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Hospital Inpatient Workload for Tactical or Strategic Decision-Making

Total surgical workload (e.g., for choosing when to open one additional OR) is forecasted using 1 yr of data from each hospital alone. See the "Long-term workload" report in our sample OR staffing file. From Dexter et al. 1999, Masursky et al. 2008, and Dexter et al. 2018, this time series method accurately predicts total OR hours, but not workload of individual specialties. From the 2008 study, local demographic and economic data are not used, because those data do not improve predictive accuracy, even with many (> 20 yr) of data. State data and trends also are not predictive (click here).

Two kinds of inpatient surgical workload analyses can be performed. A data envelopment analysis uses other facilities as benchmarks to evaluate the relative workloads of different surgical specialties at a hospital. A similarity analysis compares the types of surgical procedures performed at a hospital with those performed by other hospitals in its state or province.

Data envelopment analysis can be applied to US state and national databases to compare hospitals' production of surgery. The University charges $2000. Upon receipt of the appropriate data for DEA from the client hospital, a PDF file with results is generally created and sent by e-mail within 1 week.

Examples of the limited data required for the DEA are shown on pages 6-7 and 13-14 of this PDF file.

Usually the DEA methodology is performed simultaneously with a financial analysis to decide whether to allocate additional block time to a specialty. Click here for consultation details, click here for the abstract of the article, and click here for a PDF of the full text:

> O'Neill L, Dexter F. Tactical increases in operating room block time based on financial data and market growth estimates from data envelopment analysis.
> Anesthesia & Analgesia 104: 355-368, 2007.

The following are types of questions that are answered using the DEA analysis:

- How does each specialty inpatient workload compare to the volume of other key specialties, based on statistical population distribution?

- What would be the likely impact of hiring a new thoracic (or vascular, neurological, etc.) surgeon on the hospital's specialty workload?

- Is thoracic surgery inpatient workload of 121 lung resections high or low compared to that of orthopedics' 213 hip replacements, urology's 132 nephrectomies, and cardiac surgery's 304 coronary artery bypass grafts?

- If a new urologist were recruited, would the hospital likely grow the practice and perform more surgery, or simply have another urologist?

- Are there sufficient patients for each specialty residing close to the hospital?

- To what extent is inpatient specialty OR workload limited by population size as compared to existing capacity or hospital visibility within the community?

- Orthopedic surgery has a very high contribution margin per operating room hour. Operating room capacity is being expanded by running some ORs for 10 hr instead of 8 hr. Should the additional OR time be planned for orthopedics? Are there really more cases to be done?

After the PDF report is sent, these questions can be discussed by e-mail. The University charges $250 per hour.

Similarity analysis uses state discharge abstract data to compare the surgical procedures performed at one hospital with those performed at every other hospital in its state or province. The University charges $4000. Unlike for the DEA, the state discharge abstract data are provided by the hospital. Upon receipt of the data, a PDF file with results is generally sent by e-mail within 1 week.

Click here, here, and here for abstracts of the articles, and click here, here, and here for the full text:

> Wachtel RE, Dexter EU, Dexter F. Application of a similarity index to state discharge abstract data to identify opportunities for growth of surgical and anesthesia practices.
> Anesthesia and Analgesia 104: 1157-1170, 2007.

> Wachtel RE, Dexter F, Barry B, Applegeet C. Use of state discharge abstract data to identify hospitals performing similar types of operative procedures. Anesthesia and Analgesia 110: 1146-1154, 2010.

> Dexter F, Ledolter J, Hindman BJ. Quantifying the diversity and similarity of surgical procedures among hospitals and anesthesia providers. Anesthesia & Analgesia 122: 251 263, 2016.

A similarity analysis is appropriate for a hospital located in any sized community. A DEA analysis is not appropriate for a hospital in a metropolitan area with a population exceeding one million. A similarity analysis identifies the relationship of a hospital to other hospitals in the state or province, which are identified by name, whereas the DEA uses benchmark hospitals. Both group surgical procedures together into categories using Clinical Classifications Software (CCS) terminology.

