations in the per capita use of common medical treatments and surgical procedures (2). Reasons for these variations—which far exceed variation in the prevalence rates of the illnesses under treatment—are of considerable interest to health care policy makers and third-party payers for health care. Do high-use regions represent overutilization? Do low-use regions suggest unmet clinical needs?

Wennberg et al. (3–6) and others (7–10) have investigated the determinants of small-area variations, considering three domains: the health care system (facilities, services, providers), the community (illness rates, sociodemographic and environmental factors), and individuals (patient beliefs and behaviors). Studies have shown both community and provider variables to be explanatory; the strongest predictors of surgical practices appear to be the supplies of beds, doctors, and surgeons (2). Wennberg et al. (11) have proposed that variation is also related to the degree of consensus among physicians regarding diagnosis and the efficacy of treatments.

Received June 27, 1994; revision received Nov. 18, 1994; accepted Dec. 8, 1994. From the Malcolm Wiener Center for Social Policy, John F. Kennedy School of Government, Harvard University, Cambridge, Mass., and the Department of Psychiatry, Harvard Medical School and McLean Hospital. Address reprint requests to Dr. Hermann, Department of Psychiatry, McLean Hospital, 115 Mill St., Belmont, MA 02178.

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STUDIES OF VARIATION IN PSYCHIATRIC PRACTICES

Although more than 100 studies of variation in medical and surgical practices have been published (2), only a few have shown variation in psychiatric practices. Most of these studies focused on hospitalization rates (12), inpatient lengths of stay (13), and use of pharmacologic versus nonpharmacologic treatments (14).

ECT Use in Other Countries

Studies have shown wide variation in ECT utilization rates among Health Board areas in Great Britain

(0.16 to 0.52 patients treated annually per 10,000 population) (15) and Ireland (0.32 to 0.65 per 10,000) (16). In Ireland there were significant positive correlations between ECT use per capita and favorable attitudes of psychiatrists toward ECT, admission rates for "manic-depressive psychosis," and inpatient turnover. Community characteristics, including age, migration rates, and rurality, did not correlate with ECT rate (17). A more recent survey of selected districts in England also showed wide variation, including 10-fold variation between an inner-city London district and other areas (18).

ECT Use in the United States

Small-area variation in ECT use in the United States has not been studied, to our knowledge. However, studies in the United States have suggested many possible determinants of ECT variation, including community characteristics, regulation, and health care system characteristics, although the studies do not reveal which factors are primary and which are mediating.

Middle and upper socioeconomic groups are disproportionately represented among ECT recipients (19, 20). These contemporary findings contrast with results of studies in the 1950s that showed lower socioeconomic groups to be more likely to receive ECT (21, 22). More recent studies also show a steady increase in ECT utilization with age (19, 23). A recent National Institute of Health consensus conference found that ECT is an effective treatment for depression in the elderly but that it is generally underused (24). Several studies have shown women to be more likely to receive ECT than men (19, 20, 25, 26), but another found that differences by gender disappeared when diagnosis and age were controlled for (27).

State regulation of ECT has been implicated in influencing ECT use. Kramer (19) found ECT use in California to decline after passage of restrictive legislation in 1977. Mills et al. (25) found a 50% drop in ECT use in Massachusetts from 1974 to 1980, which they partially attributed to the impact of state regulations. Winslade et al. (28) have shown that regulation of ECT is widespread.

National (23, 27) and state (19, 25, 26) studies have consistently demonstrated that ECT is far more commonly used in private hospitals than in public facilities. There are multiple reasons for this wide disparity, including some states' stricter regulation of ECT use in public hospitals than in private facilities (28), differences in diagnoses between public and private hospitals (25), and differences in financial reimbursement for ECT between the two sectors (29).

