Assessing production characteristics, influential factors and administrative policies in a multicenter dental organization

Charles W. Patterson, DDS, MS, MBA

Large group dental practices are increasingly common for a variety of reasons, including economies of scale[1] and barriers to entry for new solo practices. In these organizations, managers routinely make policy decisions that are instituted throughout all production centers. A critical underlying assumption with some policies is that production characteristics and factors that influence production are identical or similar throughout the organization. Therefore, managers assume that policy decisions will have a similar effect on each production center. However, if the underlying assumptions are incorrect, the resulting policies may have different effects than those anticipated.

In this study, I examined the production characteristics of a large, six-center dental practice in the Chicago area (72,000 patients of record) and conducted a statistical analysis of seven factors influencing production. These seven factors focus on three critical areas: staffing (factors 1 and 2), patients (factors 4 and 7) and clinical procedures (factors 3, 5 and 6).

METHODS

I obtained production data for the 2010 calendar year for all six centers, designated A through F. (The number of staff members in each center was as follows: A, 30; B, 10; C, 10; D, 12; E, seven; and F, seven). I plotted the daily production (in dollars) for the year against the numbers of days during which the production occurred for each center. Figures 1 and 2 illustrate the production distribution for two typical centers. I used the Spearman rank correlation test and the Pearson

ABSTRACT

Background. In multicenter service organizations, managers often make centralized decisions without considering the effects of differing production characteristics and influential factors on each center.

Methods. In this study, the author examines differences in production characteristics and factors that influence production, as well as their likely effect on policy formulation, in a large, six-center dental group in the Chicago area.

Results. The results of the study show that the six centers (in two groups) exhibited two distinct production patterns, with three having logarithmic distributions and three having normal distributions. Production differences between the groups likely resulted from differences in managed care, staffing and dental procedures performed.

Conclusions. Instead of being monolithic, the organization exhibited two types of centers, each with its own production characteristics and factors that influenced production.

Practice Implications. The study results suggest that large service corporations and }partnerships would benefit from conducting analyses of production characteristics and factors that influence production before making policy decisions that affect the entire organization.

Key Words. Policy; practice management; production; multicenter organizations; influence; factors; statistics; analysis.

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Dr. Patterson is chief clinical officer, Advanced Family Dental, P.C., 2241 Theodore St., Crest Hill, Ill. 60403, e-mail clucas1954@yahoo.com. Address reprint requests to Dr. Patterson.

product moment correlation coefficient to assess the influence of seven factors (independent variables) on production (dependent variables) in each center. The seven factors are as follows:

- number of dentists in the office;
- number of dental care providers (dentists and hygienists) in the office;
- number of units of fixed prosthetics, core buildups, endodontic procedures and implants placed or performed;
- number of patients seen;
- number of orthodontic cases begun (but not necessarily completed);
- number of restorative procedures;
- number of patients enrolled in managed care.

The Spearman rank correlation test is a nonparametric measure of dependence between two variables.[2] Nonparametric tests do not rely on data conforming to any specific probability distribution. This is important because health care data often exhibit what is termed a "skew to the right,"[3] meaning that the right tail in a normal distribution is larger than the left tail, which creates analytical difficulties. The Spearman test avoids this problem.

The Spearman rank correlation test places independent variables (that is, factors 1-7) in rank order and lists them against the rank order of dependent variables (that is, daily production). Table 1 illustrates the Spearman ranking process for center A. The daily production rank is listed in descending order from 1 to 10 for 10 consecutive days; 1 is the highest day of production and 10 is the lowest day of production. Table 1 shows factors 1 through 7 with their rankings listed next to their respective daily production rank. I ranked tied production data by averaging the ranks for those data.

When tied data occur with the Spearman rank test, investigators use the Pearson correlation coefficient[2,4] to determine the degree of influence that the independent variables exert on the dependent variables (that is, the correlation). In this case, the independent variables are factors 1 through 7 and the dependent variables are the daily production in dollars. The resulting coefficient quantifies the degree of influence. The Pearson correlation coefficient is defined as follows:

$$\rho = \sum_i (X_i - X_{avg})(y_i - y_{avg}) / [\sum_i (X_i - X_{avg})^2 (y_i - y_{avg})^2]^{1/2}$$

where X_i and y_i are the dependent and independent variables, respectively, for a specific production center "$_i$", and X_{avg} and y_{avg} are the average values for the dependent and independent variables, respectively, for a specific production center.

Table 2 shows the Pearson coefficients for the six centers and seven factors.

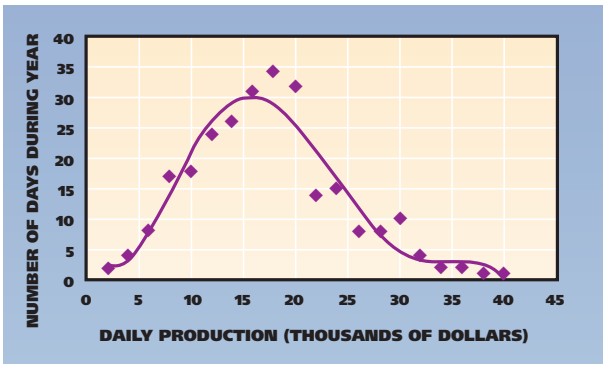

Figure 1. Normal model of production distribution for center A (group 1). Diamonds indicate the total daily production in dollars.

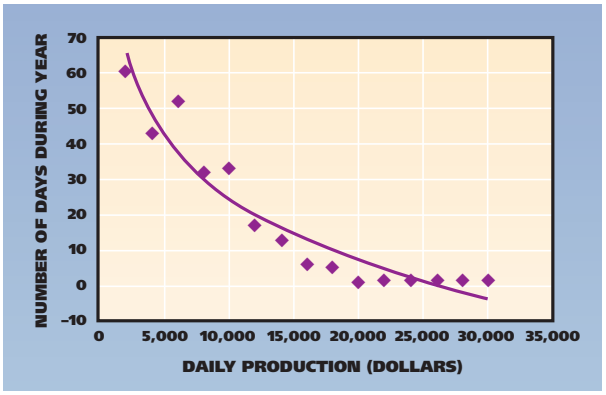

Figure 2. Logarithmic model of production distribution for center C (group 2). Diamonds indicate the total daily production in dollars.

RESULTS

The study findings showed production distributions that exhibited two distinct patterns: a group displaying a normal distribution (group 1, consisting of centers A, E and F), fitting polynomial equations, and a group displaying a logarithmic-type distribution (group 2, consisting of centers B, C and D), fitting logarithmic equations. The equations and *r* values are shown in the box (page 619).

Pearson test results are expressed as a dimensionless number between +1 and –1. A value of +1 indicates a perfect positive correlation. A value of zero indicates no correlation. A value of –1 indicates a perfect negative correlation. Investigators interpret the results within the context of the data.[5] For example, a correlation of +0.9 may be statistically significant in the social sciences but may not be statistically significant in the field of precision engineering. Rodgers and Nicewander[6] offered guidelines for