The following are examples of questions that are answered using similarity analyses:

- Do other hospitals in the hospital's primary market area perform the same types of procedures as the hospital for which the analysis is being performed? Do other hospitals in the primary market area compete with the hospital for the same patients or do the other hospitals perform types of procedures that are different from those of the hospital of interest?

- What other hospitals in the state are competitors? What other hospitals in the primary and secondary market areas perform the same types of procedures as the hospital of interest, such that the hospital is competing with those other hospitals for the same patients?

- What opportunities for growth can be targeted by the hospital? What types of procedures are being performed in large numbers by other hospitals in the primary and secondary market areas? Which other hospitals are performing large numbers of procedures that could also be performed at the hospital?

- Which other hospitals can be considered peer institutions for purposes of recruiting physicians and nurses, negotiating purchasing contracts and insurance reimbursement rates, comparing costs and charges, benchmarking lengths of stay and quality improvement initiatives, and evaluating volume and market share?

- For what types of procedures are patients leaving the hospital's primary or secondary referral areas to have their surgery elsewhere in the state?

- Which hospitals located outside the hospital's primary or secondary referral areas are performing surgery on patients who live within the region?

After the Excel file report is sent, these questions are discussed during a web conference.

Similarity analysis is based on state or provincial discharge abstract data. Such data are typically available at no cost to participating hospitals, usually from its hospital association. Discharge abstract data contain diagnostic, treatment, and patient demographic information from virtually every hospital discharge in the state. The only fields needed to perform a basic similarity analysis are hospital identifier and either the ICD-10-PCS procedure codes or CPT codes for each procedure associated with the discharge. For some analyses, patient and hospital counties must also be provided.