Current Study

In this study we examined variation in the use of ECT among 317 U.S. urban centers, designated by metropolitan statistical areas. The efficacy and safety of ECT are well established, particularly for major depression, bipolar mania and depression, and some forms of schizophrenia, including catatonia (30–32). It has been used for a wide variety of other conditions as well, although with less scientific support. We hypothesized that ECT would show wider variation in use than many other medical and surgical treatments, because of psychiatry's historically divergent theories of the etiology, diagnosis, and treatment of mental disorders and because of the particularly controversial standing of ECT. We then examined factors that influence ECT variation.

METHOD

Sources of Data

The data on ECT use were drawn from the 1988–1989 Professional Activities Survey of the American Psychiatric Association (APA). Dorwart et al. (33) have described the survey methods in detail elsewhere. Surveys were sent to 34,164 psychiatrist members of APA and the 10,091 nonmember psychiatrists identified from the American Medical Association's Physician Masterfile. The APA members' response rate was 67.7%, and the nonmembers' response rate was 28.9%. Of 26,045 respondents, the final sample consisted of 17,729 "active psychiatrists" (not retired, residents, or fellows) who lived in the 317 metropolitan statistical areas studied. (This represents all but four metropolitan statistical areas across the United States; these four were excluded because of missing data.) The survey asked all respondents to report the number of patients to whom they had administered ECT in the past month. There was no significant difference in the average number of patients treated with ECT by APA members (mean=0.29) and nonmembers (mean=0.31).

Data on the demographic and physician supply characteristics of each metropolitan statistical area came from the U.S. Department of Commerce's Area Resource File (34). Data on supply of beds are from the American Hospital Association's 1988 Annual Survey of Hospitals (35). Data on the stringency of ECT regulation are from a national survey of ECT regulation during 1981–1983 (28) and from unpublished findings provided by the survey's principal author, Dr. Winslade. State statutes on ECT and regulations issued by state departments of mental health were available for 33 of the most populous states, containing 238 of the 317 metropolitan statistical areas. States were rated according to the stringency of ECT regulation on an ordinal scale: low, medium, and high regulation. Factors taken into account in these ratings included whether the regulations governed primarily legal domains such as consent and competency or imposed restrictions on the medical procedures with which ECT was carried out, whether they restricted ECT to certain populations (e.g., specific diagnostic or age groups), and whether they seemed likely to make the prescription or application of ECT particularly burdensome (by mandating extensive review, for example).

Analysis

Variation in ECT use was studied at the level of the metropolitan statistical area. This geographic unit consists of a large population nucleus (50,000 or more) along with adjacent communities that have a high degree of economic and social integration with the nucleus. Metropolitan statistical areas have fewer boundary problems than counties, which do not necessarily match populations and health care resources, and are a common choice for area variation analysis. However, it has been noted that metropolitan statistical areas can contain some internal variation (2).

For each metropolitan statistical area, the ECT utilization rate was determined by dividing the number of patients who were treated with ECT during the study period by the entire population. The ECT use data from the APA survey were adjusted (weighted) to estimate an annual rate and to reflect utilization by survey nonresponders, on the

basis of the percentage of responding psychiatrists in each metropolitan statistical area. Rates are reported as the number of patients treated with ECT per 10,000 population per year, a common measure of utilization. Because the survey data were collected over several months, variation due to seasonality is negligible.

On the basis of previous studies of ECT use, we expected ECT use to vary because of both community and health system factors. Several of these characteristics were represented by independent variables in a multiple regression analysis. Among community factors, the mean annual income of each metropolitan statistical area was calculated as a broad measure of socioeconomic status. We hypothesized, on the basis of previous studies, that ECT use would be greater in areas with higher average incomes. The percentage of people in each metropolitan statistical area who were over age 60 was included because older depressed patients may be more likely to receive ECT. The population of each metropolitan statistical area was included to account for the likelihood that large urban areas have higher rates of ECT use. We expected that greater stringency of ECT regulation would be associated with a lower rate of ECT.

