

Evaluating Inpatient Hospital Bed Need at the Community Level

Ronald Lagoe*, Shelly Littau

Hospital Executive Council, Syracuse, NY, USA

Email: *Hospexcl@cnyemail.com

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Abstract

An important component of health care planning at the community level is the identification of inpatient hospital bed capacity. In the United States, hospitals are major providers of patient care and the largest sources of health care expenses. This study evaluated inpatient hospital capacity for major services including adult medicine, adult surgery, and obstetrics. It was based on local and regional demographics, admissions per capita, immigration, and inpatient lengths of stay. The study also involved the use of the methodology to estimate bed need based on a reduction in hospital admissions and discharges of 15 percent. This level has been the experience of area hospitals between 2019 and 2022. The study also included the use of the bed need methodology to estimate the hospital utilization based on a decline in inpatient lengths of stay. It resulted in a decline in hospital occupancy in the hospital service area from 1213.1 to 1012.6 patients based on 80 percent occupancy and the best practice hospital stays in the region.

Keywords

Hospitals, Hospital Bed Need, Health Planning

1. Introduction

Health care planning has historically been a challenging issue in the United States. Per capita health care costs have been higher than those of other nations throughout the twentieth and twenty-first centuries [1] [2].

A large proportion of these costs have been generated by acute hospitals. These providers are the largest sources of inpatient care in most communities. They account for the care provided to patients with the highest severity of illness [3] [4] [5].

Inpatient hospital utilization includes adult medicine and adult surgery, the largest inpatient services in the United States. It also includes additional services such as obstetrics, pediatrics, neonatology, and psychiatry.

The planning of these services in an efficient manner is important to support the ability of hospitals to serve community and regional populations. Such planning needs to account for community and regional demographics, as well as inpatient utilization and other resources.

Closely related to inpatient hospital utilization at the community level is the need for efficiency. This factor is usually evaluated with respect to staffing, pharmaceuticals, and testing.

One of the most important resources involved in health care planning during the twenty-first century has been inpatient nursing. It is essential for hospitals to maintain sufficient nursing staff in order to serve the populations of their communities [6].

During the twenty-first century, other clinical factors have had a major impact on inpatient hospital utilization. One of the most important issues has been the impact of the coronavirus [7].

The planning of inpatient hospital services is closely related to bed need at the community level. In this context, bed need is a product of several factors including demographics, admissions, immigration, lengths of stay, and occupancy [8].

This study reviewed the development of a hospital bed need methodology in one community in Upstate New York. It evaluated the impact of these factors on hospital utilization to demonstrate their relative importance from a quantitative perspective.

The format will need to create these components, incorporating the applicable criteria that follow.

2. Population and Method

The original Central New York bed need summary was developed by the Central New York Health Systems Agency as part of its planning activities during the 1970s. The bed need summary has been updated by the Hospital Executive Council since the 1980s.

The utilization data in this methodology have been updated during 2007, 2019, and 2023.

The bed need algorithm includes the following components. These components are based on inpatient hospital data from the New York Statewide Planning & Research Cooperative System (SPARCS) and the Hospital Executive Council.

Resident population by Resident County and age level;

Inpatient admission rates by Resident County and age level;

Immigration to Onondaga County hospitals by Resident County and age level;

Inpatient lengths of stay in Onondaga County hospitals by age level;

Inpatient hospital occupancy by age level.

Brief summaries of the bed need methodology for each of these components follow.

Resident population by county and age level.

The basis of inpatient bed need for health care providers is based on the resident populations of their service areas. The bed need methodology for Central New York is based on the following counties.

Broome	Madison
Cayuga	Oneida
Chenango	Onondaga
Cortland	Oswego
Delaware	Otsego
Franklin	St. Lawrence
Herkimer	Tioga
Jefferson	Tompkins
Lewis	

The current versions of the bed need methodology are based on populations for 2025 and 2030. These data were developed by county and age level by the Cornell University Program on Applied Demographics.

The methodology includes the following age levels.