Sample output for *similarity analysis* in which the client hospital of interest (Hosp #1) is compared to a single other hospital in the state (Hosp #2).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Hospital	Total N	similarity	SE similarity	CCS Category	Description	N Hosp #1	N Hosp #2	Possible Competitor Hosp #2 >= 75% of total or Hosp #2 does 100 more	Potential for Growth Hosp similarity > 0.6 CCS similarity >= 0.8 min 50 procs	potential charges (millions)	Advertising Strategy Hosp #1 >= 5x	Advertising Strategy Hosp #1 >= 10x	similarity of CCS Hosp #1 vs. Hosp #2	SE similarity	Herfindahl of CCS Statewide	SE Herfindahl	Herfindahl of CCS Hosp #2	SE Herf Hosp #2
Hosp #2	2,201	0.77	0.02															
				158	Spinal fusion'	177	182		X	$11.7			0.93	0.00	0.20	0.00	0.24	0.02
				134	Cesarean section'	123	181		X	$2.6			1.00	0.00	0.97	0.00	0.97	0.02
				3	Laminectomy; excision intervertebral disc'	110	119		X	$2.9			0.97	0.00	0.46	0.00	0.56	0.04
				115	Circumcision'	98	192		X	$1.1			1.00	0.00	1.00	0.00	1.00	0.00
				124	Hysterectomy; abdominal and vaginal'	94	71						0.79	0.07	0.28	0.00	0.34	0.04
				119	Oophorectomy; unilateral and bilateral'	68	71						0.73	0.09	0.37	0.00	0.34	0.05
				152	Arthroplasty knee'	57	124		X	$4.9			1.00	0.00	0.79	0.00	0.85	0.04
				153	Hip replacement; total and partial'	55	102						0.53	0.07	0.28	0.00	0.28	0.02
				142	Partial excision bone'	45	48						0.96	0.00	0.21	0.00	0.57	0.09
				114	Open prostatectomy'	41	0								0.80	0.01		
				67	Other therapeutic procedures; hemic and lymphatic	38	9						0.23		0.30	0.00	0.51	0.15
				90	Excision; lysis peritoneal adhesions'	30	69						1.00	0.00	0.64	0.00	0.66	0.06
				86	Other hernia repair'	27	40						0.82		0.17	0.00	0.18	0.02
				132	Other OR therapeutic procedures; female organs'	27	17						0.61		0.07	0.00	0.29	0.08
				99	Other OR gastrointestinal therapeutic procedures'	26	23						0.68	0.00	0.10	0.00	0.17	0.05
				106	Genitourinary incontinence procedures'	24	8						0.86		0.55	0.01	0.63	0.15
				80	Appendectomy'	23	103						0.99	0.00	0.45	0.00	0.69	0.06
				129	Repair of cystocele and rectocele; obliteration of va	22	20						0.83	0.00	0.28	0.00	0.49	0.07
				175	Other OR therapeutic procedures on skin and breas	22	5						0.23		0.10	0.00	0.44	0.18
				61	Other OR procedures on vessels other than head a	21	38						0.49	0.12	0.18	0.00	0.14	0.03
				84	Cholecystectomy and common duct exploration'	20	78						1.00	0.00	0.63	0.00	0.77	0.06
				160	Other therapeutic procedures on muscles and tend	18	24						0.06		0.06	0.00	0.29	0.09
				94	Other OR upper GI therapeutic procedures'	18	7						0.00		0.14	0.00	0.18	0.05
				121	Ligation or occlusion of fallopian tubes'	15	49						0.88		0.51	0.00	0.70	0.07
				123	Other operations on fallopian tubes'	15	6						0.68		0.19	0.00	0.28	0.06
				146	Treatment; fracture or dislocation of hip and femur'	14	72						0.99		0.41	0.00	0.41	0.04
				125	Other excision of cervix and uterus'	13	2								0.64	0.01		
				78	Colorectal resection'	12	57						0.59		0.18	0.00	0.20	0.03
				167	Mastectomy'	11	11						0.96		0.32	0.00	0.42	0.06
				147	Treatment; fracture or dislocation of lower extremity	9	38						0.96		0.40	0.00	0.60	0.09
				96	Other OR lower GI therapeutic procedures'	8	47						0.29		0.05	0.00	0.07	0.01
				120	Other operations on ovary'	8	6						0.35		0.27	0.01	0.33	0.14
				164	Other OR therapeutic procedures on musculoskelet	8	2								0.09	0.00		
				148	Other fracture and dislocation procedure'	7	35						0.83		0.16	0.00	0.52	0.09
				104	Nephrectomy; partial or complete'	6	0								0.52	0.01		
				157	Amputation of lower extremity'	5	23						0.37		0.31	0.00	0.31	0.05
				112	Other OR therapeutic procedures of urinary tract'	5	9						0.00		0.05	0.00	0.63	0.18
				33	Other OR therapeutic procedures on nose; mouth a	5	5						0.07		0.04	0.00	0.44	0.18
				1	Incision and excision of CNS'	5	0								0.21	0.00		
				169	Debridement of wound; infection or burn'	4	40						1.00		1.00	0.00	1.00	0.00
				75	Small bowel resection'	4	10						0.98		0.91	0.01	0.82	0.15
				101	Transurethral excision; drainage; or removal urinary	4	5						0.86		0.50	0.00	1.00	0.00
				122	Removal of ectopic pregnancy'	4	4						1.00		0.90	0.01	1.00	0.00
				9	Other OR therapeutic nervous system procedures'	4	1								0.06	0.00		
				113	Transurethral resection of prostate (TURP)'	4	1								0.75	0.01		
				162	Other OR therapeutic procedures on joints'	3	19						0.05		0.06	0.00	0.22	0.08
				42	Other OR Rx procedures on respiratory system and	3	4						0.13		0.05	0.00	0.38	0.13
				52	Aortic resection; replacement or anastomosis'	3	4						0.46		0.33	0.00	0.50	0.00
				66	Procedures on spleen'	3	1								0.74	0.01		
				28	Plastic procedures on nose'	3	0								0.24	0.01		
				161	Other OR therapeutic procedures on bone'	2	37						0.07		0.07	0.00	0.85	0.08
				51	Endarterectomy; vessel of head and neck'	2	29						1.00	0.00	1.00	0.00	1.00	0.00
				55	Peripheral vascular bypass'	2	24						0.78		0.78	0.01	0.59	0.08
				103	Nephrotomy and nephrostomy'	2	10						0.50		0.50	0.01	1.00	0.00
				74	Gastrectomy; partial and total'	2	4						0.27		0.27	0.00	0.63	0.22
				127	Dilatation and curettage (D&C); aspiration after deliv	2	4						0.50		0.50	0.00	1.00	0.00
				172	Skin graft'	2	4						0.25		0.25	0.00	1.00	0.00
				10	Thyroidectomy; partial or complete'	2	3						0.38		0.38	0.00	0.56	0.18
				12	Other therapeutic endocrine procedures'	2	0								0.11	0.00		
				85	Inguinal and femoral hernia repair'	1	15								0.12	0.00	0.15	0.03
				72	Colostomy; temporary and permanent'	1	14								0.40	0.01	0.46	0.08
				60	Embolectomy and endarterectomy of lower limbs'	1	12								0.51	0.00	0.51	0.05
				30	Tonsillectomy and/or adenoidectomy'	1	4								0.40	0.01	0.63	0.22
				79	Local excision of large intestine lesion (not endosco	1	2								1.00	0.00		
				59	Other OR procedures on vessels of head and neck'	1	1								0.32	0.01		
				2	Insertion; replacement; or removal of extracranial ve	1	0								0.33	0.01		
				39	Incision of pleura; thoracentesis; chest drainage'	1	0								1.00	0.00		
				73	Ileostomy and other enterostomy'	1	0								0.35	0.01		
				109	Procedures on the urethra'	1	0								0.19	0.01		
				141	Other therapeutic obstetrical procedures'	1	0								0.85	0.02		
				145	Treatment; fracture or dislocation of radius and ulna	0	15								0.56	0.01	0.48	0.14
				154	Arthroplasty other than hip or knee'	0	15								0.19	0.00	0.77	0.13
				57	Creation; revision and removal of arteriovenous fistul	0	9								0.52	0.01	0.56	0.10
				118	Other OR therapeutic procedures; male genital'	0	4								0.08	0.00	0.38	0.13
				15	Lens and cataract procedures'	0	2								0.24	0.01		
				81	Hemorrhoid procedures'	0	2								0.66	0.02		
				140	Repair of current obstetric laceration'	0	2								0.42	0.01		
				151	Excision of semilunar cartilage of knee'	0	2								1.00	0.00		
				34	Tracheostomy; temporary and permanent'	0	1								1.00	0.00		
				36	Lobectomy or pneumonectomy'	0	1								0.21	0.00		
				89	Exploratory laparotomy'	0	1								1.00	0.00		
				150	Division of joint capsule; ligament or cartilage'	0	1								0.37	0.02		
				170	Excision of skin lesion'	0	1								1.00	0.00		