Among health system factors, the numbers of psychiatrists and primary care doctors per capita were determined for each metropolitan statistical area; we expected ECT use to increase with the supply of these practitioners. The number of academic medical centers in each area was included because studies suggest ECT may be more likely to be performed in these hospitals (29). We determined the number of private psychiatric beds per capita for each metropolitan statistical area, hypothesizing that this supply variable might also predict ECT use by providing greater access to ECT. As expected from prior studies, the number of public psychiatric beds per capita did not significantly correlate with ECT use, and it was not included in our analysis. Because affective disorders are the most common disorders treated with ECT, we included in the analysis the mean percentage of patients with affective disorders in the psychiatrists' caseloads for each metropolitan statistical area, hypothesizing that it might be related to ECT use across areas.

Tobit regression was used to examine the impact of the independent variables on ECT use. Ordinary least squares regression is inappropriate because it assumes a normal distribution, and our data included a large number of metropolitan statistical areas where no ECT was performed. The Tobit analysis is a variant of multiple regression, used when a large number of observations are concentrated at zero (36, 37). Tobit regression is designed to adjust the error term for the problems caused by such a censored distribution, allowing for inclusion in the analysis of the information contained in the "zero" cases.

We first performed the analysis by using all 317 metropolitan statistical areas and all the independent variables except regulation. We then repeated the analysis with the regulatory variable, using the 238 metropolitan statistical areas for which we had data on state regulation of ECT.

RESULTS

Descriptive Statistics

Of the 17,729 psychiatrists in our sample, 1,102 (6.2%) had each administered ECT to at least one patient in the previous month. Psychiatrists using ECT in the previous month used it to treat a mean of 4.0 patients (SD=6.1). A total of 4,398 patients received ECT.

No ECT use was reported in 115 metropolitan statistical areas (36.3%). Among the remaining 202 metropolitan statistical areas there was great variation in annual ECT use: from 0.4 per 10,000 population in the lowest-use metropolitan statistical area to 81.2 per 10,000 population in the highest-use area. Examination of the interquartile range—one means of minimizing the impact of outliers—still resulted in more than fourfold variation between low- and high-use metropolitan statistical areas, from 2.0 to 9.2. Most metropolitan statistical areas in which ECT was performed (N=117) had utilization rates between 0 and 1 patient per 10,000 population. Approximately 20 metropolitan statistical areas had rates of 2 to 5 patients per 10,000. More than 70 metropolitan statistical areas had rates of 6 patients per 10,000 or greater. Figure 1 shows a national map of metropolitan statistical areas with high and low per capita rates of ECT use and those with no ECT reported.

From the metropolitan statistical area data, rates of ECT use were calculated for six large geographic regions, such as the Northeast and Midwest. An analysis of variance (ANOVA) showed no significant differences in utilization rates among these regions; their larger size masked differences seen at the level of the metropolitan statistical area. Nationwide, we estimate that 4.9 patients per 10,000 population received ECT annually in these 317 metropolitan statistical areas.

