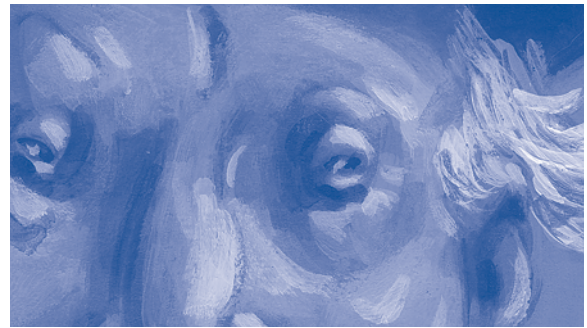


How Many Regional Medical Centers Can Maine Sustain?

How Patient Hospital Utilization Can Help Define Structure

by Lars H. Rydell



Making thoughtful decisions about where various levels of hospital care are to be provided is an important part of controlling overall healthcare costs. Efficient utilization of healthcare resources requires that high-cost and less frequently used high-tech equipment and specialized personnel should be limited to a few tertiary regional medical centers. Here, Lars Rydell uses patient discharge data from the Maine Health Data Organization to suggest that Maine currently has only two hospitals that function as tertiary regional medical centers—Maine Medical Center in Portland and Eastern Maine Medical Center in Bangor. Policymakers need to think about whether Maine's population base warrants more than two such centers. 🐉

Maine has initiated a process to try to control the total cost of healthcare services, and in particular hospital services. In part, this process requires making choices about the degree to which sophisticated healthcare technologies and specialty services are consolidated versus available at many locations. Efficient healthcare provision and utilization requires that high-cost and less frequently used high-tech equipment be placed in a limited number of regional medical centers where the overhead cost of the equipment and specialty personnel is spread over a large population base to minimize the per-patient (per-service-unit) cost. A central question is: How many tertiary or regional medical centers does Maine have? And, relatedly, how many such centers can Maine sustain? The following analysis uses patient discharge data collected by the Maine Health Data Organization (MHDO) to provide a data-driven assessment of which Maine hospitals currently function as regional medical centers.

THE DATA

The MHDO captures discharge data from 41 hospitals in Maine: four specialty hospitals (three psychiatric facilities, one rehabilitation hospital) and 37 nonprofit community hospitals.¹ Five of the community hospitals are located in towns with another community hospital. Four of these were founded by religious organizations—St. Joseph Hospital in Bangor, St. Mary's Regional Medical Center in Lewiston, Parkview Adventist Medical Center in Brunswick, and Mercy Hospital in Portland. The fifth, Inland Hospital in Waterville, was founded originally as an osteopathic hospital but now is affiliated closely with Eastern Maine Medical Center.

The MHDO uses the Maine Bureau of Health's division of the state into 35 hospital regions.² As originally designed, each region included a central town with one or more general community hospitals and a grouping of contiguous surrounding towns from which a majority of the patients sought treatment at the hospital in the central town. For some of the very small northern towns, utilization was calculated on multitown census tracts. Two of the original regions, Bath and Berwick, no longer have hospitals but still are considered separate regions by MHDO. For the purpose of

analysis here, the Bath region is combined with Brunswick and Berwick is combined with York, reflecting the pattern of hospital use of most of the Bath and Berwick region patients. The hospitals in Presque Isle and Fort Fairfield now comprise The Aroostook Medical Center. The hospital in Presque Isle provides general medical services and the facility in Fort Fairfield specializes in psychiatric and drug and alcohol services. The hospital in Augusta and the larger hospital in Waterville have combined administratively under the umbrella of Maine General Management Services. However, they are retained as separate regions in the analysis here because both hospitals still report discharge data separately to the MHDO, and each still receives a large majority of its patients from its own region. Patients with out-of-state or no permanent Maine residence were listed as "unclassified" and are treated as a separate "region" for the purpose of this analysis. With these modifications to the original Bureau of Health hospital regions in mind, this analysis is based on 33 regions.

