Relationship Between Staffing Ratios and Effectiveness of Inpatient Psychiatric Units

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Objective: **Most staffing models designed for adult psychiatric hospitals are based on the well-known relationship between high staff-patient ratios and high effectiveness of treatment units. Staffing ratios likely gain their predictive power by serving as a proxy measure for the amount of attention patients receive from staff. This study directly measured the amount of attention that patients received from staff to determine whether it could account for the variance in unit effectiveness predicted by staffing ratios and serve as a better predictor of unit effectiveness.** ***Methods:*** **Data from 22 wards in state or Department of Veterans Affairs mental health institutions, which housed 673 short- and long-stay patients, were analyzed. Only full-time direct care staff were included in the calculation of staff-patient ratios. The amount of attention provided to patients by staff was determined over seven days by a highly reliable observational assessment system. The two best social-action outcome measures over a six-month period were adjusted for confounding variables to provide residualized indexes of unit effectiveness.** ***Results:*** **Staff-patient ratios significantly predicted unit effectiveness as indexed by residualized community tenure, accounting for 24 percent of the variance. However, staff-patient ratios did not significantly predict unit effectiveness as indexed by net gain in discharge rates. Taking into account the amount of staff attention received by patients significantly improved the prediction of community tenure by 36 percent and the net gain in discharge rates by 66 percent over staffing ratios alone. The amount of staff attention also accounted for the relationship between staffing ratios and community tenure.** ***Conclusions:*** **Staffing decisions should be made on the basis of more precise information about treatment requirements, not just staffing ratios. (*Psychiatric Services* 52: 1374–1379, 2001)**

Inpatient facilities account for most expenditures in the public mental health system in the United States. Personnel costs account for about 80 percent of ongoing expenses in publicly funded adult psychiatric institutions. Consequently, cost reduction efforts by budgetary authorities focus on reducing the number of highly paid staff or overall staff-patient ratios (1–3). These efforts are in direct conflict with nearly all staffing models designed to provide effective treatment programs for inpatients. Whether reflected in annual budgetary requests from unit administrators or in specific models proposed for determining appropriate staffing levels, the prevailing sentiment appears to be "the more staff, the better" (4–8).

Resolution of the conflict between cost reduction efforts and the desire for more clinical staff should benefit from evidence of the ability of staffing data to differentiate between more and less effective treatment units. Higher staff-patient ratios and smaller treatment units have long been identified as the only non-patient-related characteristics that are consistently associated with the effectiveness of inpatient units, independent of specific treatment programs (2). Although these two highly correlated variables lend support to the notion that more staff is better, they account for a small proportion of the variance in any practical measure of inpatient unit effectiveness, such as posttreatment community tenure or discharge rates.

Although staff-patient ratios are easy to calculate and readily available, they are, at best, a proxy for the amount of attention that patients receive from clinical staff. The amount of staff attention varies widely according to staff utilization practices and program structures. In fact, direct observational studies in public mental institutions have shown that patients on a typical unit spend, on average, less than 5 percent of their waking hours engaged in scheduled therapeutic activities and less than 11 percent in any contact with staff (9).

In one study, differences were observed in the amounts of attention provided by staff to patients across

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two intramural psychosocial programs that had identical staffing levels (10). If the amount of staff attention underlies the predictive power of staffing ratios, direct measurement of the amount of attention received by the average patient should be an even better predictor of the effectiveness of a treatment unit, because it would take into account variations in the utilization and performance of on-the-floor staff.

A review of the literature from 1960 through January 2001 yielded only ten studies that reported associations between unit effectiveness and staffing levels or between unit effectiveness and the amount of attention patients received from staff (10–20). Few of these studies have been conducted since the mid-1970s, paralleling the relative dearth of research among inpatients on psychosocial factors over the past two decades (2,21).

Methodological difficulties were apparent in most of these studies. Identification of which staff members are counted in the determination of staffing levels or staff-patient ratios is crucial for consistent accumulation of evidence across studies. However, only five studies explicitly restricted staffing estimates to professional, preprofessional, or online clinical staff members (10–12,16–18). The quality of the criteria used to determine unit effectiveness was highly variable. These criteria ranged from subjective ratings of patient functioning (12,14) to the best social-action indicators of postdischarge community tenure and operationally defined rates of "significant release" (discharge) (10,13,20).