Ages 18 - 44 years, young adults

Ages 45 - 64 years, older adults

Ages 65 - 84 years & 85 years and over, elderly

Data from the Cornell University Program has indicated that populations of most Central New York Counties have declined in recent years.

Inpatient admission rates by Resident County and age level.

After resident populations, the next component of the bed need methodology includes inpatient admission rates by age level and Resident County.

Inpatient admission rates among the hospitals increased with additional population age levels for high utilization patients. The use of admission rates in the methodology results in projections of numbers of inpatients by county and age level.

Population admission rates for 18 - 44 years, young adults, were relatively low because most of these individuals are not admitted to hospitals. Inpatient admission rates for individuals aged 65 years and over increase because these residents required more frequent use of hospital services.

The following admission rate ranges were developed through use of the methodology with the Central New York region. These rates increased with increasing age.

Ages 18 - 44 years	0.020 - 0.061
Ages 45 - 64 years	0.045 - 0.094
Ages 65 - 84 years	0.099 - 0.250
Ages 85 years and over	0.180 - 0.615

Resident admission rate information was based on New York Statewide Planning & Research Cooperative System (SPARCS) data.

Inmigration to Onondaga County hospitals.

After inpatient admission rates, the next component of the methodology is immigration to hospital county by resident county and age level. Immigration rates among the counties are based on demographic and economic use of health care services in the region. It is also based on the proximity of each county to Onondaga County.

The largest immigration rates are produced by Onondaga County and the four counties that are contiguous to Onondaga including Oswego, Madison, Cayuga, and Cortland. The immigration rates to Onondaga County hospitals within the Central New York region have not changed appreciably during the last several years.

A summary of immigration rates by age level follows. These rates declined with decreasing age.

Ages 18 - 44 years	0.018 - 0.969
Ages 45 - 64 years	0.009 - 0.966
Ages 65 - 84 years	0.008 - 0.973
Ages 85 years and over	0.002 - 0.979

Resident immigration rate information was based on New York Statewide Planning & Research Cooperative System (SPARCS) data.

Inpatient lengths of stay in Onondaga County hospitals by age level.

After immigration to Onondaga County hospitals, the next component of the methodology is inpatient lengths of stay in the Onondaga County hospitals by age level. Lengths of stay are determined by the number of patient days generated by patients in Onondaga County hospitals. These stays are produced by Central New York residents throughout the Central New York region.

In the current use of the bed need methodology, lengths of stay were employed based on hospital inpatients by age level. In a second component of the methodology, lengths of stay were employed based on the most efficient provider in the region, St. Joseph's Hospital Health Center.

The lengths of stay are listed below.

	Combined Syracuse Hospitals	St. Joseph's Hospital Health Center
Ages 18 - 44 years	4.2 days	3.2 days
Ages 45 - 64 years	6.0 days	5.0 days
Ages 65 - 84 years	6.5 days	5.6 days
Ages 85 years and over	6.2 days	5.2 days

Inpatient hospital occupancy by age level.

The final component of the bed need study was hospital occupancy by age level. This was developed by dividing the average daily census for each of the age levels by 80 percent. This occupancy has been used nationally to identify optimum inpatient hospital utilization.

3. Results

The use of specific indicators in the bed need methodology has allowed the me-

thodology to address updated changes in hospital utilization. These changes were based on updates in projected populations, hospital admissions, hospital immigration, and lengths of stay.

This analysis described the use of the Central New York bed need methodology to evaluate the impact of hospital inpatient utilization in Central New York. Relevant data are described in **Table 1**.

Units

This information described the relative impact of inpatient hospital utilization within the service area of the Syracuse hospitals. It included Onondaga County, the demographic and clinical center of the region; the four counties contiguous to Onondaga including Cayuga, Cortland, Madison, Oswego; and other counties within the region, Broome, Chenango, Delaware, Franklin, Herkimer, Jefferson, Lewis, Oneida, Otsego, St. Lawrence, Tioga, and Tompkins.

