DETERMINING THE NEED
FOR NURSING HOME BEDS

by

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ABSTRACT

The increasing costs of health care and the expansion of the nursing home industry have contributed to the growing attention given to nursing homes. This thesis surveys the present methods used in determining the need for nursing home beds and suggests improvements in this planning methodology.

The presently used determining need methodologies are reviewed and critiqued. Considerations often overlooked in determining need are discussed. Specifically, the concept that the supply of beds will create demand is analyzed and is found to be unconfirmed by United States and Massachusetts data.

THESIS SUPERVISOR: Thomas R. Willemain
TITLE: Assistant Professor of Urban Studies
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Dedication

To my Grandmother.
Chapter 1: Nursing Homes - Part of the Health Care System

1.0 Overview

The rapid expansion of the nursing home industry, coupled with the rising costs of health care, has brought attention to nursing homes. Methods of determining the need for nursing home beds grow in importance as more and more states adopt regulatory measures to control the growth of health care facilities.

This thesis will review the methods of determining need for nursing homes currently in use. Each approach to estimating bed requirements has certain underlying assumptions and differing viewpoints of what must be considered to successfully determine how many beds are required. Some considerations that the current methods overlook, such as the level of inappropriate use of nursing homes, and the relationship between nursing homes, hospitals, and home health services, are presented. The assumption that planning should be based on projected need, since it is widely held that supply creates demand, is analyzed in detail. The thesis concludes with a series of policy recommendations.

1.1 Rising Costs and the Expansion of Nursing Homes

During the fiscal year 1972, the United States spent $83.4 billion, 7.6% of the GNP, on health care. The number of skilled nursing home beds increased from 150,000 to 650,000
nationwide between 1950 and 1970;\(^2\) intermediate care and related nursing facilities provided an additional 400,000 beds in 1970.\(^3\) In Massachusetts, in 1973, there were 49,471 nursing home beds compared with 29,201 acute general hospital beds.\(^4\)

U.S. expenditures on the nursing home industry have increased from $142 million to $2.84 billion between 1950 and 1969,\(^5\) an increase of 1902%. Nursing homes comprised over 42% of all Massachusetts Department of Public Welfare expenditures in medical assistance programs\(^6\) in 1973. Nationwide, Medicaid financed 50% of all nursing home residents in 1973, while Medicare financed only 4% of nursing home care.\(^7\) This difference is reflected in Medicaid's 1973 expenditures on nursing home care which totaled $1.9 billion, compared to about one tenth as much ($206 million) from Medicaid.\(^8\)

1.2 Certification of Need (C/N)

The ever rising costs for health care necessitated intervention. Certificate of Need (C/N) legislation has been one response by states to regulate the growth of the health care sector. C/N, first adopted in New York in 1965, was an attempt to put "teeth" into planning: a C/N is required from the state for the addition to or new construction of a health facility or change in service. This is a regulatory measure added to the planning process. Presently, 24 states have adopted some form of C/N.\(^9\) Although the C/N programs vary by
state, the goal behind C/N is to control the costs of care by regulating the capacity and the distribution of facilities. Thus, cost containment has been one main reason for C/N.

1.3 Survey of the Development of Health Planning

The Hill-Burton Hospital Construction Act, adopted in 1946, appropriated federal funds for construction and renovation of hospitals. This formula was flawed, as we shall examine in Chapter 2; however, the concept of determining need was instituted.

In an effort to provide patients at the regional level with the latest advances in diagnosing and treating heart disease, cancer, stroke, and related diseases, the federal government established the Regional Medical Programs (RMP) in 1965. RMP had some difficulties. First of all, it was developed through a categorical approach to each disease. Second, it was never clear if its goal was to upgrade the existing health care delivery system or to change it. Finally, RMP could do no more than encourage voluntary efforts for cooperative arrangements between institutions.

The Partnership for Health Act of 1966 was an attempt to integrate comprehensive planning with the programs for health care. State Comprehensive Health Planning (CHP) agencies, known as "A" agencies, and local "B" agencies were promoted. The governing boards of these CHP agencies had to consist of a majority of consumers. However, CHP failed, revealing deficiencies in the Partnership for Health Act.
Reasons for failure included: (1) financing the Local B agencies; (2) the absence of incentives, with persuasion as the only means of influence; (3) coping with the mandate to improve the health system without interfering with current practice; (4) and the primitive state of planning methodologies.¹², ¹³ Such planning efforts and the resulting avoidance of action has been termed "paper planning."¹⁴

A 1972 amendment to the Social Security Act, Section 1122, instituted the C/N concept at the federal level allowing the Department of Health, Education, and Welfare to deny interest and depreciation payments to hospitals by Medicare and Medicaid if the state has not approved the construction of the bed facilities. If a state adopted Section 1122, more federal funds became available to the A and B agencies. Since 1972, thirty seven states have adopted Section 1122.¹⁵ These payments cover only about 6% of the average cost of a construction project, and therefore do not necessarily stop unapproved construction.¹⁶ However, a study for HEW on the impact of Section 1122 indicates that it has accelerated the development of the process of regulating facility construction in 20 states.¹⁷

On January 4, 1975, the National Health Planning and Resource Development Act was signed into law, merging CHP, RMP, and the Hill-Burton Hospital Construction program. One billion dollars has been authorized to establish a national
network of area wide and state health planning agencies. The state agencies are designated by the Governors and do not have to be the State's Health Department. The state agencies are now required to review at least every five years the "appropriateness" of health services provided by institutions in the state. The area wide agencies would determine the appropriateness and send their recommendations to the state agency. Originally, the bill read "need" rather than "appropriateness" of institutional health services, but the American Hospital Association (AHA) argued for the change on the grounds that the original wording jeopardized the ability to borrow funds in the private money market if a hospital could be declared "unneeded". The AHA also had a paragraph deleted, the paragraph stating that an area side agency was required to "work for the improvement or elimination" of an institution once it had been declared inappropriate. The National Health Planning and Resource Development Act requires states to adopt C/N laws that compel area wide agencies to recommend action and the state agency to rule on this recommendation.

1.4 Problems with C/N and Regulation

Since all states must now adopt C/N laws, we should be aware of some of the problems resulting from regulation in the health care system. Clark Havighurst has explored some of these problems. C/N bolsters a monopoly and has institutionalized two cartel practices. One cartel practice is output
restrictions and the other, market division. Note that since 1968, the AHA has been a proponent of C/N. As an alternative to C/N, financial incentives through rate setting have been proposed. This system, however, provides for controlling only the use of the facility - after capital has already been invested in it - instead of the existence of the building itself.

1.5 Other Problems with C/N

C/N has other drawbacks besides regulatory problems. C/N is reactionary in that it lacks the power to initiate action where needed, and can respond only to proposals brought before it. C/N is dealing with an open system of resource allocation: controlling the upper limit of beds in one area by denying a C/N does not necessarily result in reallocation of financial resources to a needed area or type of service. The merger of regulation and planning roles has taken its toll. It is ironic that planners seek regulatory roles even though regulation appears to weaken planning efforts. This weakening is due to a steady number of C/N applications that demand prompt review, comment, and action, and therefore receive higher priority than developing a master plan. Limited resources are generally allocated to regulatory functions. Another problem is that a local plan may run counter to the intentions of the B agency's supporters. The C/N program also assumes that there is an accepted methodology for determining
need and for developing plans. Methodologies often lead to controversy and criticism based on their inherent assumptions. Because the planning criteria used in the regulatory process are never fully developed, the combination of planning and regulation seems to undermine the planning effort, and erode the credibility and power of the entire process.

1.6 **Necessity for "Determining Need"**

Criteria that define need must be developed in order that regulation consistently be rational and coherent. Since C/N is based on the ability to determine shortages or excesses of health care facilities and services, increased attention is being focused on methodologies used in determining need -- the foundation of the C/N process.

1.7 **Thesis Content**

The methodologies presently used in determining need will be reviewed in Chapter 2 with emphasis on determining the need for nursing homes. Chapter 3 explores some considerations that are generally neglected by current approaches to estimating nursing home bed requirements. The concept of progressive patient care is introduced and the history of the different levels of nursing care in Massachusetts is presented. The role of the Massachusetts Rate Setting Commission is then reviewed in regard to nursing home rates and utilization. The misutilization of nursing homes as documented in
the literature as well as the results of Massachusetts's Periodic Medical Review will then be explored in the context of the relationship between hospital discharges and nursing home admissions. A recent study of the days spent waiting in a hospital for a nursing home bed will be reviewed, and a mathematical model is introduced to help illustrate the relationship between nursing homes and hospitals. A discussion follows of the difference between the number of beds physically present and the number of beds actually available for a given patient. The consideration of home health care as an alternative to nursing home care will then be discussed. Chapter 3 will conclude with a review of a study on the impact of home care and an extended care facility.