Other investigations relied solely on release and disposition rates or on proxy measures of community functioning—for example, the percentage of patients who were employed at discharge—as indicators of unit effectiveness (11,16–19). In only six studies were attempts made to control for confounding variables that might have influenced the effectiveness of the treatment unit (10–13,16,20).

Despite these methodological shortcomings, the body of evidence shows that higher staff-patient ratios are generally associated with greater unit effectiveness, defined by multiple criteria. However, the amount of variance in outcomes that is accounted for by staff-patient ratios ranged from less than 9 percent to more than 42 percent, with little consistency across studies. Although four studies showed that higher amounts of staff attention were associated with greater unit effectiveness (10,11,14, 17,18), the quality of measurement of both staff attention and unit effectiveness lacked sophistication in all but one study (10).

Paul and Lentz (10) properly controlled for extraneous variables, accurately calculated on-the-floor staffing levels, and systematically measured the amount of attention that patients received from staff by using a highly reliable observational assessment instrument. Despite equivalent staffing ratios across conditions, patients who were treated in two comprehensive psychosocial programs that demonstrated high rates of staff attention had significantly better community outcomes than patients from comparable hospital programs with lower rates of staff attention. However, the comprehensive program based on social-learning principles remained more effective than the second-best program under conditions of both more and less staff attention. These results indicate that the amount of staff attention that patients receive affects unit effectiveness more than staff-patient ratios do. They also show that the manner in which staff attention is delivered is even more important in determining unit effectiveness.

Does direct measurement of the attention patients receive from staff account for the predictive power of staffing ratios, perhaps serving as a better predictor of unit effectiveness?

Although the literature generally supports the idea that staffing ratios predict unit effectiveness as well as the notion that the amount of attention that patients receive from staff may account for this relationship, findings have not provided answers to two important questions. First, do staff-patient ratios explain enough of the variance in practical measures of unit effectiveness to inform staffing decisions? Second, does direct measurement of the amount of staff attention account for the predictive power of staffing ratios, perhaps serving as a better predictor of unit effectiveness than raw staffing ratios?

The existence of a large multi-institutional data set allowed us to conduct a correlational investigation of these questions among 22 adult psychiatric treatment units in public psychiatric institutions. Because the data set was originally collected to examine the feasibility and generalizability of observational assessment instruments, objective data were available for indexing all relevant variables. Reliable tallies of the actual number of online clinical staff and the number of resident patients over a seven-day assessment period enabled us to calculate accurate staff-patient ratios.

Similarly, observational coding of staff-patient interactions through hourly samples of all patient waking hours for a full week allowed accurate calculation of the amount of attention the average patient received from staff on each unit. The data set also provided the best indexes of social-action outcomes for each patient during a six-month follow-up period. These indexes, along with information on patient and treatment characteristics that have known associations with patient outcomes, enabled us to calculate two residualized scores for each unit to provide unconfounded measures of unit effectiveness.

Methods

All data for the study were drawn from a multi-institutional data set that was collected to establish feasibility and normative information on observational assessment instruments in residential settings. The complete data set included information about 1,205 patients from 35 treatment units housed in 17 facilities in Illinois. For this larger data set, characteristics of patients, staff, and units were deliberately selected to be representative of national and large-state samples of public psychiatric hospitals and community facilities.

Independent project personnel collected data on each unit during a seven-day assessment period. Information about patient outcomes was obtained from agency records over a standard six-month period after the on-site assessment week. Details of the data collection design and procedures for the multi-institutional project are published elsewhere (22,23).

Treatment units

The 22 units studied, which served clients who had psychiatric diagnoses in state and Department of Veterans Affairs hospitals, were selected from the larger data set. Community facilities and units that served predominantly people with diagnoses of mental retardation or alcohol or drug abuse were excluded. The sample consisted of 11 units that served predominantly acute psychiatric admissions—stays of less than 90 days—and 11 units that served chronically institutionalized psychiatric patients—stays of more than one year—or served both short- and long-stay patients. A total of 673 patients received services from the treatment units during the assessment phase of data collection. Characteristics of the patients, staff, and units were analyzed and found to be representative of patient populations, staff groups, census characteristics, and staffing ratios in public psychiatric hospitals nationwide and in the nine largest states (22,23).