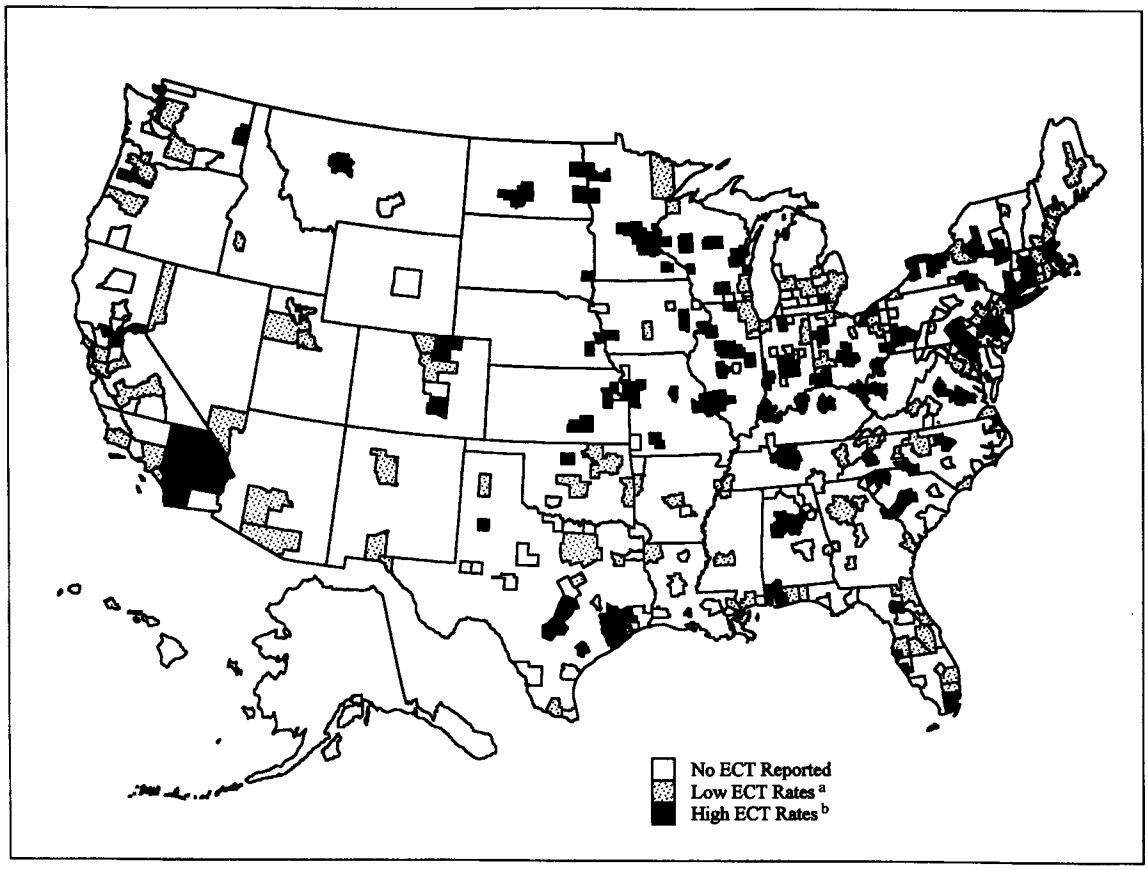
ECT use was strongly associated with the presence of an academic medical center within the metropolitan statistical area. Only two of the 115 areas in which ECT was not performed contained an academic medical center, while 88 (43.6%) of the 202 metropolitan statistical areas in which ECT was performed had one or more centers. Among the metropolitan statistical areas with the highest rates of ECT use were several relatively small metropolitan areas with prominent academic medical centers: Rochester, Minn.; Charlottesville, Va.; Iowa City, Iowa; Ann Arbor, Mich.; and Raleigh-Durham, N.C.

The largest cities typically have several academic medical centers, e.g., seven in New York, two in Los Angeles, six in Chicago. However, these metropolitan statistical areas, like other major metropolitan areas, had low to moderate rates of ECT use (1.4 to 6.1 patients per 10,000 per year), because of their large populations and variation within the areas.

Regression

In a Tobit analysis using the full sample of 317 metropolitan statistical areas, the numbers of psychiatrists per capita (χ^2=9.54, df=306, p=0.002), primary care physicians per capita (χ^2=21.74, df=306, p=0.0001), and private hospital beds per capita (χ^2=4.05, df=306, p=0.04) were the strongest determinants of ECT use across metropolitan statistical areas (log likelihood for normal=–335.75). The proportion of patients with affective disorders in the psychiatrists' caseloads was positively related to ECT use, but this finding did not reach statistical significance (χ^2=2.75, df=306, p=0.10). The number of academic medical centers in each metropolitan statistical area was not significantly related to ECT use. None of the community factors predicted ECT use. Mean income, population, and proportion of residents over age 60 were not significantly related to utilization rate.

