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Patterns of Care in Tennessee

Use of rural vs. non-rural facilities

Previous research papers from the BlueCross BlueShield of Tennessee Health Institute have demonstrated a potential health care capacity crisis in Tennessee. In light of that, the Health Institute thought it important to examine actual patterns of care, such as where Tennesseans are going to obtain medical services. For this approach, our organization's research focused primarily — though not exclusively — on patterns of care for rural residents. The hypothesis in each case studied was that geographic proximity to a health care facility would have a statistically significant influence on a patient's ability to seek care. This hypothesis proved to be false.

The starting point: rural and non-rural care facilities

Starting with the Tennessee state list of licensed facilities, the pattern research first eliminated all specialty facilities from the study, such as psychiatric hospitals, rehabilitation hospitals, children's hospitals, and long-term care facilities for patients on respirators. This left 101 hospitals remaining, with those classified as either rural, small rural, urban, tertiary, or rural referral. For simplicity, these were regrouped as either rural (n=63) or non-rural (n=38).

Commercial data used from BlueCross BlueShield of Tennessee showed there were 60,414 hospital inpatient stays in those facilities in 2009. Of those, the data showed that 48,405 were by people living in Tennessee or in the state's contiguous counties. (Arriving at this figure was necessary to exclude those patients who come to our major teaching hospitals from out-of-state.)

Next, the study calculated the nearest facility on a straight-line basis for each of those stays.

Each stay was then categorized using the Diagnosis Related Groups (DRG) classification system, which groups inpatient stays based on similar diagnosis codes, severity, and patient demographics. After eliminating stays with an unknown DRG classification (e.g. M98, M99), 47,300 stays were retained for further analysis. Of those, 33,041 (69.9%) were not at the member's closest care facility.

An attempt was then made to compare apples to apples from the standpoint of medical services offered at competing non-rural facilities. In other words, it is not reasonable to say that a patient "chose" a non-rural hospital over a rural one if the service he or she needed (e.g. a coronary bypass) was not available at the closer facility. This methodology left 20,536 people (43.4%) who made a *choice* to "migrate." Since the research examined the DRG claims actually submitted by each rural facility, the assumption was made that a service was not offered by a facility if there had been no claims submitted by that facility for that DRG in 2009. Therefore, this method may

understate the actual range of services offered by a rural hospital, and in turn would make the estimates of the number of rural people leaving their area conservative ones.

Those rural members, defined as those whose closest facility was a rural facility, willingly migrated and chose a facility that was, on average, 22.6 miles farther away than their closest facility. For those who are interested, there is a more complete discussion of methodology in the appendix.

What do the numbers show?

In simple terms, almost half of the people in rural areas are not using the hospital closest to them, preferring to go to a larger, non-rural hospital to get care, *even if the same services are available locally*.

Proximity vs. mobility

Distance may not be a barrier in today's mobile culture. When most of the state's rural hospitals were established, transportation was much more difficult than it is today, particularly when transporting severely ill patients. Transportation capability has changed from a family member with a station wagon, who sped to the closest emergency room, to a rapid-response helicopter that can travel any direction, begin effective treatment in-flight, and evacuate the patient to larger, more distant facilities in mere minutes.

Technology vs. investment capital

Additionally, when most rural hospitals were established, their service capabilities were similar to those provided by facilities in more urban locations. All of that has changed with the explosion in technology in the medical care industry. Effective hospitals are typically highly capital intensive, and often, the rural facilities just don't have the money to keep up. While some rural facilities have maintained an adequate patient base to be financially viable, others have not.

Capacity vs. costs

But then, what about capacity? Do the urban referral centers have the capacity to take on the additional patients? All large hospitals in the state have far more licensed beds than staffed beds. That means, simply put, that they have beds already on their fixed cost base, and they could staff up those beds by incurring only variable (staffing) costs.