Predictor variables

Staff-patient ratios. To produce the best possible index of staffing levels, only full-time-equivalent clinical staff members were included in the calculation of the staff-patient ratio for each unit. "Clinical staff" refers to professional and preprofessional mental health personnel who are available for direct treatment or care of patients and who cover all work shifts. This definition excludes administrative and support staff as well as physical health professionals and assistants. Staff-patient ratios for each unit were derived by dividing the total number of full-time-equivalent clinical staff by the average daily number of patients, calculated as the daily mean during the assessment week. Tallies for both staff and patients were verified with 100 percent accuracy (23).

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Attention-received index. To provide an objective measure of the total amount of attention received by the average patient on each unit during the assessment week, the attention-received index was selected from each unit's full-week program summary of observations on the Staff-Resident Interaction Chronograph (SRIC) (24). The SRIC is a matrix instrument for direct observational coding of a single clinical staff member during a ten-minute observation period. The instrument uses 94 codes to record staff-patient interactions and three codes to record noninteractive staff behavior during each minute of the observation period. Collateral information is also recorded during each observation, including time, location, activity, and number of patients for whom the staff member being observed is responsible (25).

A pool of 17 independent, noninteractive observers collected the SRIC data. Before data collection, the observers were trained to a criterion of 100 percent agreement during a full shift that included a minimum of 15 active ten-minute observations. A team of two to five observers collected SRIC data at each site over a seven-day period, after a three-day habituation period during which interobserver reliabilities were established for each unit. For every SRIC observation, a trained observer chronologically coded all instances of a targeted staff member's behavior in functional relation to patient behavior for ten consecutive minutes. One or two SRIC observations during every patient waking hour—16 hours a day for seven days—provided coverage of the psychosocial aspects of each treatment program, with representative sampling of all activities (23).

The attention-received index from a full-week SRIC program summary on each unit is calculated by dividing the sum of the 94 interactive codes across all observations by the number of patients present for all observations over the seven days. The result, expressed as a rate per hour, represents the amount of attention received by the average patient on the unit during the entire week's observations (24). This index was exceptionally reliable: even the lower-bound omega squares were greater than .98 for single ten-minute observations with observer-level differences counted as error (26).

Measures of unit effectiveness

Raw outcome data. Data on community outcomes for all patients were collected from central records, mailed questionnaires, and telephone follow-up interviews over the six-month period after the standard assessment week on each unit (23). From these data, the best continuous and categorical social-action measures of outcome were selected for

each patient: continuous community tenure (number of consecutive days after release without return to an equally restrictive inpatient or correctional facility) and presence or absence of a "significant release," or discharge, without return to an equally restrictive inpatient or correctional facility for 30 consecutive days (SR-30). Patients who were discharged irregularly—that is, against medical advice—were counted as treatment failures; for these patients, zero days of community tenure and absence of an SR-30 were assigned.

Residualized indexes of unit effectiveness. The influence of patient and treatment variables—other than psychosocial treatment factors—that predict institutional outcomes was removed from the raw outcome measures to provide unconfounded indexes of unit effectiveness. This adjustment was accomplished by developing residualized community tenure and SR-30 measures for each of the 22 units according to procedures used in another study (unpublished data, Menditto AA, Paul GL, Mariotto MJ, et al, 2001). By using all patients in the sample, prime bivariate correlations were calculated between each criterion as well as patient and treatment variables that had been identified as being historically predictive of inpatient treatment outcomes (2). The observers collected information for these patient and treatment variables from facility records; agreement between blindly overlapped record abstractions exceeded 99 percent (23). Variables that showed significant correlations (two-sided $p<.05$) with both outcome criteria were selected for inclusion in multiple regression procedures to develop residualized measures of unit effectiveness.