The MHDO has collected and posted on its Web site aggregate data on patients discharged for each year from 1994-2002. These data provide a count of the number of times patients use a hospital, counting the patient at the time of discharge. This method results in counting the same patient multiple times if the patient has more than one incident of hospitalization in a year or is transferred (discharged) from one hospital to another. The information collected on each discharge includes the number of inpatient days the person spent in the hospital and the total charges.

The analysis below looks at the data broken down by the region of the patient's residence for each of the 37 community hospitals. The four specialty hospitals are excluded (three psychiatric, one rehabilitation). To get a picture of the general system,



Efficient healthcare provision and utilization requires that high-cost and less frequently used high-tech equipment be placed in a limited number of regional medical centers.

TABLE 1: **Hospital Ranking Groups, Maine Health Data Organization**

MHDO Peer Group	Acute Beds	Hospital	Total Discharges (2002)
A	598	Maine Medical Center	29,623
A	426	Eastern Maine Medical Center	16,947
A	250	Central Maine Medical Center	7,860
B	200	Mercy Hospital	9,061
B	142	MaineGeneral Medical Center-Augusta	5,840
B	202	MaineGeneral Medical Center-Waterville	5,684
B	150	Southern Maine Medical Center	5,510
B	233	St. Mary's Regional Medical Center	4,812
B	66	York Hospital	4,174
B	113	Penobscot Bay Medical Center	4,114
B	100	St. Joseph Hospital	3,716
B	89	Aroostook Medical Center (A. R. Gould Hospital)- Presque Isle	2,801
C	144	Mid Coast Hospital	4,235
C	70	Franklin Memorial Hospital	2,829
C	34	Maine Coast Memorial Hospital	2,695
C	65	Redington-Fairview General Hospital	2,386
C	65	Cary Medical Center	2,262
C	49	H.D. Goodall Hospital	2,182
D	78	Inland Hospital	2,440
D	55	Parkview Adventist Medical Center	2,328
D	50	Stephens Memorial Hospital	2,114
D	49	Waldo County General Hospital	2,004
D	63	Houlton Regional Hospital	1,905
D	30	Miles Memorial Hospital	1,893
D	46	Mayo Regional Hospital	1,684
D	52	Northern Maine Medical Center	1,625
D	38	Down East Community Hospital	1,502
D	40	Bridgton Hospital	1,373
D	28	Sebastcook Valley Hospital	1,156
D	49	Rumford Hospital	1,101
D	49	Mount Desert Island Hospital	1,021
D	49	Calais Regional Hospital	929
D	42	Millinocket Regional Hospital	903
D	26	Blue Hill Memorial Hospital	844
E	25	Penobscot Valley Hospital	1,117
E	20	St. Andrews Hospital	370
E	14	Charles A. Dean Memorial Hospital	184
TOTAL			143,224

the data for 23 of the reported diagnostic groups was summed to obtain the number of patients from each hospital region discharged from each hospital. Diagnoses related to alcohol, drug use and mental illness were eliminated because they require specialized services provided by the three psychiatric facilities and by only a handful of community hospitals.

When it started, the MHDO classified hospitals into five different peer groups (A-E), based on size and specialty services available. To retain consistency, it has maintained this classification for successive years, even though the size and role of some of the hospitals has changed over time. Among other information provided, the MHDO Web site includes information on the number of beds in each hospital.

The analysis in this paper is based on the most recent data published on the MHDO Web site. The discharge data are for the year 2002.

MEDICAL CENTER SIZE

As shown in Table 1, Maine's hospitals range in size from Maine Medical Center (MMC) with 598 acute beds and 29,623 discharges per year to Charles A. Dean Memorial Hospital with 14 beds and 184 discharges. The MHDO ranks three hospitals in their highest "A" peer group: MMC in Portland; Eastern Maine Medical Center (EMMC) in Bangor; and Central Maine Medical Center (CMMC) in Lewiston. Maine Medical Center is by far the largest hospital. Eastern Maine Medical Center is second with 426 acute beds and 16,947 discharges per year. Central Maine Medical Center in Lewiston has 250 acute beds and 7,860 discharges. Mercy Hospital in Portland, classified as a "B" peer group facility, has fewer beds (200) but a greater number of discharges (9,061) than CMMC.