FIGURE 1. Annual ECT Use in 317 U.S. Metropolitan Statistical Areas



[a]ECT use per capita greater than zero and less than the median rate for all metropolitan statistical areas.
[b]ECT use per capita equal to or greater than the median rate for all metropolitan statistical areas.

The Tobit analysis was repeated for the 238 metropolitan statistical areas for which we had regulatory data, this time including the stringency of state regulations along with the other independent variables. Regulation was significantly and negatively associated with ECT use (χ^2=5.88, df=231, p=0.02). Numbers of psychiatrists per capita (χ^2=5.11, df=231, p=0.02) and primary care physicians per capita (χ^2=25.96, df=231, p=0.0001) remained significant (log likelihood for normal=–238.11). Number of private hospital beds per capita was not significantly related to ECT use in the smaller sample. With the addition of the regulatory variable, the proportion of psychiatrists' caseloads consisting of affective disorders proved to be an even less powerful predictor of ECT variation (χ^2=1.52, df=231, p=0.22). Results for the other independent variables were similar to those in the previous analysis.

The effect of legal regulation can be illustrated by comparing the regulations and ECT utilization rates of two states, New York and California. As of 1983, New York had relatively little regulation of ECT, requiring review of the procedure by a hospital committee and informed consent with disclosure of risks and benefits. Of the 14 metropolitan statistical areas in New York, four (28.6%) had no instances of ECT use during the study period, two (14.3%) had rates of use below the national average, and eight (57.1%) had rates higher than average. In contrast, California was among the most stringent regulators of ECT, restricting its use for minors, requiring review by two physicians for patients hospitalized involuntarily, requiring a competency evaluation by a separate physician for voluntary patients, limiting the period of treatment, and prescribing in detail the information required for record keeping and consent. Of the 24 metropolitan statistical areas in California, 12 (50.0%) had no cases of ECT use during the study period, 10 (41.7%) had low rates of use, and two (8.3%) had high rates.

DISCUSSION

In a psychiatrist-level analysis of the APA national survey of professional activities (unpublished manuscript), Koran concluded that the availability of ECT may be limited. He suggested that future research should examine differential geographic utilization of the procedure.

In this study we found ECT use to vary widely across metropolitan statistical areas, more so than most other medical and surgical procedures (2). Among the strongest predictors of ECT use were the provider variables: the numbers of psychiatrists, primary care physicians, and private psychiatric hospital beds per capita. Primary care physicians may influence ECT rates by detecting cases of psychiatric illness and referring patients for treatment.

Only a small proportion of the variation in ECT use is likely to be attributable to variation in the prevalence of depression, the condition most commonly treated with ECT. Differences in the 1-year prevalence of depression among the five sites of the Epidemiologic Catchment Area study ranged only from 1.7% to 3.4% (38). Further study should clarify whether use of ECT for other disorders, particularly those with less evidence of efficacy, contributes to variation.

ECT use may also be influenced by provider variables we did not examine, such as the theoretical orientation of academic departments of psychiatry, the extent of ECT training these departments provide, and the time period during which psychiatrists were trained (39); these warrant further study.

Stringency of state regulation was the only community characteristic we studied that significantly predicted ECT use. To our knowledge, this is the first study to show a relationship between regulation and ECT use in a large, multistate sample. Further investigation might indicate which types of regulations are most associated with lower rates of ECT.

Our estimated rate of national ECT utilization, 4.9 patients per 10,000 population per year, is comparable to previously estimated rates. A 1976 survey of practitioners yielded a rate of 4.4 per 10,000 (30), while hospital surveys showed rates of 1.5 per 10,000 in 1980 and 2.0 per 10,000 in 1986 (23, 27). Our results yield an estimate of 100,000 U.S. patients treated with ECT in the year studied (with a population of 250,000,000 and omission of the 20% of the population under the age of 15). All such estimates of national rates and total use are subject to the studies' methodologic limitations and have been disputed (23, 27, 40).