Preventive care and treatment choices

In addition to examining the numbers for inpatient stays, pattern examples from both preventive care and treatment of a medical condition were explored. The examples studied could serve to give a better view of how the health care delivery system could be structured, since these tests involve patient choice and elective care situations. The geographical correlation analysis of the delivery system could also provide insight into how providers and patients interact — and whether geographic barriers of access still exist in today's mobile world.

1. The preventive care analysis first examined a commonly studied interaction between access to a mammogram facility and the likelihood of women being adherent with recommended breast cancer screenings. The analysis included nearly 23,000 female patients insured by BlueCross BlueShield of Tennessee with ages ranging from 42 to 69. Of these women, 53% were past due to receive their recommended breast cancer

screening. From supplied home address information, the patients' residential locations were mapped using a geographic information system. The 196 accredited mammography facilities in Tennessee were mapped, as well. Then, a statistical model was constructed to determine if distance from the home to the nearest facility had any influence on adherence with the screening, while controlling for other factors, such as race, age and socio-economic status.

What do the numbers show?

Results suggest that distance had no influence. In fact, the average distance from a member's residence to the nearest mammography facility was almost identical for adherent patients (4.77 ± 0.04 miles) versus non-adherent patients (4.76 ± 0.04 miles). In other words, a patient's proximity to a mammography facility does not predict that they are more likely to be compliant with the Centers for Disease Control's preventive guidelines for mammography screening.

2. For a treatment measure, since low-back pain is one of the three most common non-obstetrical diagnoses treated in Tennessee hospitals, analysis further examined the likelihood that a patient diagnosed with low-back pain would have surgery. (The appropriateness of surgery was not a part of the analysis — just whether surgery occurred, since that indicates access to a surgical facility). Just as before, the analysis mapped the patients with a clinical diagnosis of low-back pain (n=6152), and employed a balanced design containing 3,076 patients who had back surgery following their diagnosis and 3,076 patients who did not have back surgery following their diagnosis. Again, the study was controlled for various socio-economic and health status factors. Access to chiropractors, surgeons or surgery facilities had no influence on whether low-back pain patients ended up in surgery.

What do the numbers show?

Results show that 2% of non-rural members had surgery, compared to 6% of rural members – a difference that is not statistically significant.

Note that this method could potentially understate the difference between rural and non-rural residents in that it requires at least an initial consultation with a physician. It is possible that some rural (or urban) residents with back pain did not seek *any* medical care, in which case they would not be included in the study. However, once patients accessed the care system, geography did not prove to be a barrier to receiving surgery.

What can be seen in these patterns of care

As seen by these examples, research results on patterns of care suggest that:

- Location within the measured parameters (i.e. rural vs. non-rural) does not significantly influence the patients' ability to receive care.
- In many cases, rural residents are choosing to receive care farther from their home.
- While rural patients did drive farther for inpatient care, they were not less likely to be compliant with preventive care recommendations when compared to their urban counterparts.
- Rural and urban patients also received treatment for existing conditions at the same rate as seen in the back surgery study.

With patients becoming more mobile, it appears they are more likely to seek care anywhere and at their own convenience. This could spell trouble for smaller, rural facilities. With more than 43% of rural patients choosing to drive by their nearest facility in order to receive care at larger, more distant facilities, it may be difficult for these rural hospitals to remain solvent.

A limitation of this study is that the data are all from BlueCross BlueShield of Tennessee commercial membership. Therefore, it would be inappropriate to draw conclusions about other populations such as the uninsured, TennCare members or Medicare beneficiaries.

It should be noted that this study did not examine the impact that rural facilities have on their communities, either from a clinical or economic standpoint. A hospital can employ many people who live, shop, spend and pay taxes within a community. It can also bring in revenue from outside the community through federal programs such as Medicare, state programs such as Medicaid, and from commercial insurance. The study also did not take into account the clinical consequences of closing a rural facility. There are medical situations and disease conditions for which minutes count — coronary artery disease and acute myocardial infarction, for example.