Chapter 4 will examine the Roemer-Feldstein hypothesis, that the supply of beds creates demand. The question at hand is whether this concept applies to nursing home beds. The thesis results will be summarized and policy recommendations offered in Chapter 5.
References

1. B. Cooper and N. Worthington, National Health Expenditures 1929-72, SSA, DHEW No. 73-11700, p. 1.


3. Ibid.


5. Levey et al., p. 67.


8. Ibid.


17. Ibid.

18. Ibid.

Chapter 2: Current Methodologies for Determining Need

2.0 Introduction

As the adoption of C/N continues, the development of approaches to determining need increases in importance. A report to the U.S. Bureau of Health Services Research cites the development of the definition and measurement of need as essential.\(^1\)

2.1 Demand vs. Need

The question that arises is whether regulations and standards should be based on demand or need. The demand, which is the amount of care actually consumed, is influenced by the patient's sex, age, educational background, income, race, ethnicity, and other such demographic characteristics.\(^2\) Demand is also a function of the physician's pattern of practice, payment arrangements, and availability of services.\(^3\)

An alternative to planning for demand is to plan for need, the amount of care professionals believe to be necessary. Demand may be less than need when individuals disagree with expert opinion. Religious convictions may lower the incidence of blood transfusions or abortions. In the case of nursing home care, the findings of one study show that compared with non-married people, a higher percentage of married people who "needed" nursing home care were not in nursing homes.\(^4\) In other words the demand was less than the need.
Demand may also exceed need, as with well baby visits or annual check ups for healthy teenagers. The same nursing home study cited above also found that non-married people made up a higher proportion of inappropriately placed nursing home patients than did married folks (The results of this study will be explored further in Chapter 3). That is, some patients needed less care than that demanded by an appropriately placed nursing home patient.

Need can identify services demand overlooks. However, there may always be a gap between needed services and demanded services, even with insurance setting prices to zero. The low level of attention to need and its determination is reflected by the present methodologies. "In spite of the economist's uneasiness about it, a considerable demand exists for the concept of need."  

2.2 Hill-Burton Methodology

Putting the theoretical discussions aside, let us now turn to some presently used methods of determining need for facilities. Since Hill-Burton was the first government intervention that established standards for hospital bed requirements, it is a widely used approach for both hospital and nursing home bed determination. Originally Hill-Burton, in 1946, used a formula based on bed/population ratios as a function of state density as found in Table 2.1.
Table 2.1
Hill-Burton Bed/Population Ratios

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<th>Population Density of State (persons/square mile)</th>
<th>Number of Beds/1000 Population</th>
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<tr>
<td>More than 12</td>
<td>2.5 - 4.5</td>
</tr>
<tr>
<td>6 - 12</td>
<td>3 - 5</td>
</tr>
<tr>
<td>Less than 6</td>
<td>3.5 - 5.5</td>
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Hill-Burton was amended in 1962, at which time the following formula for determining bed need was adopted:

\[
\text{Beds Needed in 5 Years} = \frac{\text{TPD}}{365} \times \frac{1}{0.85} \times \frac{\text{EP}}{\text{Pop.}}
\]

TPD = Total Patient Days in region in current year
Pop. = Population in region in current year
EP = Estimated Population in region in 5 years
0.85 = Proposed occupancy rate

The advantages of this new formula over the bed/population rations include the use of an efficiency standard and relating historic demand to future estimates. However, there are some drawbacks with this approach. One disadvantage is that patient days are used regardless of patient origin, thereby establishing a positive feedback loop for existing institutions that are used due to the lack of other facilities. This formula
is static in that it does not reveal trends. With increasing use the formula underestimates demand, with decreasing use the demand is overstated. There is no differentiation between services such as pediatrics, obstetrics, medicine, or surgery all of which have different occupancy rates. It is assumed that there will be no change in the pattern of use or the methods of health care delivery. Such changes might include the increasing use of HMOs or the instituting of National Health Insurance. The current level of use is assumed to be optimal. Geographic distributions of the various institutions within the state as well as the resulting travel times are neglected. In addition, there is no consideration of any religious or ethnic affiliation with the institution or the quality of care offered. Finally, the variability of admissions is not taken into account.\textsuperscript{9, 10}

Often overlooked is the size of the population being served. As the population increases, variability decreases. Through centralization, fewer beds are required to match specified probabilities of meeting demands, while the occupancy rates will increase.\textsuperscript{9, 10} Hence a tradeoff results between increased efficiency or accessibility.

2.3 Massachusetts's C/N for Nursing Homes

Massachusetts takes a slightly different approach to planning for nursing homes as shown by the standards established and adopted by the Public Health Council. It was
decided in March, 1974, that the number of beds in the state should be frozen. Unless the region from which a C/N proposal originates is below the state mandated average, the proposal is generally turned down. By limiting the construction of more beds, one hopefully can control further utilization and costs. The idea behind this is that no more nursing home beds are necessary, and that it is the further development of alternative services such as home health services that is lacking. Turning down nursing home C/N proposals might lead to the provision of alternative services. This strategy is in part based on the Roemer-Felstein hypothesis which states that the supply of hospital beds creates demand. However, it is not clear that this hypothesis applies to nursing homes. (This will be explored further in Chapter 4.) By limiting the number of beds the utilization of facilities may be limited: however, the appropriate as well as the inappropriate use of facilities may be limited. Therefore, there seems to be a need for controlling the appropriate usage through utilization review. This contention is discussed further in Chapter 3.

2.4 North Dakota's Modified Hill-Burton Formula

North Dakota has adopted the Hill-Burton formula with some modifications for nursing homes. It has been estimated that 90% of the aged population can live at home with suitable assistance. Therefore the total aged population potentially
institutionalized is calculated by taking 10% of the population 65 years of age and over. Nationally, there are 52 nursing home residents/1000 aged population. Taking this into account, the potentially institutionalized population is then multiplied by .53 to determine the population needing nursing care. A usage rate is then applied in arriving at the expected average daily census. The average daily census is divided by an occupancy rate to calculate the long term bed need. In attempting to plan specifically for nursing homes, the North Dakota formula has inherited the same problems that plagued its progenitor, the Hill-Burton formula.

2.5 Decision Analysis

Recently the analytic tool for decision making under uncertainty, "decision analysis", has been applied to determining the number of hospital beds needed, but not yet applied to determining nursing home bed need. Decision analysis makes use of utility theory in attempting to incorporate into a single decision making criterion the benefits and costs, or the utility, resulting from meeting, underestimating, or overestimating the bed need.

In reviewing the few cases using decision analysis to date, it appears more development is necessary in measuring the utility of the various outcomes. In the Grimes paper no utility is actually computed. The Kuskey work is theoretically more useful as the future bed limit is calculated
as a function of the future bed demand, approximated by a probability density function, and then optimizing the utility function, measured by the relative importance of bed surpluses compared to deficits. As a tool useful in assessing the effects of determining a specific bed level or need, decision analysis is a welcome addition to the methodologies used in determining need. However, more work on developing suitable utility functions is needed before the full value of decision analysis will be reached.

2.6 Summary

Current methods for determining the need for nursing home beds are far less sophisticated than those used for hospital beds; Massachusetts's standards being represented by bed/population ratios. The use of decision analysis has yet to be applied to nursing home bed need and a suitable utility function expressing the effects of underestimating as well as overestimating the bed level has yet to be developed. All of the methods for determining need overlook the relationships between other types of facilities.
References


5. Ibid.


13. R. Grimes et al., "Use of Decision Theory in Regional Planning", Health Services Research, Spring 1974, pp. 73 - 78.
Chapter 3: Considerations in Determining Bed Need

3.0 Overview

An implicit goal of the health care system is to meet the needs of the individual patients. In Massachusetts, nursing homes offer three levels of care in an attempt to match a continuum of needs. This chapter begins by tracing the development of the different levels of nursing care in Massachusetts. The process the Massachusetts Rate Setting Commission uses in setting the nursing home rates and the role it plays in establishing current utilization patterns and occupancy rates is then explored.

In determining the need for nursing home beds one assumption often made is that appropriate use will be made of the beds. Methodologies reflecting past utilization rates reflect only the use of the beds and not the appropriateness of the usage. Nevertheless, the appropriate utilization of beds should be an important factor in determining need.

The medical care literature provides us with a few documented studies of the misutilization of nursing homes. In reviewing these studies, one questions just how "appropriate" use is assessed. In the studies reviewed in this chapter, the criteria for appropriate usage are based on medical or clinical need. It should be recognized that although a patient's clinical need or appropriate level of care may call for a lower level of nursing, the lack of alternatives may
make one's placement systemically appropriate due to the constraints of the system.