The study data were based on the inpatient census of the Syracuse hospitals by Resident County and age level. These indicators were related to community and area populations, admission rates, immigration, lengths of stay, and occupancy. All of these indicators except lengths of stay were based on the utilization of community services. Lengths of stay were based on inpatient use within the Syracuse hospitals.

The study data demonstrated that the average daily census of the combined Syracuse hospitals in 2023 were 970.5 patients. On the basis of a national occupancy

Table 1. Central New York inpatient hospital bed need summary.

	Average Daily Census Based on Combined Syracuse Hospitals Lengths of Stay	Average Daily Census Based on 15% Reduction in Inpatient Discharges for Combined Syracuse Hospitals	Average Daily Census Based on St. Joseph's Hospital Health Center Lengths of Stay
Resident County			
Onondaga County	597.6	508.0	498.0
Cayuga County	52.2	44.4	44.0
Cortland County	23.1	19.6	19.3
Madison County	44.3	37.7	37.2
Oswego County	100.3	85.3	83.8
Other	153.0	153.0	127.8
Total	970.5	848.0	810.1
Average Daily Census at 80% Occupancy	1213.1	1060.0	1012.6

rate of 80 percent, these patients would account for an average daily census of 1213.1 patients. The actual number of certified inpatient beds in the service area of the Syracuse hospitals was 1338.

This average daily census was employed as a baseline for follow-up health care planning in the combined Syracuse hospitals. This follow-up evaluation was developed based on potential changes in inpatient admissions and lengths of stay.

The first follow-up analysis involved the reduction of inpatient admissions by fifteen percent. This reduction was based on an actual fifteen percent decline in hospital discharges that occurred between 2019 and 2022 in the service area of the Syracuse hospitals. It resulted in a reduction in the average daily census adjusted for occupancy from 1213.1 to 1060.0 patients.

The second follow-up analysis was based on a reduction in lengths of stay consistent with the best practice within the service area of the Syracuse hospitals. This practice has been demonstrated by St. Joseph's Hospital Health Center over an extended period of time. It would result in a decline in the average daily census adjusted for occupancy from 1213.1 to 1012.6 patients.

4. Discussion

An important component of health care planning at the community level is the identification of inpatient hospital bed capacity. In the United States, hospitals are major providers of patient care and the largest sources of health care expenses.

This study evaluated inpatient hospital capacity for major services including adult medicine, adult surgery, and obstetrics. It was based on local and regional demographics, admissions per capita, immigration, and inpatient lengths of stay. The study employed a quantitative methodology for identifying the combined impact of these factors.

The bed need methodology also included limitations. The structure of the methodology was useful in identifying the use of inpatient hospital utilization. At the same time, it contained limitations related to the content of the information concerning hospital services.

The analysis provided examples of the use of a bed need methodology that has been used in Upstate New York. These examples were based on the impact of changes in hospital utilization.

The basis of the methodology involved the application of the study variables to generate an estimated average daily census of 970.5 patients for January-December 2025. When adjusted for 80 percent occupancy, this census became 1213.1 patients.

The study also involved the use of the methodology to estimate bed need based on a reduction in hospital admissions and discharges of 15 percent. This level has been the experience of area hospitals between 2019 and 2022.

This decline in inpatient utilization was generated by the movement of inpatients to outpatient settings, especially adult surgery. A reduction in resident

populations at the community level also contributed. It resulted in a decline in the estimated hospital occupancy from 1213.1 to 1060.0 patients.

The study also included the use of the bed need methodology to estimate the hospital utilization based on a decline in inpatient lengths of stay. It resulted in a decline in hospital occupancy in the hospital service area from 1213.1 to 1012.6 patients based on the best practice of hospital stays in the region. This was larger than the decline generated by the reduction in inpatient discharges.

The bed need methodology may be used to project increases in hospital utilization, however, this would require larger numbers of high utilization populations, such as the elderly, or longer lengths of stay. A rise in younger adults would probably not measurably increase the need for hospital occupancy because they are not major users of inpatient services.

Conflicts of Interest

The authors declare there are no conflicts of interest regarding the publication of this paper.

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