COLUMN	COMMENTS
A	Name of comparison hospital, Hosp #2
B	Number of surgical procedures performed by Hosp #2
C	Similarity index comparing the types of procedures performed at the two hospitals. Values > 0.7 indicate a high degree of similarity.
D	Standard error of the similarity index
E	Clinical Classifications Software category number. CCS creates groupings of procedures that involve related organ systems.
F	Description of CCS category
G	Number of surgical procedures performed by Hosp #1 within the CCS. The CCS categories are sorted in descending order of number of procedures.
H	Number of surgical procedures performed by Hosp #2 within the CCS.
I	An "X" is placed in this column if Hosp #2 is a potential competitor of Hosp #1.
J	An "X" is placed in this column if the CCS represents a potential for growth for Hosp #1.
K	The potential charges that could be billed by Hosp #1 if it performed the procedures currently done by Hosp #2.
L	An "X" is placed in this column if Hosp #1 can use the CCS as an advertising strategy because it performs 5 times as many procedures as Hosp #2.
M	An "X" is placed in this column if Hosp #1 can use the CCS as an advertising strategy because it performs 10 times as many procedures as Hosp #2.
N	Similarity index comparing procedures within the CCS category to determine whether the two hospitals are actually performing the same types of procedures
O	Standard error of the similarity index
P	Herfindahl index of procedures within the CCS category statewide to indicate the number of different types of procedures that comprise the category
Q	Standard error of the Herfindahl index
R	Herfindahl index of procedures within the CCS category for Hosp #2 to indicate the number of different types of procedures that comprise the category
S	Standard error of the Herfindahl index
T	(not shown) National mean length of stay for patients admitted for surgical procedures within the CCS
U	(not shown) Mean charges nationwide for patients admitted for surgical procedures within the CCS
V	(not shown) Mean discharges per week nationwide for patients admitted for surgical procedures within the CCS