One result of the inappropriate usage of nursing homes is to make it more difficult for appropriate patients to get into nursing homes. The Massachusetts Department of Public Health (M.D.P.H.) has recently documented the days spent in a hospital by patients who were ready and waiting for placement in a nursing home. In this chapter, we will review this study and further examine the relationship between nursing homes and hospitals with the aid of a simple mathematical model of patient movement between a hospital and a nursing home. This chapter follows with a discussion on the difference between the number of beds physically present and the smaller number of beds effectively available to any given patient. The consideration of home health services as an alternative to nursing home care is then examined. Finally, the chapter concludes with a study of the impact one program of home health services and extended care had on hospital utilization.

3.1 The Development of Different Levels of Nursing Care in Massachusetts

Massachusetts's nursing homes currently operate within a system which offers three levels of nursing care. Progressive patient care is a means of reducing the costs of health care by providing a system using less costly facilities and
few skilled personnel in appropriate situations. The multiple levels of nursing care reflect this concept of progressive patient care. However, a multi-level tier system did not always exist.

Levey et al.\(^1\) briefly reviewed the development of the nursing home industry in Massachusetts. In 1963, Massachusetts's public assistance patients in nursing homes all had their nursing home stay paid at the same rate, which was $6.85 per diem. By paying different rates for more services or hours of nursing it was hoped that the quality of care would improve. In 1964 a two-tier system was adopted, with institutions providing at least two hours of nursing per patient per day receiving a rate increase from $6.35 to $7.16. This distinction was only temporary, as one year later in 1965 there was a single fixed rate of $7.71. It had been found that with the 31 cent differential in rates, it often did not make sense financially for large institutions to incur the additional expenses of qualifying for the higher rate.

Following the enactment of Medicare, a five level system was instituted in 1966, which was based on evidence of the quality of the care, records, and physical plant. With a limited number of inspectors, more than 1 out of 7 nursing homes were operating with violations, some of which were serious. In 1968 a cost-plus reimbursement scheme was adopted, following Medicare's promulgated method. By 1969
the idea of a classification system was abandoned. There were newspaper reports that the nursing homes were reaping huge profits under the cost-plus reimbursement formula. At the same time the Massachusetts Federation of Nursing Homes claimed that the state owed the industry over $40 million in back payments.

With only one level of care and the same fee covering all patients, regardless of their condition or nursing care requirements, patients requiring extensive care became undesirable. Dr. David Kinloch, the Director of the Division of Medical Care for the Massachusetts Department of Public Health between 1967 and 1971, proposed the idea for the present three level care system. The idea was to base reimbursements on the patients' need for specific levels of care. It was hoped that payment based upon need for care would produce an incentive to admit patients in need of extensive care.

At the public Health Council meeting discussing the proposal, the Massachusetts Federation of Nursing Homes strongly opposed it. They claimed such a system would increase the costs since many facilities would have to employ more qualified personnel and specialized staff such as therapists, social workers, and the like. The Department of Public Health replied that although some rates might rise, costs overall would decrease. It was estimated that no more
than 37% of the patients would be in the most costly skilled nursing homes and 40% of the patients would appropriately belong in the cheaper rest homes. In 1973, 27% of nursing home patients were in skilled nursing homes, however only 15% of the patients were in rest homes.

It is important to understand just how the three levels of care differ. Skilled nursing homes, known as Level I for Medicare reimbursement and Level II for Medicaid reimbursement, provide skilled nursing care and related services and/or rehabilitative therapy for those patients requiring such care. Intermediate nursing care homes, Level III homes, provide health related care and services to patients who do not require the degree of care and treatment which a hospital or skilled nursing facility is designed to provide, but who do require care and services above the level of room and board. Resting homes, Level IV homes, provide residential services to patients who do not routinely require nursing care. Skilled nursing homes are required to provide a minimum of two hours of nursing care per patient per day. However, the Rate Setting Commission (RSC) will not cover the costs of providing more than the maximum allowable 3.6 hours of nursing care per patient per day. Level III homes are required to provide 1.5 hours of nursing care per patient per day, but the RSC will disallow costs resulting from more than 2 hours of care per patient per day. As rest homes largely
provide room and board, only 4 hours per month of nursing care per patient is allowable by RSC. The rates established by the Rate Setting Commission apply only to Medicaid patients.

3.2 The Massachusetts Rate Setting Commission (RSC)

The Massachusetts RSC is empowered to set prospective rates, but it has not yet done so, although this is currently under discussion. An audit is annually conducted on every nursing home in the state. On the results of this audit a final per diem rate is arrived at for that past year. An interim rate is used for the current year based on the prior year's final rate plus a cost of living increase. For example, the 1973 final per diem rate is used to calculate the 1974 interim rate by multiplying by a cost of living factor. When the 1974 audit is complete a final rate is established and the differential between the interim and final rates is then billed for.

To gain further insight into the rate setting process, let us briefly examine how the final per diem rate is set.

The Final Per Diem Rate Computation sheets used by the RSC are exhibited in the Appendix. The final per diem rate is the sum of the per diem cost of operations, administrative planning allowance, and return on equity capital.

The cost of operations is the sum of total operating costs minus adjustments or disallowable costs. Excess nursing
costs and excess variable costs (room and board) are two examples of adjustments made in the total operating costs. Not only are minimum and maximum allowable nursing care hours established, but maximum allowable nursing costs are also calculated.

Nursing costs can be controlled through staffing patterns and mixes of licensed (R.N.s and L.P.N.s) nurses and aides. Skilled nursing homes are allowed up to $12.40/patient/day, intermediate care homes are allowed $6.75/patient/day unless there are over 60 beds in which case the Level III homes are allowed $7.55. The rationale being that with over 60 beds a Director of Nursing is required. The rest homes under 16 beds are allowed $2.54/patient/day and $3.04 if there are 16 or more beds.

The variable costs or room and board expenditures also have ceilings on allowable costs, which are higher for multi-level facilities than for free standing or single level facilities. Table 3.1 summarizes the maximum allowable variable costs.

<table>
<thead>
<tr>
<th></th>
<th>Multi-Level</th>
<th>Free-Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled Nursing Homes</td>
<td>$11.59</td>
<td>$11.34</td>
</tr>
<tr>
<td>Intermediate Nursing Homes</td>
<td>$8.72</td>
<td>$8.47</td>
</tr>
<tr>
<td>Rest Homes</td>
<td>$6.39</td>
<td>$6.27</td>
</tr>
</tbody>
</table>
The net operating costs or the total operating costs less the adjustments are then divided by the patient days to give the per diem cost of operations. The patient days are calculated by multiplying the licensed bed capacity by 365 and multiplying this by the actual occupancy rate or the mandated occupancy rate, now set at 90%, whichever occupancy rate is greater.

The administration/policy-planning allowance is a function of the size of the facility. The larger the nursing home, the higher the allowable administrative salary and allowance. This again is calculated on a per diem basis.

Any equity capital invested is allowed a 9.2% return and the per diem return is calculated. The per diem costs of operation, administration, and return on equity are summed to reach the final per diem rate.

In a study for the Massachusetts Department of Public Health by Beattie and Jordan, the authors claimed that the rate structure discourages nursing homes from admitting Medicaid patients after reaching the mandated minimum occupancy rate. In fact, RSC is considering raising the minimum occupancy rate to 93% to encourage the further admittance of Medicaid patients. However, a further analysis of this point raises some questions of the Beattie and Jordan statement. The per diem rate is figured on the basis of patient days without regard to the number of Medicaid patients or any
other type of patient. It is important to keep in mind that a nursing home can charge a private patient more at any time, regardless of the occupancy rate. As long as the maximum allowable costs are not yet reached, the extra costs of one more patient of any type at any time regardless of occupancy rate (if costs do in fact increase) can be passed on as an increase in the per diem rate. Under such conditions, there does not seem to be any reason for differentiating between the type of patient to be admitted as a function of occupancy rate. If costs remain constant with one more patient, the per diem rate will then decrease, but then again the costs/patient are decreasing. Finally, even if the additional costs of one more patient cannot be passed on, having reached the maximum allowable costs, the nursing home may still be better off admitting the extra patient if the fixed cost loss of an empty bed is greater than the loss from the additional costs that cannot be passed on.

3.3 Nursing Home Misutilization as Found in the Literature

Despite the establishment of different rates for the varying levels of care, there still remains the desire to accept those patients that will require the least amount of care. This section will review a few documented studies of the misutilization of nursing homes.

Berg et al. ⁶ surveyed by sample, the needs of those 65 years of age and over in Monroe County, New York. The
appropriate placement was judged on the basis of the type and amount of health care services required by the patient. The findings point to the misplacement of many aged persons in facilities providing a higher and more costly level of care than required and the need for more congregate living and home care services in general.

Specifically, 19% of the aged patients in nursing homes were inappropriately placed, while an additional 14% of those in homes for the aged, 25% in the Monroe County Home, and 59% in boarding homes and homes for adults were misplaced. The appropriateness of the placement varied with the age group, as those 65 - 69, 70 - 79, 80 - 89, and 90 and over, each revealed an increasing percentage of appropriate placement. Women receiving too high a level of care accounted for most of the misplacement in nursing homes. Social class varied directly with appropriate placement. The higher the social class, the higher the level of appropriate placement.