Without knowing more about the prevalence and severity of psychiatric disorders in individual metropolitan statistical areas, it is not possible to determine whether ECT is overused in some areas. Studies have shown that undertreatment of psychiatric illness is more the norm (38, 41). In the many metropolitan statistical areas where we found little to no ECT, there appeared to be a lack of access to this procedure. This finding may have important implications for public health, particularly for severe or refractory depression, and deserves further study. Our findings suggest that increasing access to ECT may require increasing the supply of ECT-trained psychiatrists and psychiatric hospitals in underserved areas and reconsidering the more restrictive state statutes.

Wennberg et al. (11) have hypothesized that high variation in use of a specific procedure, such as ECT, can reflect a lack of consensus among clinicians regarding the clarity of diagnosis, the procedure's efficacy (compared with alternative treatments), and the timing of the procedure among a sequence of alternatives. Low-variation procedures, in contrast, tend to be associated with reliably diagnosed conditions and to have a single widely recognized treatment, for example, surgical repair of inguinal hernia.

Although psychiatry has made progress in improving diagnostic reliability, the emergence of standard diagnostic criteria for major depressive disorder is a fairly recent and not universally accepted development in American psychiatry (42). Survey data suggest that the use of DSM-III-R criteria for diagnosis varies, with less adherence among psychiatrists trained earlier (43–45). Furthermore, depression occurs along a continuum of symptomatic severity and functional impairment, and judgments about when ECT is needed vary. A similar lack of consensus can be seen in attitudes of mental health professionals toward the efficacy and safety of ECT; surveys of psychiatrists and other clinicians show marked disagreement regarding its value (30, 46–48). Nor do psychiatrists agree on the choice of ECT among treatment alternatives or on the timing of ECT in the sequence of treatments. For example, one group of psychiatrists expressed wide disagreement about whether they would choose ECT, lithium augmentation, or a different antidepressant to treat a patient who had failed to improve during an antidepressant trial (49).

Several limitations of our study should be noted. Survey data may be subject to response bias. The response rate for APA nonmembers was low, although ECT use did not significantly differ between members and nonmembers. We studied ECT variation only in urban areas, but these 317 metropolitan statistical areas contained 90% of all respondent psychiatrists and 88% of all ECT use reported in the national survey. In some of the 115 metropolitan statistical areas where no ECT was recorded, the procedure may have been performed by nonrespondents or outside of the study period.

Clinical and demographic data on the patients treated with ECT were not available, and therefore our analysis of the impact of demographic variables should be considered preliminary. Claims data would allow for more extensive study of the impact of demographic and diagnostic factors and of referral between metropolitan statistical areas. However, analysis would be limited to populations for which claims data are widely available, such as Medicare patients.

CONCLUSIONS

Twenty years of research into area variation in medical practices have given theoretical foundation and momentum to recent efforts to promote consensus in diagnosis and treatment. The U.S. Agency for Health Care Policy and Research and several medical specialty societies have begun to develop detailed, research-based practice guidelines, with the aim of promoting

treatments with the best-known effectiveness. While APA is at the forefront of guideline development, and indeed cites practice variation among its reasons, little analysis of area variation in psychiatric practices has been conducted. This study establishes that wide variations exist in the use of ECT and suggests that this procedure is among the highest-variation procedures in medicine.

Practice guidelines for major depressive disorder recently issued by APA (50) and the Agency for Health Care Policy and Research (51) specifically address the efficacy and safety of ECT and clinical indications for its use. Further studies should evaluate whether practice guidelines and related efforts serve to educate physicians and result in narrowing variation in professional practices. At the same time, however, guideline development has underlined the need for more extensive data concerning the efficacy of our procedures, medications, and therapies—individually, in combination, and in comparison. Further outcome studies will be crucial for developing better guidance for clinicians.

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