Summary of the Data Envelopment Analysis
for General Hospital
January 1, 2007

Outputs - Counts of hospital discharges including the listed procedures		**Specialty for which listed procedures are a reliable surrogate for the "inpatient workload"**
AAA	Abdominal aortic aneurysm resection	Vascular surgery
CABG	Coronary artery bypass graft	Cardiac surgery
Colorectal	Colorectal resection	General surgery
Craniotomy	Craniotomy, not for trauma	Neurological surgery
Hip	Hip replacement	Orthopedics
Hysterectomy	Hysterectomy	Gynecology
Lung	Lung resection	General thoracic surgery
Nephrectomy	Nephrectomy	Urology

Inputs

County	Estimated hospital charges for the above 8 procedures performed on residents of hospital's
Region	county and region, normalized by the land area of hospital's county and region
Beds	Staffed beds at the hospital
Surgeons	Surgeons who performed at least three cases of any one of the above 8 procedures at the hospital
Tech	Number of nine high technology services offered at the hospital (e.g., solid organ transplantation)

References

O'Neill L, Dexter F. Market capture of inpatient perioperative services using data envelopment analysis. *Health Care Management Science* 7:263-273, 2004

Dexter F, O'Neill L. Data envelopment analysis to determine by how much hospitals can increase elective inpatient surgical workload for each specialty. *Anesthesia & Analgesia* 99: 1492-1500, 2004

O'Neill L, Dexter F. Methods for understanding super-efficient data envelopment analysis results with an application to hospital inpatient surgery. *Health Care Management Science* 8: 291-298, 2005

O'Neill L, Dexter F. Tactical increases in operating room block time based on financial data and market growth estimates from data envelopment analysis. *Anesthesia & Analgesia* 104: 355-368, 2007

Dexter F, O'Neill L, Lei X, Ledolter J. Sensitivity of super-efficient data envelopment analysis results to individual decision-making units: an example of surgical workload by specialty. *Health Care Management Science* 11: 307-318, 2008

Instructions

Press Tab key to go from one field to the next. Answer questions sequentially, as successive questions rely on preceding answers. Overwrite example responses with your own. If a question is confusing, e-mail me at Franklin-Dexter@UIowa.edu.

E-mail the completed file to   {unlisted here}

If you do not receive an e-mail from me within one day confirming receipt of the file, call me at 319-621-6360.

State in which hospital is located

Florida

Hospital name precisely as reported to the State of Florida

General Hospital

Staffed acute and intensive care beds at General Hospital, both surgical and non-surgical. The value should be the close to that reported in the American Hospital Association annual survey.

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First date of the start of the one year (365 day) period to be studied

July 1, 2004

Name of county in which General Hospital is located

Lee

Alphabetical list of the names of counties that are contiguous to Lee county, regardless of how short is the common border. Include any counties that abut Lee county, even if they just touch. Include counties in adjacent states. PLEASE check spellings, because these entries will be aligned with U.S. Census data.

Beaver	Fayette	Luzerne	Sullivan						

Yes or No questions specify availability of technological services at General Hospital. For each response, select ' Yes ' if there were at least 3 discharges or outpatient visits for such care between 7/1/2004 and 6/30/2005. Usually these questions are answered from general knowledge of the hospital.
I provided DRG's solely if you wish to investigate the services provided at General Hospital.