Characteristics associated with those unmet needs, or that should be in a nursing home, are increasing age and decreasing social class. Men with unmet needs were mainly lacking physical care while women were about equally divided between needing physical care and supervision for mental impairment. Berg et al. found that 90% of the aged population can live at home with suitable assistance.
The bed need arrived at in Berg's study amounted to 30 beds/1000 aged population, nursing homes, and 59 beds/1000 aged population, in homes for the aged. The average bed/population ratio for the state of New York is 29.3 beds/1000 aged population for nursing care homes and 41.1 beds/1000 aged population for nursing care and related homes. These figures are below the United States averages of 44.6 beds/1000 aged population for nursing care homes and 58.4 beds/1000 aged population for nursing care and related homes. In Massachusetts, these figures are well above the United States average at 61.3 beds/1000 aged population, for nursing care homes, and 77.3 beds/1000 aged population, for nursing care and related homes. 7

A study in the Netherlands suggested 153 beds/1000 aged population in homes for the elderly and 34 beds/1000 in nursing care homes. 8 A Nuffield Trust study in Great Britain concluded that 95% of the aged population can live at home with suitable assistance. 9

Davis and Gibbon 10 surveyed by sample the use, misuse, and non-use of nursing homes in six counties in western New York: 26.8% of those in nursing homes were found to be at a higher level of care than necessary. There was no difference by sex in the levels of appropriate placement in nursing homes; however, appropriate placement did increase with advancing age. A higher percentage of married people were
appropriately placed, as were people from rural environments. 

Fourteen percent of those in hospitals or at home should have been in a nursing home. There was a higher percentage of married people than non-married people who should have been in nursing homes and were not. The rural or urban location made no difference in terms of the number of people with unmet nursing care need, however people from rural areas tended to remain at home while those from urban areas tended to be in general hospitals.

These results imply there is some choice or preference expressed in seeking nursing home care or there is a lack of available alternatives. Davis and Gibbon suggest inappropriately placed people seek companionship and assistance with routine daily maintenance, rather than the skilled nursing care. They offer an environmental or sociological explanation for the different utilization patterns of those from rural and urban settings. The impersonal urban environment may provide fewer resources for the needs and attention of elderly. This is in contrast with the closer communal or familial ties associated with the rural setting. Thus when someone from the rural location seeks nursing home care, he is more likely to appropriately need that level of care. There is an additional explanation for the differences in nursing home usage by married and non-married people. A larger number of non-married people in nursing homes could explain the larger number of non-married people
inappropriately placed. With a larger number of non-married people in nursing homes one might then expect to find a smaller proportion of non-married people needing placement in a nursing home.

A recent article in the *American Journal of Public Health* on the nursing home industry in Massachusetts, cites a patient care survey by the M.D.P.H. estimating that 1/3 of the patients in Massachusetts nursing homes require little if any of the nursing home services.

3.4 **Periodic Medical Review**

The Division of Health Care Standards of the M.D.P.H. conducts a Periodic Medical Review of nursing home patients in Level II (Medicaid - skilled nursing) facilities, under contract from the Massachusetts Department of Public Welfare. The results of the Periodic Medical Review (PMR) are expressed in terms of the number of patients recommended for transfer to a lower level of care. Between December, 1972 and December, 1974, it was found that 26% of the 3,291 patients reviewed in 119 Level II facilities were recommended for transfer to a lower level of care. Of the 399 patients reviewed in 11 Level II facilities in January, 1975, 25% were recommended for transfer to a lower level. In February, 1975, 343 patients were reviewed in 9 Level II facilities and 23% were recommended for transfer to a lower level of care.
Overall, 25.7% of the 4,033 patients in 139 facilities were recommended for transfer to a lower level of care. It should be recognized that the 25.7% of the patients recommended for transfer is not the number actually transferred. An estimated $\frac{1}{3}$ of those recommended for transfer were eventually transferred. The reason cited as preventing most transfers is that of expected "transfer shock" resulting from movement to another institution and a new environment. This increases the value of multi-level facilities, in which patients can be internally transferred to lower levels of care with less risk of transfer shock.

3.5 **Hospital Waiting Time Study**

Beattie and Jordan\textsuperscript{5} of the M.D.P.H. recently conducted a study examining the factors contributing to queues of hospital patients medically ready for discharge and awaiting placement in a nursing home. A one day survey was used to collect data on the individual patients waiting for placement in nursing homes and the number of nursing home beds available that day. A follow-up survey six weeks later was conducted to provide further information on placement patterns.

There were 2,021 patients awaiting placement on the day of the survey and they accounted for 112,000 days of hospitalization during a four month period. The days spent waiting are underestimated because some of the patients were already waiting for placement prior to the survey and some
continued to wait for placement after the follow-up study. During the six week follow-up period 41% of the patients were placed, 45% remained waiting, and 14% died, went home, or were no longer ready for nursing home placement. The average waiting time for all patients was 55 days. There were many more patients (771) waiting for placement than there were available beds (41) for Level I/II care. Although the number of beds exceeded the number of patients waiting for placement in Level III and IV beds, it was estimated that only 12%, 6% and 1% of the available beds would be filled each day in Levels I/II, III, and IV. An inverse relationship between the number of available beds and waiting time was found. This is explored later in the chapter.

Medicaid was the source of payment for 48% of the patients. For the patients in acute general hospitals, those with Medicaid financing had a longer wait (36 days) than non-Medicaid patients (22 days). Medicare patients had the shortest mean waiting time and the highest percentage of all those placed, categorized by source of payment. The source of payment and the level of care sought both had an effect on the waiting time for placement in a nursing home.

3.6 A Simple Mathematical Model of Nursing Home Placement

Beattie and Jordan report in their findings that waiting time appeared to be a function of the number of available beds. This inverse relationship is an established fact in
Willemain\textsuperscript{13} has devised a three state nursing home Markov model that enables us to further explore the relationships between hospital discharge and nursing home placement. The model assumes that the population must be in one of three states: (1) a nursing home; (2) an acute general hospital receiving hospital care; or (3) an acute general hospital waiting for placement in a nursing home.

The number of hospital beds is assumed to be infinite, thus it is the number of nursing home beds that is the limiting factor. The four variables in the model are: (1) the number of nursing home beds; (2) the total patient population (always assumed to be greater than the number of beds); (3) the average length of stay in the nursing home; and (4) the average length of stay in the hospital receiving care.
The results of this model confirm that as the number of nursing home beds increases, the number of patients medically ready for discharge and waiting for placement in a nursing home decreases. The average number of days spent waiting in a hospital decreases too. In Figure 3-1, the decreasing percentage of the hospital census medically ready for discharge is plotted against increasing nursing home beds. Figure 3-2 illustrates the decreasing number of hospital days spent awaiting nursing home placement plotted against increasing nursing home beds. As might be expected, with an increasing number of nursing home beds and therefore more nursing home patients in the system, the average daily cost/patient in the system should decrease. The following cost function: 

\[ C_H (1-S) + C_{NH}(S) \]

with \( S \) = probability of being in a nursing home, \( C_H \) = daily hospital charges valued at $100, and \( C_{NH} \) = daily nursing home charges valued at $20 is plotted in Figure 3-3. The model's results illustrated in Figure 3-3, confirm that the average daily cost per patient in the system decreases with increasing nursing home beds. In each figure, the curves flatten out at 950 beds. This is because at this point the nursing home beds are no longer the limiting factor. There will always be some patients in the hospital regardless of the number of nursing home beds. Therefore, there are no further savings resulting from lower average daily costs/patient if there are more than 950 beds.
Figure 3-1. % Hospital Census Medically Ready For Discharge vs. # Nursing Home Beds
Figure 3-2. Average Delay in Days Spent Awaiting Nursing Home Placement vs #Nursing Home Beds

Patient Population: 1000

Average Delay in Days

#Nursing Home Beds

700 750 800 850 900 950 1000

-50 -50 -50
Figure 3-3. Average Daily Cost/Patient vs #Nursing Home Beds
in this system.