TABLE 2: **In and Out-of-Region Patients—
MMC, EMMC, CMMC, and Mercy Hospital**

	Region	Number Discharges	Percent Total	Number of Regions Comprising 95% of Discharges
Maine Medical Center	Portland Region	15,732	53.1%	17
	Out-of-Region	13,891	46.9%	
	Total	29,623	100.0%	
Eastern Maine Medical Center	Bangor Region	9,119	53.8%	17
	Out-of-Region	7,828	46.2%	
	Total	16,947	100.0%	
Central Maine Medical Center	Lewiston Region	5,701	72.5%	7
	Out-of-Region	2,159	27.5%	
	Total	7,860	100.0%	
Mercy Hospital	Portland Region	7,390	81.6%	8
	Out-of-Region	1,671	18.4%	
	Total	9,061	100.0%	

The other eight “B” peer group hospitals have 3,000-6,000 discharges, and between 66-233 beds. The combined Bath and Brunswick region’s Mid Coast Hospital also is in this size group, with 144 beds and 4,235 discharges, even though it retains its original Brunswick Hospital “C” peer group classification. None of the remaining “C,” “D,” and “E” peer group hospitals have more than 3,000 discharges or more than 78 acute beds, most having considerably fewer.

Based only on size, MMC and EMMC are the best candidates to function as regional centers. The “B” peer group hospitals with 3,000-6,000 discharges probably provide mid-range specialty hospital services for their region and immediately surrounding regions with smaller hospitals, but do not have sufficient volume to function as regional medical centers. Central Maine Medical Center and Mercy are in between, but appear closer in size to the “B” peer group hospitals than to either MMC or EMMC.

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REGIONS FROM WHICH HOSPITALS DRAW PATIENTS

Size is not the only factor determining whether a hospital functions as a regional medical center. Another major ingredient is whether a hospital’s patients are drawn mainly from its own region or whether a substantial number are drawn from a large share of the other regions in the state.

Four Largest Hospitals

Table 2 shows the percent of patients in the four largest hospitals coming from their own region and from regions outside their own region. Both MMC and

EMMC had slightly over 46% of their discharges coming from outside their own region (46.9% and 46.2%, respectively). This percent compares with 27.5% for CMMC and 18.4% for Mercy Hospital.

In addition, both MMC and EMMC drew most of these out-of-region discharges from a large share of the other 31 hospital regions (see Table 3 for details). For both MMC and EMMC, 95% of discharges came from either their own region or one of 16 other regions. Of these other regions, only two, Waterville and Unclassified, are included on both the MMC and EMMC lists. In contrast, 95% of the discharges from CMMC came from the Lewiston region or one of only six other regions. In addition, all of these six were included in the regions in MMC’s list and only one, Rumford, sent more patients to CMMC than to MMC. For Mercy Hospital, 95% of discharges came from the Portland region or one of seven other regions, all of which sent a far greater number of patients to MMC than to Mercy.

TABLE 3: Patients' Region of Residence—MMC, EMMC, CMMC, and Mercy Hospital

Eastern Maine Medical Center				Maine Medical Center			
Region	Number Discharges	Percent Total	Cumulative Percent	Region	Number Discharges	Percent Total	Cumulative Percent
Bangor	9,119	53.8%	53.8%	Portland	15,732	53.1%	53.1%
Ellsworth	780	4.6%	58.4%	Biddeford	2,012	6.8%	59.9%
Dover-Foxcroft	774	4.6%	63.0%	Unclassified	1,403	4.7%	64.6%
Pittsfield	616	3.6%	66.6%	Lewiston	1,288	4.3%	69.0%
Lincoln	587	3.5%	70.1%	Augusta	1,162	3.9%	72.9%
Calais	461	2.7%	72.8%	Brunswick	1,010	3.4%	76.3%
Presque Isle	446	2.6%	75.4%	Sanford	1,007	3.4%	79.7%
Houlton	416	2.5%	77.9%	Rockland	890	3.0%	82.7%
Millinocket	411	2.4%	80.3%	Waterville	776	2.6%	85.3%
Belfast	396	2.3%	82.6%	Bridgton	574	1.9%	87.3%
Waterville	387	2.3%	84.9%	Farmington	491	1.7%	88.9%
Blue Hill	377	2.2%	87.2%	Bath	437	1.5%	90.4%
Unclassified	300	1.8%	88.9%	Norway	361	1.2%	91.6%
Caribou	298	1.8%	90.7%	Skowhegan	321	1.1%	92.7%
Machias	287	1.7%	92.4%	Damariscotta	306	1.0%	94.8%
Bar Harbor	285	1.7%	94.1%	York	302	1.0%	93.7%
Fort Kent	281	1.7%	95.7%	Rumford	249	0.8%	95.6%