Yes	Trauma care (e.g., MS-DRG 082 - 087, 183 - 185, 562 - 563, 604 - 605, 913 - 914, 955 - 965, 927 - 929, 933 - 935)
Yes	Cardiac surgery (e.g., MS-DRG 001 - 002, 216 - 221, 228 - 236, 306 - 307)
No	Solid organ transplantation (e.g., MS-DRG 001, 002, 005 - 010, 652)
Yes	Cardiac catheterization (e.g., MS-DRG 216 - 218, 222 - 225, 231 - 234, 286 - 287)
Yes	Urological lithotripsy (e.g., MS-DRG 691 or 692, but do not just limit to hospitalizations)
Yes	Neonatal intensive care (e.g., MS-DRG 790 - 794)
Yes	Megavoltage radiation therapy (e.g., MS-DRG 849, but be sure to include the outpatient visits)
Yes	Magnetic resonance imaging

Enter the number of hospital discharges during the one year (365 days) period chosen above, 7/1/2004 to 6/30/2005. Enter how many different surgeons performed the procedure at least 3 times during the year at General Hospital. Include a patient if the DRG matches or if any of the ICD-9-CM procedure codes match, primary or secondary. The appropriate DRG and ICD-9-CM are listed below.
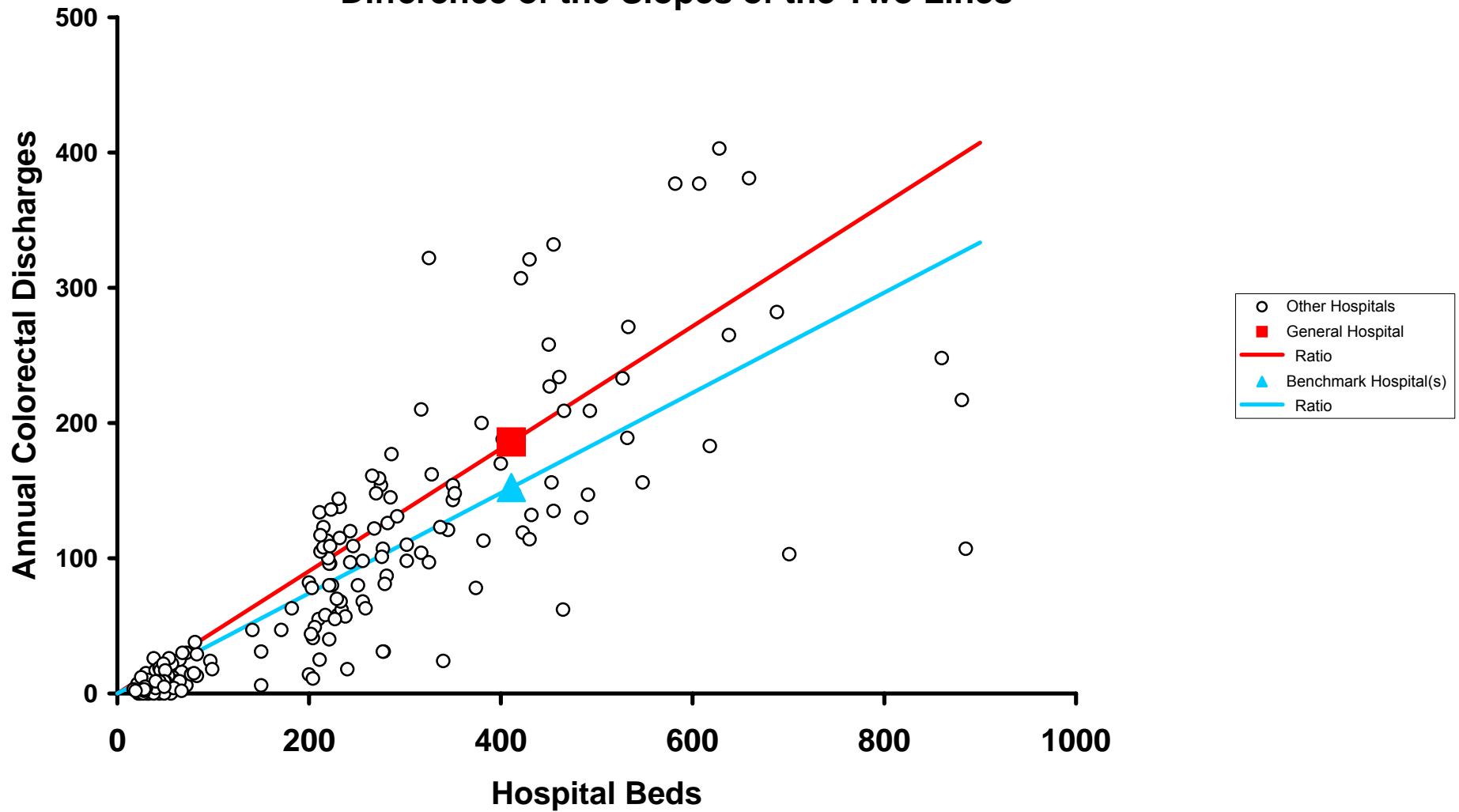
Discharges	Surgeons	Clinical Classifications Software (CCS) description of the procedure(s)
14	2	AAA; Aortic resection, replacement or anastomosis (CCS 52)
756	3	CABG; Coronary artery bypass graft (CCS 44)
186	8	Colorectal resection (CCS 78)
32	3	Craniotomy in adults, not for trauma (DRG 1, 2, or 543; MS-DRG 23 - 27)
179	11	Hip replacement, total and partial (CCS 153)
459	22	Hysterectomy, abdominal and vaginal (CCS 124)
47	4	Lung resection (CCS 36)
44	7	Nephrectomy, partial or complete (CCS 104)