The use of the nursing home length of stay as a performance measure was then explored. Increasing the primary care available through more physician visits or the use of telemedicine systems might result in longer nursing home stays. The model was then used to explore the relationship between nursing home lengths of stay and the number of days spent in a hospital medically ready for discharge awaiting nursing home placement, another performance measure. With increased lengths of stay in the nursing home, longer delays to get into the nursing home would be expected. Figure 3-4 illustrates the resulting increasing hospital days spent awaiting nursing home placement plotted against increasing nursing home lengths of stay. The results indicate that there may be a tradeoff with a fixed supply of nursing home beds, between decreasing the days spent waiting in a hospital for a nursing home placement and increasing the length of stay in nursing homes. Therefore, the use of either index separately may not fully represent the performance of the entire system. The same cost function used earlier is plotted against the increasing nursing home lengths of stay in Figure 3-5. The results of the model indicate that the decreasing daily costs per patient in the system levels off rather rapidly, since the probability of being in a nursing home is so high to begin with.
Figure 3-4. Days Spent in Hospital Medically Ready For Discharge Awaiting Nursing Home Placement vs. Nursing Home Length of Stay
Figure 3-5 Average Daily Cost/Patient vs Nursing Home Length of Stay
This model, with all of its simplifications, serves two main purposes. First, the model helps illustrate some relationships between nursing homes and hospitals. Second, this model lays the groundwork for further models encompassing more states in the system. Additional states might include the home, death, and the nursing home beds differentiated by levels of care.

3.7 The Effective Number of Beds

One further assumption that was made in the preceding model was that if a nursing home bed was empty, it was available to all of the patients medically ready for discharge. The study by Beattie and Jordan found discrepancies between the number of licensed beds and the number of operating beds. Beds located in double rooms that were occupied by one patient paying private rates were the most frequently mentioned reason for beds not being in operation. The second most frequently cited reason was temporary remodeling. Besides the difference between the number of licensed and operating beds, the number of beds actually available differed as the study found that some empty operating beds were being reserved for specific patients.

The number of beds actually available is also a function of the patient's characteristics. The Beattie and Jordan study found that only 54% of the Level I/II beds were available for Medicaid patients. The percentage of beds
available to Medicaid patients rose in Level III facilities to 69%.

This evidence calls into question the practice of treating all beds equally. Beds should not be viewed as a scalar quantity, but rather as a vector or multi-dimensional quantity, reflecting the various restrictions on availability to patients.

3.8 The Development of Home Health Services

Much of the work with nursing homes has accepted a rather restricted or parochial view of the role of nursing homes and their interaction with the rest of the health care system. Besides the relationship between hospitals and nursing homes, home health services is one other alternative to nursing care that should be considered when determining the need for nursing home beds.

The development of hospital based home health services dates back to 1946 when Montefiore Hospital in New York City started its Home Care Program as a new approach to meeting the needs of the chronically ill homebound patient. Today a home health agency provides skilled nursing and other therapeutic or rehabilitative services for the patient and family. Skilled nursing personnel and physical, speech, and occupational therapists along with social workers, home health aides, and other specialists comprise the staffing of a typical Massachusetts home health agency.
Almost 80% of the cases that the Massachusetts Home Health Agencies work on, are the results of physical illness. However, the services provided included child care, supportive services, personal care, and homemaking. These services help to shorten the duration of institutional stay, delay or prevent re-institutionalization, promote self-care and maintenance, maintain family unity, and avoid absence from work or school of some other family member. 3

With the rising costs of institutional care, home care becomes financially attractive. Economics aside, Rossman stated that "it was conceded that it was heavily preferred by patients and their families." 4 Yet 29 years after home care services were introduced with such promise, there were only an estimated 2500 such agencies across the country in 1973. 7

3.9 Problems Faced by Home Health Agencies

While home health services may help accrue large savings in lieu of more expensive institutional care, there have been many obstacles in the way of the further expansion of home health care. First of all, reimbursable care by Medicare and Medicaid requires skilled nursing care. 14 It is rather apparent that many patients in nursing homes do not need skilled nursing; only 27% of all nursing home patients were in skilled nursing homes. 3 Therefore, the requirement that reimbursements cover only skilled nursing
severely restricts the growth of home health services. Other problems faced by home health agencies include the decreasing availability of primary care physicians, trends in medical education toward hospital based care, shortages in other skilled personnel, and the increasing hazards of home visits in some urban areas.\textsuperscript{14}

In an attempt to overcome some of the problems mentioned in the preceding section, the Home Care and Extended Services Department at Montefiore Hospital, where home health services first began, has proposed an alternative to home care.\textsuperscript{14} The "After Care Project" transports patients with similar therapy needs to the hospital. At the hospital, rehabilitative group therapy, access to doctors, nurses, a library, and other such services are available. More services are offered to meet the individual needs of the patient at the hospital than were available at home.

Reviewing the After Care Project, Rossman found that more patients could be served by eliminating the travelling time and making more efficient use of the skilled staff's time. Patients who had been in both programs favored the After Care over the Home Care Program as it enabled them to get out of their house and socialize. It is estimated that about half of the patients receiving home health services could be cared for by an After Care Project. The further
development of such programs, the expansion of the number of physician's assistants and allied manpower, and more liberal coverage of home health services will contribute to the increased use of home health care as an alternative to institutional care.

3.10 The Use of Home Care and Extended Care Facilities

The impacts on costs and hospital utilization of increasing the use of home health services and extended care facilities (ECF) is largely unknown, as the concept of progressive patient care has seldom been implemented. An experimental project was designed by the Kaiser-Permanente comprehensive prepaid group practice to provide home care and extended care facilities, in part of the hospital complex, to those under 65 years of age.\(^{15}\)

It was estimated that 53% of the ECF patients would have used additional acute hospital days if the ECF was not adjacent to the hospital. A specially trained aide served as the main member of the home care team providing physical and occupational therapy, social work, and nursing in the home. With the use of aides, only a limited number of highly trained professionals were needed.

During the project period there was a 16.6% reduction in the number of hospital patient days. The project ended when the ECF was converted for use as acute hospital beds. Although home care continued, the hospital utilization rate
returned to earlier levels when the ECF was closed. With rough cost estimates, it appeared that ECF and home care services were provided for the entire health plan at a smaller increase in cost than would have been expected from inflation during that time period.

This project was conducted with a pre-paid group practice which already had a history of low hospital utilization. Therefore, one might expect more dramatic results outside of such a health plan where the hospital utilization is higher. However, before generalizing these results one must realize that the pre-paid comprehensive nature of the health care delivery system and the patients in it are two factors to be reckoned with. In addition, the ECF was part of the hospital. The ECF census doubled due to the ease of transferring patients between the hospital and the ECF. With all of the conditions qualifying the Kaiser-Permanente results it appears the next step is to implement home care and an ECF within a hospital outside of a pre-paid group practice in an integrated manner.

3.11 Summary

This chapter traces the history of different levels of nursing care in Massachusetts, which presently has skilled, intermediate, and resting care levels. How nursing home rates are established by the Massachusetts Rate Setting Commission is then explained.
Reports that 25% of the nursing home patients do not require the level of care they are receiving is substantiated by the Massachusetts Periodic Medical Review and studies reported in the literature. A recent study of the days spent in a hospital awaiting nursing home placement points out the importance of considering other facilities and services in the health care system when making determinations of bed need. A mathematical model helps illustrate the relationship between nursing homes and hospitals and the tradeoff between increasing nursing home stays and increasing delays for nursing home placements. The concept of beds as a multi-dimensional quantity, describing its availability to specific types of patients, is introduced. Finally, the use, problems and potential of home health services as an alternative to nursing homes is explored.
References


4. Personal communications with Mr. John Lawlor, Massachusetts Rate Setting Commission, Spring 1975.


Chapter 4: The Roemer-Feldstein Hypothesis and Nursing Homes

4.0 Introduction

There is a five-fold variation among the states in the number of nursing home beds per 1000 population 65 years and over (aged population). West Virginia has 19.5 nursing home beds/1000 aged population, while Minnesota has 98.9 nursing home beds/1000 aged population.\(^1\) The Roemer-Feldstein hypothesis is probably one of the more widely accepted explanations given for the large variance in hospital use.\(^2\) The works of Milton Roemer\(^3\) and Martin Feldstein\(^4\) indicate that as the number of hospital beds in an area increases, the utilization rates increase. It is postulated that demand expands to meet the supply, a simplified version of Say's Law in economics.\(^5\) It is not clear that the Roemer-Feldstein hypothesis holds for nursing homes. Yet the Massachusetts C/N Program and Standards are predicated on the validity of the Roemer-Feldstein hypothesis.

4.1 Roemer's Work

In 1958, an upstate New York county was observed\(^6\) where there was no pressure for more hospital beds and the number of hospital beds were increased by 42% "over night". Controlling for population fluctuations, the number of hospital admissions, hospital lengths of stay, and the product of these two measures, total patient days, for the year preceding this change were examined. In the year
following the increase in hospital beds, the number of hospital admissions, the lengths of stay, and consequently the total patient days all increased. In fact, for Blue Cross patients where the hospital stay was covered by insurance, the increase in patient days of 38% corresponds rather closely with the 42% increase in beds. This study implied that demand may be endogenously related to supply. In 1961 on the basis of this work, Milton Roemer suggested that states should exercise control over the supply of beds that are built and put into use.