When examining voluntary choices and the effects of consumer behavior on the health care delivery system, more needs to be studied before any conclusions can be drawn regarding the viability of small or rural hospitals. Questions such as these deserve further analysis and elaboration.

- Is it to be expected that rural hospitals seek to maintain a competitive set of surgical services and capabilities, compared to their urban counterparts?
- What are the factors that patients consider in making their choices in hospital and treatment care?
- If a small hospital closed its doors — and nothing replaced it — what would be the clinical consequences for the local citizens?
- If a small hospital closed its doors — and nothing replaced it — what would be the economic consequences for the community and the local citizens?
- Is it time to review policies that subsidize with tax dollars those facilities that cannot make it on their own? ❖

About the BlueCross BlueShield of Tennessee Health Institute

The BlueCross BlueShield of Tennessee Health Institute was established with the goal of becoming the premier source of information about health care for Tennessee decision makers.

It is committed to providing a fact-based intellectual framework that will contribute to the public discussion on health care and policy development. When possible, the Health Institute will articulate with data the likely implications of health care policy changes on the local market in Tennessee. The mission is to inform interested parties about emerging trends through extensive research and analysis and to become a trusted source for reliable insights.

Appendix

Methodology used to analyze a member's willingness to migrate

Using the commercial claims data warehouse of BlueCross BlueShield of Tennessee, the research extracted all inpatient stays having either an admission or discharge date during the 2009 time period (n = 151,845). Only inpatient stays where the member was age 21 – 75 at the time of service (n= 97,830) were retained. The length of stay was adjusted to only capture the number of stay days occurring in 2009. Using the list of hospital facilities provided by the Tennessee Department of Health, Division of Health Statistics, the facilities were data mapped to the inpatient stay data by cross-referencing the National Provider Indicator (NPI) value. Then all specialty facilities and therefore inpatient stays at psychiatric hospitals, rehab hospitals, children's hospitals, and long-term care facilities were eliminated. Only inpatient stays where the member lived inside Tennessee or a surrounding county (n = 48,405) were retained.

For all distance calculations, the research calculated Euclidean (i.e., straight-line) distance values. Previous work in this area has shown a significantly high correlation between Euclidean distance and drive-time distances within Tennessee and associated inpatient stay data (Jones SG, Ashby AJ, Momin SR, Naidoo A. Spatial Implications Associated with using Euclidean Measurements and Zip Code Centroid Geoimputation Methods in Healthcare Research. 2010. Health Services Research, 45(1):316-327). Distances were calculated from each member to their closest facility, as well as to their admitting facility (note: in some cases, these facilities were the same). If the member's inpatient stay was at a location other than their closest facility, this member was defined as "migrating." Members closest to a rural facility were defined as rural members. Note that distance calculations accounted for the curvature of the earth where:

Distance = 3956 * (2 * arsin(min(1, sqrt((sin(((member_latitude – facility_latitude) * constant('pi')/180)/2)**2) + ((cos(facility_latitude * constant('pi')/180)) * (cos(member_latitude * constant('pi')/180)) * (sin(((member_longitude – facility_longitude) * constant('pi')/180)/2)**2))))))

To determine if migrations were voluntary, the reason for the member's stay was evaluated via the Diagnosis Related Group coding system. Using four years of prior inpatient claims data (2005-2008) from BlueCross BlueShield of Tennessee, DRGs were evaluated for all inpatient stays for all facilities in order to build a reference table. This reference table contained information on all the DRGs that were performed at the facility in question during the look-back period. The assumption was that if a DRG previously occurred at a facility, then this facility is capable of performing the service. If a member migrated beyond their nearby facility and the admitting DRG had been previously performed at their nearby facility, then this stay was defined as a "voluntary migration." This means the patient willingly chose services elsewhere, even though those services could have been performed locally. Frequency tables were constructed in SAS® statistical analysis software to examine the percentage of voluntary and involuntary migrations for rural and non-rural members. Confidence limits (95%) were also constructed though not reported in this brief.

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