Craniotomy is based on DRGs. The other procedures use the CCS grouping of ICD-9-CM. To facilitate your data exporting, each CCS's
ICD-9-CM can be copied from the columns below. Alternatively, click on   http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccsfactsheet.jsp

AAA	CABG	Colorectal	Hip Replacement	Hysterectomy	Lung Resection	Nephrectomy
3834	3610	4571	8151	683	3220	554
3844	3611	4572	8152	6831	3221	5551
3864	3612	4573	8153	6839	3222	5552
3971	3613	4574	8169	684	3223	5553
3973	3614	4575	0070	6841	3224	5554
3979	3615	4576	0071	6849	3225	
	3616	4579	0072	685	3226	
	3617	458	0073	6851	3229	
	3619	4841	0074	6859	323	
	362	4849	0075	686	3230	
	363	485	0076	6861	3239	
	3631	4861	0077	6869	324	
	3632	4862	0085	687	3241	
	3633	4863	0086	6871	3249	
	3634	4864	0087	6879	325	
	3639	4865		689	3250	
		4869			3259	

Productivity Ratio Equals Percentage Difference of the Slopes of the Two Lines

Annual Colorectal Discharges vs. Hospital Beds

Legend:
- ○ Other Hospitals
- ■ General Hospital
- — Ratio
- ▲ Benchmark Hospital(s)
- — Ratio

Productivity Ratios for General Hospital

	AAA	CABG	Colorectal	Craniotomy	Hip Replacement	Hysterectomy	Lung Resection	Nephrectomy
Beds	-70%	**100%**	20%	-50%	-30%	**100%**	30%	40%
County	-70%	**100%**	20%	-50%	-30%	**100%**	30%	40%
Region	-70%	**100%**	20%	-50%	-30%	**100%**	30%	40%
Surgeons	-80%	60%	0%	-60%	-40%	60%	0%	20%
Tech.	-70%	**100%**	20%	-50%	-30%	**100%**	30%	40%

Data envelopment analysis chooses automatically those outputs and inputs that make General Hospital appear as efficient as possible. Those are the output and input combinations highlighted in bold red. The super-efficiency score of the hospital equals 100% plus the listed bold red value. Productivity ratios equal the ratios of (hospital's output / hospital's input) expressed as percentage differences from that of the corresponding benchmark hospital(s). For inputs, focus on the largest (most positive) values, as those are the bottlenecks to increased surgery. For outputs, focus on the smallest (most negative) values, as those are the specialties with the weakest market capture.