4.2 Feldstein's Work

In an economic study of the National Health Service of Great Britain, it was found that hospital use or demand is a function of bed supply. It was found that the demand for bed days rises proportionately with the available supply. Correlations between the number of beds/1000 population and bed demand as measured by the number of admissions, the number of admissions plus increased waiting list length, and the number of beds used resulted in correlation coefficients of .6508, .6556, and .8380, respectively. Feldstein states that the evidence does not indicate there is a level of supply at which the demand would be satiated. A fairly constant pattern of bed supply in Britain (almost 50% of the hospitals were more than 70 years old and no hospital construction had taken place for twenty five years)
had not adjusted itself to changing demand from population shifts. This constant bed supply, Feldstein claimed, allows one to state that supply affects demand.

4.3 Nursing Homes and the Roemer-Feldstein Hypothesis

An attempt was made to determine if the Roemer-Feldstein hypothesis held for nursing homes. To date, no previous work on this subject could be found in the literature. In Figures 4-1 (annotated) and 4-2, the number of nursing home residents/1000 aged population was plotted against the number of nursing home beds/1000 aged population, for each state. The use of nursing home residents as a measure of demand was adopted due to the lack of national data on the more commonly used indices such as admissions or lengths of stay in nursing homes by state. The number of nursing home residents refers to the number of residents in the nursing home at the time of the survey. There was a very high degree of correlation, correlation coefficient $r = .99$, between the number of nursing home residents/1000 aged population and the number of nursing home beds/1000 aged population, in the fifty states and Washington, D.C. Note that although the number of nursing home beds and nursing home residents are normalized per 1000 aged population, there is a constant occupancy rate of approximately 87.5%
49 Degrees of Freedom
r = .99 (Correlation Coefficient)
t = 49
p < .005

Figure 4-1. The Number of Nursing Home Residents/1000 aged pop., by state; 1971
The Number of Nursing Home Beds/1000 aged pop., by State; 1971

Source: Health Resources Statistics 1974
N.C.H.S. DH.EW pp 391-392
49 Degrees of Freedom

\[ r = 0.99 \text{ (correlation coefficient)} \]

\[ t = 49 \]

\[ p < 0.005 \]

**Fig 4-2.** The Number of Nursing Home Residents/1000 aged pop., vs
The Number of Nursing Home Beds/1000 aged pop. by State: 1971

Source: Health Resources Statistics 1974
N.C.H.S. DHHS p391-2
Figure 4-3 The 8 Regions in Massachusetts
Massachusetts data was similarly analyzed using nursing home beds/1000 aged population and nursing home patient days/1000 aged population by each of the eight regions established by the Commonwealth of Massachusetts, Executive Office for Administration and inance. Figure 4-3 illustrates the area that each region encompasses.

The Massachusetts data was analyzed for all nursing home beds and by each level of care: skilled nursing care beds, intermediate care beds, and resting home beds. Skilled nursing care homes provide skilled nursing care and related services and/or rehabilitative therapy for those patients requiring such care. Intermediate nursing care homes provide health related care and services to patients who do not require the degree of care and treatment which a hospital or skilled nursing facility is designed to provide, but who do require care and services above the level of room and board. Resting home care provides residential services to patients who do not routinely require nursing care. 8

All levels of care were found to substantiate the U.S. nursing home correlation results, although the eight regions' bed/population ratio varied by only a factor of 1.5. See Figures 4-4, 4-5, 4-6, and 4-7. All nursing home beds considered together resulted with a correlation coefficient of .875. (The significance of the correlations were
6 Degrees of Freedom

\[ r = 0.875 \]

\[ t = 4.431 \]

\[ p < 0.005 \]

Source: Health Data Annual 1974

Figure 4-4: Patient Days/1000 aged pop. vs.
Number of Nursing Home Beds/1000 aged pop. by Region
6 Degrees of Freedom
r = .9154
\( t = 5.571 \)
p < .005

Source: Health Data Annual 1974
Mass. Dept. of Public Health Vol. 1 No. 1

Figure 4-5. Patient Days/1000 aged pop vs Number of Skilled Nursing Home Beds/1000 aged pop By Region
6 Degrees of Freedom

r = .6592

\( t = 2.147 \)

\( p < .05 \)

Source: *Health Data Annual 1974*

Mass. Dept. of Public Health Vol. 1 No. 1

Figure 4-6. Patient Days/1000 aged pop. vs Number of Intermediate Care Beds/1000 aged pop. by Region
Figure 4-7. Patient Days/1000 aged pop vs. Number of Rest Home Beds/1000 aged pop by Region

Source: Health Data Annual 1974
Mass. Dept. of Public Health Vol. 1 No. 1

6 Degrees of Freedom
r = .8049
t = 3.323
p < .01
tested with one tailed tests.) Skilled nursing, intermediate nursing, and rest home beds each had correlation coefficients of .92, .66, and .81 respectively. The low correlation coefficient of .66 for intermediate care beds means that only 44% of the observed variation in patient days can be explained by the bed/population ratios. The scatter diagrams present thus far, all resemble the one plotted by Steven Moeller, relating hospital beds and hospital patient days in Figure 4-8.

The Roemer-Feldstein hypothesis is one explanation for the variation in bed/population ratios and the constant occupancy rate among the states in the U.S. and the regions in Massachusetts. An alternative explanation might be that demand is so great that no supply has been able to meet this demand.

An attempt was made to test the Roemer-Feldstein hypothesis. If one accepts the Roemer-Feldstein hypothesis, then the level of appropriate usage would be expected to decrease with increasing bed supply, as demand expanded to meet the supply. The most difficult problem in testing this hypothesis is the lack of good data and the elusive definition of appropriate or the measure of severity of the patient. Besides the results of the Periodic Medical Review (PMR) in Massachusetts, indirect measures of appropriate placement or the severity of the patient population were adopted. The
Figure 4-8. Moeller's Scatter Diagram Relating the hospital bed/population ratios to total hospital utilization, 1970.
Figure 4-9. Percentage of Inappropriately Placed Patients vs Number of Nursing Home Beds/1000 aged pop. by Region.

Source: Health Data Annual 1974
Mass Dept. of Public Health Vol. 1 No. 1
results of the P.M.R. were used to examine if there was a positive correlation between the number of nursing home beds/1000 aged population and the percentage of "inappropriately" placed patients in each region, as the Roemer-Feldstein hypothesis implies. As already pointed out in Chapter 3, P.M.R. refers to Medicaid patients in skilled nursing homes. We should also be aware of the difference that exists between the number of nursing home beds and the number of nursing home beds available to Medicaid patients. Rather than a positive correlation as might be expected with the Roemer-Feldstein hypothesis, a negative correlation was found, although it was not statistically significant. Although this does not support the Roemer-Feldstein hypothesis, the results do not disprove it. One might try to explain the results by claiming that the utilization review process was improved or was more effective within larger nursing homes or in regions with more nursing home beds, thus lowering the percentage of inappropriately placed patients with the increasing nursing home bed/population ratios.

Unfortunately, no other utilization review or P.M.R. data were readily available. However, other indirect parameters describing nursing home patients were used in an attempt to further examine the Roemer-Feldstein hypothesis. It was proposed that those patients coming from hospitals
6 Degrees of Freedom

$r = -0.06899$

$t = 0.1694$

$p = no significance$

Figure 4-10. Percentage of Patients Admitted From Hospitals vs Number of Nursing Home Beds/1000 aged pop. by Region.

Source: Health Data Annual 1974

Mass Dep't. of Public Health Vol. II
Figure 4-11. Percentage of Patients Admitted From Hospitals vs Number of Skilled Nursing Beds/1000 aged pop by Region

Source: Health Data Annual 1974
Mass Dept of Public Health Vol.1 No.1
Figure 4-12. Percentage of Patients Admitted From Hospitals vs Number of Intermediate Care Beds/1000 aged pop, by Region.

Source: Health Data Annual 1974
Mess Dept of Public Health Vol.1 No.1
Figure 4-13. Percentage of Patients Admitted From Hospital vs Number of Rest Home Beds/1000 aged pop. by Region

Source: Health Data Annual 1974
Mesd. Dept. of Public Health Vol. 1, No. 1

6 Degrees of Freedom

r = 0.1907

t = 4.759

p = no significance
might be construed as being more severely in need of nursing care than those admitted from the home or other sources. The Roemer-Feldstein hypothesis would lead us to believe that as the number of nursing home beds/1000 aged population increased, the percentage of patients admitted from a hospital would decrease as demand attempting to meet the supply, would draw in more patients from other sources. However, there was no statistically significant correlation between the number of nursing home beds/1000 aged population and the percentage of patients admitted from a hospital as illustrated in Figures 4-10, 4-11, 4-12, and 4-13.