The selected variables were then entered into an all-possible-subset regression analysis separately for each outcome measure, to construct equations for calculating residualized scores for each patient (27). To ensure that only variance that was related to actual treatment outcomes was included, one patient who died and 115 patients who were discharged irregularly during the follow-up period were excluded. The best subset of variables was determined when the addition of subsequent variables did not produce a significant increment in the amount of variance explained for each outcome measure.

The best subset contained four variables for community tenure: accumulated hospital days (a measure of patient chronicity), psychotropic drug use status (yes or no), admission status (voluntary or involuntary), and graded diagnostic disability group (a rough estimate of patient functioning based on six diagnostic classes). These four variables predicted 14 percent of the variance in the community tenure measures. The best subset equation for SR-30 status included three of the same variables that predicted the community tenure measure, excluding only psychotropic drug use, and predicted 9 percent of the variance in SR-30 status.

When residential community tenure is used as a measure of effectiveness, the amount of attention patients receive is a better predictor of unit effectiveness than staffing ratios.

The two residualized unit-effectiveness indexes were then derived as follows. For community tenure, the best subset equation was applied to all 673 patients to predict the number of days in the community expected for each patient in the absence of differential psychosocial treatment factors. Each patient's expected number of days in the community was then subtracted from the actual number of days to provide a residualized community tenure score. These scores were averaged across patients within each unit to provide the unit's residualized community tenure index.

Similarly, the best subset equation for the SR-30 criterion was applied to each patient, deriving a patient's expected SR-30 status in the absence of differential psychosocial treatment factors. Each patient was coded as achieving a "better," "same," or "worse" outcome than predicted by comparing his or her actual SR-30 status with that expected on the basis of the best subset equation. The percentage of patients on each unit who achieved better or worse SR-30 status than expected was tallied to provide a residualized net-gain (or net-loss) SR-30 index of unit effectiveness.

Data analyses

Pearson correlations were used to analyze the relationship between staff-patient ratios and both residualized unit-effectiveness indexes. Separate hierarchical regression analyses were conducted to determine the extent to which the attention-received indexes improved the prediction of both residualized unit-effectiveness measures over staff-patient ratios alone. Tests of the regression weights and partial correlations were used to examine the extent to which the attention-received indexes accounted for any significant relationships observed between staff-patient ratios and residualized measures of unit effectiveness.

Results

The mean±SD age of the 673 patients was 38.45±13.10 years (range, 18 to 78 years), and 44.3 percent were women. A total of 438 of the patients (65.1 percent) were Caucasian, 208 (30.9 percent) were African American, and 27 (4 percent) were of other races. Follow-up data were available for all patients. The mean±SD age of the staff members on the 22 treatment units was 35.95±12.23 years (range, 17 to 69 years), and 391 (71 percent) were women.

The 22 treatment units in the sample varied considerably in their degree of program structure, ranging from highly structured comprehen-

sive programs to essentially unstructured units based on a private practice model. Professed theoretic orientations covered the full gamut, including custodial, biological, eclectic, phenomenological, gestalt, existential, psychodynamic, client-centered, interpersonal, rational-emotive, cognitive-behavioral, milieu, and social-learning models.

Staff-patient ratios ranged from .32 to 2.08 (median=.79) on the basis of daily patient counts of 11 to 72 patients per unit (median=30). The attention-received indexes ranged from 1.78 to 24.49 interactions per hour (median=6.01) across the 22 units. The residualized community tenure index ranged from –71.98 days to 79.32 days (median=3.64 days), and the residualized net-gain (or net-loss) SR-30 index of unit effectiveness ranged from –62.9 percent to 83.9 percent (median=–18.9 percent).

Intercorrelations showed the expected positive relations among staff-patient ratios, the attention-received indexes, and the two residualized measures of unit effectiveness. Although staff-patient ratios were significantly correlated with the residualized community tenure index of unit effectiveness ($r=.49$, $N=22$, $p<.05$), the correlation with the net-gain SR-30 index was not significant. Thus it seems questionable whether prediction of less than 25 percent of the variance with staffing ratios in only one of two unit-effectiveness indexes is strong enough evidence on which to base staffing decisions.