Central Maine Medical Center				Mercy Hospital			
Region	Number Discharges	Percent Total	Cumulative Percent	Region	Number Discharges	Percent Total	Cumulative Percent
Lewiston	5,701	72.5%	72.5%	Portland	7,390	81.6%	81.6%
Farmington	444	5.6%	78.2%	Biddeford	472	5.2%	86.8%
Rumford	405	5.2%	83.3%	Lewiston	178	2.0%	88.7%
Augusta	400	5.1%	88.4%	Brunswick	183	2.0%	90.8%
Norway	285	3.6%	92.0%	Unclassified	141	1.6%	92.3%
Portland	168	2.1%	94.2%	Sanford	114	1.3%	93.6%
Bridgton	143	1.8%	96.0%	Bridgton	107	1.2%	94.7%
				Augusta	80	0.9%	95.6%

Mid-Size Hospitals

As shown in Table 4, each hospital in peer group “B” drew 70% or more of its patients from its own region. The number of regions from which 95% of the hospital’s patients were drawn ranged from a low of three for the

York Hospital to a high of 13 for St. Joseph Hospital, with a median of five. In terms of the number of regions from which they drew 95% of their patients, CMMC and Mercy Hospital resembled other “B” peer group hospitals more than they did either MMC or EMMC.

TABLE 4: Residence of Patients Discharged from Mid-size Specialty Hospitals

	Region	Number Discharges	Percent Total	Number of Regions Comprising 95% of Discharges*
Mercy Hospital	Portland	9,061	81.6%	8
MaineGeneral Medical Center-Augusta	Augusta	5,840	83.0%	5
MaineGeneral Medical Center-Waterville	Waterville	5,684	72.2%	5
Southern Maine Medical Center	Biddeford	5,510	79.4%	4
St. Mary's Regional Medical Center	Lewiston	4,812	81.7%	6
Mid Coast Hospital	Bath/Brunswick	4,235	78.9%	6
York Hospital	York/Berwick	4,174	78.2%	3
Penobscot Bay Medical Center	Rockland	4,114	91.5%	3
St. Joseph Hospital	Bangor	3,716	77.0%	13
Aroostook Medical Center	Presque Isle/Fort Fairfield	2,801	85.6%	3

* Includes discharges with unclassified residence.

PATIENT CHOICE OF HOSPITAL

Another way to get a picture of the patient-defined regional hospital system is to examine the number and percent of patients in each region who were discharged from the hospital in their region and from MMC, EMMC, CMMC, and Mercy Hospital. Bangor, Portland, and Lewiston are the three largest regions. As shown in Table 5, EMMC handled 70.4% of the Bangor region inpatient hospital visits and less than 2% went to either MMC or CMMC combined. Similarly, in the Portland region, MMC took care of 64.2% of the inpatient visits with less than 1% going to either EMMC or CMMC combined. On the other hand, CMMC accounted for only 47.2% of the hospital discharges of Lewiston region patients, while 10.7% were

TABLE 5: Patient Choice of Hospital in the Three Largest Regions

	Number Discharges	Percent Total
Bangor Region Patients		
Eastern Maine Medical Center	9,119	70.4%
St. Joseph Hospital	2,860	22.1%
Maine Medical Center	217	1.7%
Mercy Hospital	27	0.2%
Central Maine Medical Center	11	0.1%
Total*	12,969	
Portland Region Patients		
Maine Medical Center	15,732	64.2%
Mercy Hospital	7,390	30.2%
Central Maine Medical Center	168	0.7%
Eastern Maine Medical Center	22	0.1%
Total*	24,510	
Lewiston Region Patients		
Central Maine Medical Center	5,701	47.2%
St. Mary's Regional Medical Center	3,931	32.5%
Maine Medical Center	1,288	10.7%
Mercy Hospital	178	1.5%
Eastern Maine Medical Center	12	0.1%
Total*	12,082	

* There is a small number of discharges from other, non-listed hospitals included in the totals shown here.