Alternatively, the percentage of nursing home patients admitted from home was examined. As demand expands to meet supply one would assume, if the Roemer-Feldstein hypothesis held, that the percentage of patients coming from home would increase with increasing bed/population ratios. However, besides a statistically insignificant positive correlation with skilled nursing care beds/10000 aged population, Figure 4-14, there were only negative correlation coefficients as in Figures 4-15, 1-16, and 4-17. The rest home beds/1000 aged population relationship with the percentage of patients admitted from home had a correlation coefficient of -.6945, which is statistically significant. This analysis result would allow us to disprove the Roemer-Feldstein hypothesis. However, one must take caution,
Figure 4-14. Percentage of Patients Admitted from Home vs Number of Skilled Nursing Beds/1000 aged pop. by Region

Source: Health Data Annual 1974
Mess Dept of Public Health Vol. 1 No. 1

6 Degrees of Freedom.
\[ r = 0.07 \]
\[ t = 0.1719 \]
\[ p = \text{no significance} \]
6 Degree of Freedom
$r = -.20$
t = .5
$p = \text{no significance}$

Figure 4-15. Percentage of Patients Admitted from Home vs Number of Nursing Home Beds/1000 aged pop. by Region

Source: Health Data Annual 1974
Mass Dept of Public Health Vol. 1 No. 1
Figure 4-16. Percentage of Patients Admitted from Home vs Number of Intermediate Care Beds/1000 aged Pop. by Region

Source: Health Data Annual 1974
Mass Dept of Public Health Vol. 1 No. 1
Figure 4-17. Percentage of Patients Admitted from Home vs Number of (Nursing Home) Rest Home Beds /1000 aged pop.

Source: Health Data Annual 1974
Mass Dept of Public Health Vol 1 No 1
bearing in mind the data and indirect measures used. In addition, it should be pointed out that in analyzing only the individual levels of care, between 34% and 69% of the beds in each region were lost due to the number of beds in multi-level facilities.

An alternative measure of severity might be the percentage of nursing home patients discharged back to the hospital or discharged due to death. Again no statistically significant correlation was found for the eight Massachusetts regions in the relationship between the number of nursing home beds/1000 aged population and the percentage of discharged patients due to death or back into the hospital. There was also U.S. data on the percentage of patients discharged due to death and on the number of nursing home beds by state for 1968. Using 1970 age specific population data for calculating bed/population ratios (there was no available age specific population data or nursing home bed/population data for 1968 readily available) no statistically significant correlation was found. This is illustrated in Figures 4-18 through 4-22. Some may claim that the percentage of patients discharged due to death may only reflect nursing home policy in regard to whether patients are sent off to hospitals to die. However, there is no reason to assume that whatever admitting and discharge policies are reflected in the data, the policies are not distributed and
Figure 4-18: Percentage of Patients Discharged Due to Death or to the Hospital vs Number of Nursing Home Beds/1000 aged pop by Region.

Source: Health Data Annual 1974
Mass Dept of Public Health Vol. No. 1
Figure 4-19. Percentage of Patients Discharged Due to Death or to the Hospital vs Number of Skilled Nursing Beds/1000 aged pop. by Region

Source: Health Data Annual 1974
Miss. Dept of Public Health Vol. I No. 1

6 Degrees of Freedom
r = .0024
t = .0059
p = no significance
6 Degrees of Freedom

\[ r = -0.0282 \]
\[ t = 0.0691 \]
\[ p = no significance \]

Figure 4-20 Percentage of Patients Discharged to Hospital or Due to Death vs Number of Intermediate Care Beds/1000 aged pop. by Region

Source: Health Data Annual 1974
Mass Dept. of Public Health Vol.1 No.1
Figure 4-21. Percentage of Patients Discharged to Hospital or Due to Death vs Number of Rest Home Beds/1000 aged pop by Region

Source: Health Data Annual 1974
Mass Dept of Public Health Vol.1 No.1
Figure 4-22. Percentage of Patients Discharged Due to Death vs The Number of Nursing Home Beds/1000 aged population by State

Source: Nursing Homes: National Health Survey
Series 12 No.16 N.C.H.S. DHEW
follow at a constant level with increasing bed/population ratios.

Besides the level of severity of the patients, one might expect that the percentage of problem patients, such as those with fractured hips, stroke patients, and bedfast patients, might decrease in areas with more beds if the Roemer-Feldstein hypothesis holds, as more patients with fewer nursing care needs are absorbed to fill more beds. This test of the Roemer-Feldstein hypothesis was done at the U.S. level by state and with the eight regions in Massachusetts, with different characteristics of "problem" patients for each analysis. Figure 4-23 shows that there was no significant correlation. However, the Massachusetts data did reveal significant and rather startling results. In the eight Massachusetts regions, there was a positive significant correlation ($r = .73$). That is, with more nursing home beds/1000 aged population there was a higher percentage of problem patients. Figures 4-24 through 4-27 illustrate these results. In reviewing the data, the use of patients with selected disabilities, which is what the Massachusetts data consisted of, was questioned as truly reflecting nursing problems. There was the lowest percentage of such "problem patients" in skilled nursing care homes, where one would expect the most patients with high nursing care needs. Thus it is questionable whether or not this entire index of
Figure 4-23. Number of "Problem Patients"/Bed vs Number of Nursing Home Beds/1000 aged pop. by State

49 Degrees of Freedom
r = -0.06
t = 0.1472
p = no significance

Source: Nursing Homes: National Health Survey
Series 12 No. 16 N.C.H.S. DHEW
Figure 4-24 Percentage of Patients with Selected Disabilities vs Number of Nursing Home Beds/1000 aged pop. by Region

Source: Health Data Annual 1974
Mass Dept of Public Health Vol. 1 No. 1
6 Degrees of Freedom
r = 0.4501
t = 1.235
p = no significance

Figure 4-25 Percentage of Patients with Selected Disabilities vs Number of Skilled Nursing Home Beds/1000 Aged Pop, by Region.

Source: Health Data Annual 1974

Mess Dept. of Public Health, Vol. 1 No. 1
Figure 4-26 Percentage of Patients with Selected Disabilities vs Number of Intermediate Care Beds/1000 aged pop by Region.

Source: Health Data Annual 1974
Mass Dept of Public Health Vol.11 No.1
Figure 4-27 Percentage of Patients with Selected Disabilities vs. Number of Rest Home Beds per 1000 pop. by Region.

Source: Health Lab Annual 1984

Mass Dept. of Public Health, Vital Lit.
problem patients truly reflects nursing care problem patients.

The testing of the Roemer-Feldstein hypothesis with seven different indices or sources of data revealed no significant relationship that would support the Roemer-Feldstein hypothesis and one result that might disprove it. However, these results reflect the way the corollaries of the hypothesis were framed so as to make use of the available data. The limited data available fails to support the Roemer-Feldstein hypothesis. Certainly the notion of beds as a vector quantity, rather than as a scalar quantity, introduced in Chapter 3, requires a more detailed review. Rather than implicating the need for more beds, there is a need for more relevant data to be collected to facilitate a cleaner analysis of the Roemer-Feldstein hypothesis.
References


6. Roemer, pp. 36 - 42.

7. Feldstein, Chapter 7.


Chapter 5: Policy Recommendations

The goal of the health care delivery system is to provide the appropriate care for the needs of the individual patient in the most cost-effective manner. Certificate of Need has been one response to the rising costs of health care and the expansion of the nursing home industry. The C/N objective is cost containment. However, cost containment is not necessarily the same as providing the most cost-effective care. With the new National Health Planning and Resource Development Act, all states will be adopting C/N. Although there are problems with C/N, it appears that C/N is the best way to regulate the growth of health facilities, and nursing homes in particular. The ability to determine the need for beds is the basis for the C/N program.

The first national standard for measuring bed requirements was the Hill-Burton bed/population ratio. In spite of the fact that the present Hill-Burton formula incorporates past demand and an efficiency factor, the occupancy rate, into calculating bed requirements, there still remain deficiencies in the methods used in setting bed limits. Since the setting of bed limits involves decision making under uncertainty, the use of decision analysis may prove to be a useful approach. However, decision analysis has yet to be applied to nursing homes and there has been no useful
utility function yet formulated reflecting the under- and overestimation of bed need. In addition, there are many untested assumptions that are accepted and other factors that are not considered by the present methodologies for determining the need for nursing home beds.

Massachusetts, accepting the concept that the supply of beds will create demand, known as the Roemer-Feldstein hypothesis, has adopted standards based on bed/population ratios. The Roemer-Feldstein hypothesis, when applied to nursing homes, could not be confirmed when analyzed using U.S. and Massachusetts data. Therefore, it is not clear that planning should be based on need, rather than demand.

In attempts to relate past demand to future bed requirements, it is often incorrectly assumed that all patients utilizing nursing homes are appropriately placed. In fact, studies documented in the literature and results from Massachusetts's Periodic Medical Review indicate that approximately 25% of the nursing home patients do not medically need the level of care their nursing home offers. This significant level of misutilization of nursing homes stresses the importance of utilization review to enable the health care system to offer the most appropriate and cost effective care, and warrants consideration when using past levels of demand for projecting future bed needs.
Methods of determining nursing home bed need might further be improved if patients over 65 years of age were segregated into age groups, since studies in the literature indicate increasing need of nursing home care with the increasing age of the patients. Literature studies also point out that whether the patient comes from a rural or urban setting and is married or non-married are factors that may determine different levels of bed need, and should be considered when determining the need for nursing home beds.