Hierarchical regression analyses were undertaken to examine the extent to which the amount of attention patients received from staff not only accounts for but also improves on the ability of staffing ratios to predict unit-effectiveness criteria. A significant increment in R^2 was obtained when the attention-received indexes were entered after staff-patient ratios in the prediction of the residualized community tenure measure (change in $R^2=.36$; $F=16.95$, $df=1, 19$, $p<.001$). The regression weights showed that staff-patient ratios were not significant when the attention-received indexes were entered into the prediction equation. The partial correlations showed that the degree of association between the attention-received indexes and residualized community tenure when staff-patient ratios were controlled for (partial $r=.68$, $N=22$, $p<.001$) was only slightly lower than the prime bivariate correlation between the attention-received indexes and residualized community tenure ($r=.75$, $N=22$, $p<.001$).

In contrast, the partial correlation between staff-patient ratios and residualized community tenure when the attention-received indexes were controlled for represented a large decrease in association from the prime bivariate correlation between staff-patient ratios and residualized community tenure ($r=.49$, $N=22$, $p<.001$). These results show that when residualized community tenure is used as a measure of unit effectiveness, direct measurement of the amount of staff attention that patients receive not only produces better prediction of unit effectiveness than staffing ratios but also accounts for most of the variance in unit effectiveness that is explained by staffing ratios.

Although staff-patient ratios did not significantly predict unit effectiveness as measured by the net-gain SR-30 index, entering the attention-received indexes as an additional predictor for this criterion resulted in a significant increase in the amount of variance accounted for (change in $R^2=.66$; $F=37.10$, $df=1, 19$, $p<.001$). Thus the amount of attention patients received from staff served as a better predictor of unit effectiveness than staffing ratios for the net-gain SR-30 index.

Discussion and conclusions

The results of this study provide useful information for addressing the two major questions we posed. The first question was whether staffing ratios predicted enough variance in unit-effectiveness measures to aid in making staffing decisions. Staffing ratios were found to account for 24 percent of the variance in a residualized measure of community tenure, which falls at the midpoint of percentages reported in previous studies that used a variety of unit-effectiveness criteria (13,15–20). This relatively small magnitude of prediction, combined with the fact that staffing ratios do not predict unit effectiveness when indexed by improvement in discharge rates, indicates that the predictive power of raw staffing ratios is insufficient for making staffing decisions.

The second question was whether direct measurement of the amount of attention provided to patients by staff could not only account for but also improve on the ability of staffing ratios to predict unit effectiveness. As hypothesized, the amount of staff attention substantially increased the proportion of variance explained beyond that accounted for by staffing ratios for both indicators of unit effectiveness. An additional 36 percent of the variance in the community tenure measure of unit effectiveness was explained by the amount of staff attention over staffing ratios alone. An increase of 66 percent was observed when the net-gain SR-30 index was used as the measure of unit effectiveness and staff attention was included.

The partial correlations showed that staffing ratios were not significantly related to the community tenure measure of unit effectiveness after the amount of staff attention was controlled for. In contrast, the amount of staff attention continued to be significantly associated with both measures of unit effectiveness after staffing ratios were controlled for.

Direct measurement of the amount of attention that patients receive from staff takes into account both staff utilization and staff activity. Such measurement not only predicts unit effectiveness better than staffing ratios but also explains the observed relationship between staffing ratios and unit effectiveness. Thus our findings indicate that objective data on the amount of attention patients receive from staff is a more important consideration than staffing ratios in staffing decisions aimed at improving the effectiveness of inpatient treatment programs.

Our findings suggest that some resolution is possible in the current conflict between cost-containment efforts and practice agendas in psychiatric hospitals. Staffing models based on the philosophy that more staff is better (4–8) are missing an important piece of the overall picture. Indeed, adequate staffing ratios for inpatient

treatment units set the stage for therapeutic interactions. However, this alone does not guarantee effective treatment. As suggested by observational studies, a large proportion of staff time and patient time during which therapeutic contacts could occur is not used for that purpose (9). Instead of the current practice of using the number of staff per patient to gauge whether effective patient care will be provided, staffing decisions should ensure that desirable amounts of staff attention are provided by means of empirically effective utilization structures and by training direct care staff to use empirically effective intervention techniques (28). ♦

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