Based on size and usage, two hospitals clearly stand out as regional medical centers.

handled by MMC. In the Bangor and Lewiston regions 0.2% and 1.5%, respectively, went to Mercy Hospital. The percent going to Mercy Hospital in the Portland region (30.2%) was about the same as the percent of Lewiston region patients going to St. Mary's Hospital (32.5%). The percentage of patients in the Bangor region using St. Joseph Hospital was less (22.1%).

TABLE 6: Charges at the Four Largest Hospitals

Patient Region	Number Discharges	Total Days	Total Charges	Average Charge Per Discharge	Average Charge Per Day
Maine Medical Center					
Portland	15,732	79,402	\$207,512,292	\$13,190	\$2,613
Out-of-Region	13,891	84,465	\$288,624,314	\$20,778	\$3,417
Total	29,623	163,867	\$496,136,606	\$16,748	\$3,028
Eastern Maine Medical Center					
Bangor	9,119	42,076	\$117,082,723	\$12,839	\$2,783
Out-of-Region	7,828	46,903	\$163,546,846	\$20,893	\$3,487
Total	16,947	88,979	\$280,629,569	\$16,559	\$3,154
Central Maine Medical Center					
Lewiston	5,701	26,813	\$85,238,553	\$14,952	\$3,179
Out-of-Region	2,159	13,593	\$52,336,108	\$24,241	\$3,850
Total	7,860	40,406	\$137,574,661	\$17,503	\$3,405
Mercy Hospital					
Portland	7,390	32,284	\$59,995,106	\$8,118	\$1,858
Out-of-Region	1,671	5,970	\$14,491,619	\$8,672	\$2,427
Total	9,061	38,254	\$74,486,725	\$8,221	\$1,947

In the regions with mid-size hospitals, the percent of patients from each region discharged from either MMC or EMMC ranged from a high of 28.2% in the Biddeford region discharged from MMC to a low of 11.5% in the York/Berwick region discharged from MMC. For patients from the Bath/Brunswick, Rockland, and Augusta regions, 19.8%, 15.9%, and 14.7%, respectively, were discharged from MMC. From the Waterville region, 9.8% went to MMC and 4.9% were discharged from EMMC. From the Presque Isle region, 28.2% were discharged from EMMC. In the Lewiston region, where 10.7% were discharged from MMC, the pattern of patient usage of regional medical centers outside of their own region more closely resembled the pattern of the mid-size hospital group than it did the pattern of 1% or 2% out-of-region specialty center use in the Portland or Bangor regions.

HOSPITAL CHARGES

The MHDO also collected information on hospital charges. From the total number of discharges and inpatient days and the total charges, one can compute the average charge per discharge and the average charge per day. Charges are not the same as what hospitals are actually paid by government or private insurance programs. They may, however, reflect relative differences in the cost of hospital operations. As shown in Table 6, charges per discharge and per patient day were fairly similar at MMC and EMMC. For example, the average charge per discharge for patients who came from the hospital's own region was \$13,190 for MMC and \$12,839 for EMMC. The average charge per discharge for out-of-region patients was significantly higher in both cases, \$20,778 for MMC and \$20,893 for EMMC. The same relationship existed for the average charges per day. The higher charges for out-of-region patients would be consistent with having a higher proportion of specialty care patients in the out-of-region groups, and a larger portion of general hospital patients in the in-region groups.