The consideration of the relationships between nursing homes and other facilities and services in the health care system, such as hospitals and home health care, is essential. The effect of a limited number of nursing home beds on the days spent in a hospital awaiting nursing home placement is documented by a study by the Massachusetts Department of Public Health and a theoretical mathematical model presented in this thesis. Patients queuing in a hospital awaiting nursing home placement increase health care expenditures. It is not clear that by limiting nursing home beds, resources will be reallocated to alternative services and facilities. In addition, there is a tradeoff between two performance indices of the health delivery system, since increasing the nursing home length of stay increases the delay in nursing home placements with a fixed number of
nursing home beds.

The number of beds can no longer be treated as a scalar quantity, where the availability is dependent solely on the physical number of beds. All beds are not available to all patients, depending on such variables as the patient's source of payment or physical disabilities. Therefore, the number of effective or available beds for a given patient is best described as a vector or multidimensional quantity, with certain characteristics describing the restrictions on its use.

The Rate Setting Commission may serve as a means of encouraging certain nursing home practices through financial incentives. It is clear from the literature that both multi-level facilities and nursing care homes adjacent to hospitals should be encouraged to ease the problem of transferring patients to different levels of care. It is not apparent that the Rate Setting Commission's use of a mandatory minimum occupancy rate in calculating the per diem costs in Massachusetts serves as a disincentive to admit Medicaid patients after having reached the promulgated occupancy rate.

Finally, need determining methodologies may very well be generalized and applied to determining need for hospitals and other facilities as well as future manpower requirements.
Appendix
Computing the Final Per Diem Rate

AUDIT TRANSMITTAL FORM

<table>
<thead>
<tr>
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<th>BY</th>
<th>DATE</th>
<th>REMANDED TO</th>
<th>DATE</th>
</tr>
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<tr>
<td>Turned In:</td>
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<tr>
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<tr>
<td>Turned In:</td>
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<td>Turned In:</td>
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</tr>
<tr>
<td>Turned In:</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

1973 FINAL RATE _______ Percent Change _______

1972 FINAL RATE _______

TRANSMITTED TO DIRECTOR OF NURSING HOMES ON __________________________

APPROVED
Director of Nursing Homes
RATE SETTING COMMISSION
80 BOYLSTON STREET
BOSTON, MASSACHUSETTS 02116

Computation of 1973 Final Per Diem Rate

Name of Home ________________________________

City/Town ________________________________

1. Cost of Operations
   
   Total Operating Costs (Per 1972 RSC-1 report)    
   Less Adjustments - Schedule #2, Item 3    
   Net Operating Cost  
   + Allowable Patient Days - Sch. #2, Item 1  
   Per Diem Cost of Operations

2. Administration/Policy - Planning Allowance - Sch. #2, Item 2

3. Return on Average Equity Capital
   
   Net Worth - Inc. Related Companies (per RSC-1)    
   + Loans/Notes Payable to Owners/Officers, etc.    
   Total Equity  
   X 9.2%  
   + Allowable Patient Days  
   Return on Equity Capital

Total 1973 Final Per Diem Rate

Final Rate __________

Intermediate Rate __________

Differential __________
RANGE SETTING COMMISSION  
80 BOYLSTON STREET  
BOSTON, MASSACHUSETTS 02116

Computation of 1973 Final Per Diem Rate

Name of Home: Nursing, Rest Home

City/Town: 

1. Allowable Patient Days
   Total Licensed Bed Capacity
   a) beds × 365 = 100%
   b) Nursing & Rest Homes = 90%
   c) Per RSC-1 report
   d) Actual patient days or 90%, whichever is greater

2. Administration/Policy Planning Allowance
   Total Bed Capacity
   a) beds × 365 = 100%
   b) 90% of (a) or actual patient days, whichever is greater
   c) amount per schedule $ + (b)

3. Adjustments

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<th>Reason</th>
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<tr>
<td>412</td>
<td>Officers Salary</td>
<td></td>
<td>Per Reg. 5(b)</td>
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<tr>
<td>427</td>
<td>Travel-Motor Vehicle</td>
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<td>Per Reg. 7(b)</td>
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<tr>
<td>440-1</td>
<td>Taxes-(Officers, Adm. etc. pay)</td>
<td></td>
<td>Per Reg. 5(b)</td>
</tr>
<tr>
<td>442</td>
<td>Insurance (Officer, Adm. etc. pay)</td>
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<td>Per Reg. 5(b)</td>
</tr>
<tr>
<td>451</td>
<td>Real Estate Tax</td>
<td></td>
<td>Per Reg. 5(b)</td>
</tr>
<tr>
<td>452</td>
<td>Interest</td>
<td></td>
<td>Per Reg. 5(b)</td>
</tr>
<tr>
<td>453</td>
<td>Rent</td>
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<td>Per Reg. 5(b)</td>
</tr>
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<td>Deprec. of Buildings</td>
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<td>Per Reg. 7(a)(III)</td>
</tr>
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<td>457</td>
<td>Deprec. of Equipment</td>
<td></td>
<td>Per Reg. 7(a)(III)</td>
</tr>
<tr>
<td>466</td>
<td>Deprec. of Motor Vehicle</td>
<td></td>
<td>Per Reg. 7(a)(IV)</td>
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<td>Bad Accounts</td>
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<td>Per Reg. 7(a)(V)</td>
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<tr>
<td>802</td>
<td>Corporation &amp; Income Tax</td>
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<td>Per Reg. 7(a)(III)</td>
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<td>803</td>
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Total Adjustments $
## Computation of 1973 Final Per Diem Rate

### 1. Average Equity Capital

<table>
<thead>
<tr>
<th>Description</th>
<th>Beginning of Year</th>
<th>End of Year</th>
</tr>
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<tbody>
<tr>
<td>Add: Net Worth</td>
<td>$</td>
<td>$</td>
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<tr>
<td>Net Worth-Affiliate</td>
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<tr>
<td>Officer(s) Owner Loan(s) Payable</td>
<td></td>
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<tr>
<td>Disallowed Depr.</td>
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<tr>
<td>Capitalized Items</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deduct: Loan to Officer(s) Owner</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
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Subtract Total of (B) from Total of (A) and Add Beginning and end balances to get Total.

Divide by 2 = Average Equity

### 2. Administrative & Policy Planning Allowance

For more than one facility

<table>
<thead>
<tr>
<th>Home</th>
<th>Beds</th>
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<tbody>
<tr>
<td></td>
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</tr>
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</table>

Total

Total beds ______ + schedule X 120% $________ = $________ per bed

$________ per bed X ________ total bed capacity = $________
### Computation of 1973 Final Per Diem Rate

<table>
<thead>
<tr>
<th>Name of Home</th>
<th>City/Town</th>
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#### Calculation of Total Nursing Cost

<table>
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<tr>
<th>Nursing Account</th>
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<td></td>
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<tr>
<td>611</td>
<td></td>
</tr>
<tr>
<td>621</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
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</table>

+ **Patient Days**

#### Allowable

<table>
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<tr>
<th>Level</th>
<th>Rate per Hour</th>
<th>Beds Multiplier</th>
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<tbody>
<tr>
<td>Level II</td>
<td>$12.40</td>
<td>3.6</td>
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<tr>
<td>Level III</td>
<td>$6.75</td>
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<tr>
<td>Level IV (-16)</td>
<td>$2.54</td>
<td>4 hrs. per mo.</td>
</tr>
<tr>
<td>Level IV (+16)</td>
<td>$3.04</td>
<td>4 hrs. per mo.</td>
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#### *Level III*

<table>
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<th>Bed Multiplier</th>
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</thead>
<tbody>
<tr>
<td>6.75</td>
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#### Total Nursing Excess

*Over 60 beds - Director of Nurses*

**Adjustment**

<table>
<thead>
<tr>
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<th>Patient Days</th>
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#### Calculation of Variable Cost + 10%

**Total Operating Expenses:**

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<tr>
<td>450 (451-452-453)</td>
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<tr>
<td>455 (455a-455b)</td>
</tr>
<tr>
<td>466</td>
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<tr>
<td>600 (601-611-621)</td>
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<tr>
<td>800 (801-802-803)</td>
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<tr>
<td>300 (Other Income)</td>
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<td>Other Services</td>
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<td><em>Other Adj.-Sch. 2</em></td>
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**Variable**

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<tr>
<td>Level II</td>
<td>$11.59</td>
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<td>Level IV</td>
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**Excess**

<table>
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<th>Patient Day</th>
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