Central Maine Medical Center exhibited the same trend to higher charges for out-of-region patients, \$14,952 per discharge for in-region and \$24,241 for out-of-region patients. At Mercy Hospital, while the in-region patient charges were lower (\$8,118) than the out-of-region charges (\$8,672), the difference was much smaller. The charges at Mercy Hospital also were significantly lower than the other three hospitals. These lower charges may be due to the lower number of beds relative to discharges at Mercy Hospital, and would be consistent with a lower acuity level of the patients served and fewer high-tech specialty services. Central Maine Medical Center had the highest charges per discharge for both in and out-of-region patients. These higher charges may result from spreading the cost of high-tech services over an insufficient patient base. In addition, CMMC had a larger number of beds relative to discharges than MMC or EMMC.

DISCUSSION

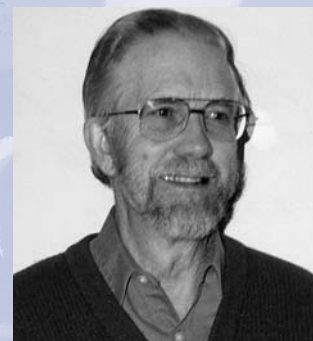
Based on size and usage, two hospitals clearly stand out as regional medical centers. Both EMMC in Bangor and MMC in Portland have the number of beds and discharges to efficiently support the high-cost and high-tech facilities needed for the range of highly specialized services found in regional medical centers. Both hospitals also serve patients from a wide area of the state. Moreover, very few patients from the Bangor and Portland regions seek care in regional medical centers outside their own region. Fortunately, MMC's and EMMC's broader regional service areas overlap very little with each other, except in the Waterville region.

The other two large hospitals, CMMC and Mercy Hospital, do not function as regional medical centers on the same level as EMMC or MMC. Neither CMMC nor Mercy Hospital draws a large enough volume of patients from a significant number of other regions in the state to justify designation as a regional center. Neither probably has a large enough volume of patients to efficiently support a full range of regional medical center services. Finally, CMMC does not serve the regional medical center needs of all the patients in its own region. Indeed, in 2002 a significant percent (10.7%) of patients in the Lewiston region sought treatment from MMC.

For either CMMC or Mercy Hospital to develop into a full regional center, it would have to expand the range of services provided, and probably the number of beds, in anticipation of attracting patients from a larger geographic region. Private payers, private insurers, and government would have to absorb these additional costs, or private donors would have to be found. In addition, CMMC or Mercy Hospital would have to convince patients and physicians in other regions to change their usage and referral patterns, and choose CMMC or Mercy Hospital specialty services. In the Lewiston region, convincing patients and physicians in that region alone would not provide a sufficient increase in patients to guarantee efficient operation of a regional medical center. Even if the transition costs were managed and patient recruitment achieved, development of additional regional medical centers would not increase the efficiency of Maine's overall hospital

system. Attracting patients to CMMC or Mercy Hospital from a larger area would reduce the number of patients using the two current regional medical centers, MMC and EMMC, and potentially cause an increase in their per-patient (service-unit) cost as their fixed overhead would be spread over a smaller patient pool.

The analysis here is based only on an examination of total numbers of discharges, charges, and geographic origins of patients discharged. More definitive conclusions about these hospitals, the roles they serve, and the quality of care provided, requires a closer examination of the type and acuity of the medical conditions treated and the type and range of services offered. This analysis also does not answer the question of the number of regional medical centers Maine can—or should—efficiently support, when compared to the costs of services at regional medical centers in other states. The geographic spread of the population and size of the state may require at least two centers. However, policymakers need to closely examine whether a population base of 1.3 million people can efficiently support more than two regional medical centers. 🐟



Lars Rydell joined the staff of the Maine Legislature's Office of Policy and Legal Analysis in 1979, and in 1989 moved to the Office of the Secretary of State as Deputy Secretary of State for Information. From 1998 until his retirement in 2002, he served as management analyst, carrying out special projects for the Commissioner of Administrative and Financial Services, a role he continues to serve on a part-time basis. Prior to 1979, he served on the faculty at the University of Rhode Island and at the Institute for Social Medicine, University of Oslo.

ENDNOTES

1. The three psychiatric facilities include the former community hospital in Fort Fairfield, Acadia Hospital in Bangor, and Spring Harbor in Westbrook. The New England Rehabilitation Hospital is the former Brighton Osteopathic Hospital in Portland.
2. The Bureau of Health is currently reviewing and updating these divisions.