Gaps for General Hospital

	Weight	AAA	CABG	Colorectal	Craniotomy	Hip Replacement	Hysterectomy	Lung Resection	Nephrectomy
Hospital 0		14	756	186	32	179	459	47	44
Hospital 55	0.64	31	244	143	57	263	210	26	23
Hospital 127	0.07	52	270	120	35	147	171	48	27
Hospital 131	0.13	53	671	156	62	160	276	31	24
Hospital 154	0.20	85	577	156	115	274	235	62	53
Benchmark (Weighted combination)		48	382	152	70	255	232	37	30
Difference		34	-374	-34	38	76	-227	-10	-14
Gap		240%	-49%	-18%	119%	42%	-49%	-22%	-31%

The same weight is applied to all procedures at each hospital. The weights are a direct consequence of the selection of inputs and outputs to make General Hospital appear as efficient as possible. The gap is the ratio of the difference to the current count of cases. A negative gap infers that more cases are being done than expected from the benchmark hospital(s). A positive gap shows the potential of General Hospital to increase its workload for the specialty.

Summary of the Data Envelopment Analysis
for Academic Hospital
October 11, 2005

Outputs - Counts of hospital discharges including the listed procedures

Specialty for which listed procedures are a reliable surrogate for the "inpatient workload"

AAA	Abdominal aortic aneurysm resection	Vascular surgery
CABG	Coronary artery bypass graft	Cardiac surgery
Colorectal	Colorectal resection	General surgery
Craniotomy	Craniotomy, not for trauma	Neurological surgery
Hip	Hip replacement	Orthopedics
Hysterectomy	Hysterectomy	Gynecology
Lung	Lung resection	General thoracic surgery
Nephrectomy	Nephrectomy	Urology

Inputs

County	Estimated hospital charges for the above 8 procedures performed on residents of hospital's
Region	county and region, normalized by the land area of hospital's county and region
Beds	Staffed beds at the hospital
Surgeons	Surgeons who performed at least three cases of any one of the above 8 procedures at the hospital
Tech	Number of nine high technology services offered at the hospital (e.g., solid organ transplantation)

References

O'Neill L, Dexter F. Market capture of inpatient perioperative services using data envelopment analysis. *Health Care Management Science* 7:263-273, 2004

Dexter F, O'Neill L. Data envelopment analysis to determine by how much hospitals can increase elective inpatient surgical workload for each specialty. *Anesthesia & Analgesia* 99: 1492-1500, 2004

O'Neill L, Dexter F. Methods for understanding super-efficient data envelopment analysis results with an application to hospital inpatient surgery. *Health Care Management Science* 8: 291-298, 2005

O'Neill L, Dexter F. Tactical increases in operating room block time based on financial data and market growth estimates from data envelopment analysis. *Anesthesia & Analgesia* 104: 355-368, 2007

Instructions

Press Tab key to go from one field to the next. Answer questions sequentially, as successive questions rely on preceding answers. Overwrite example responses with your own. If a question is confusing, e-mail me at Franklin-Dexter@UIowa.edu.

E-mail the completed file to   {Unlisted here}

If you do not receive an e-mail from me within one day confirming receipt of the file, call me at 319-621-6360.

State in which hospital is located

California

Hospital name precisely as reported to the State of California

Academic Hospital

Staffed acute and intensive care beds at Academic Hospital, both surgical and non-surgical. The value should be the close to that reported in the American Hospital Association annual survey.

850

First date of the start of the one year (365 day) period to be studied

July 1, 2004

Name of county in which Academic Hospital is located

Benton

Alphabetical list of the names of counties that are contiguous to Benton county, regardless of how short is the common border. Include any counties that abut Benton county, even if they just touch. Include counties in adjacent states. PLEASE check spellings, because these entries will be aligned with U.S. Census data.

Buchanan	Clarke	Fremont	Jackson	Williamsburg					

Yes or No questions specify availability of technological services at Academic Hospital. For each response, select ' Yes ' if there were at least 3 discharges or outpatient visits for such care between 7/1/2004 and 6/30/2005. Usually these questions are answered from general knowledge of the hospital. I provided DRG's solely if you wish to investigate the services provided at Academic Hospital.

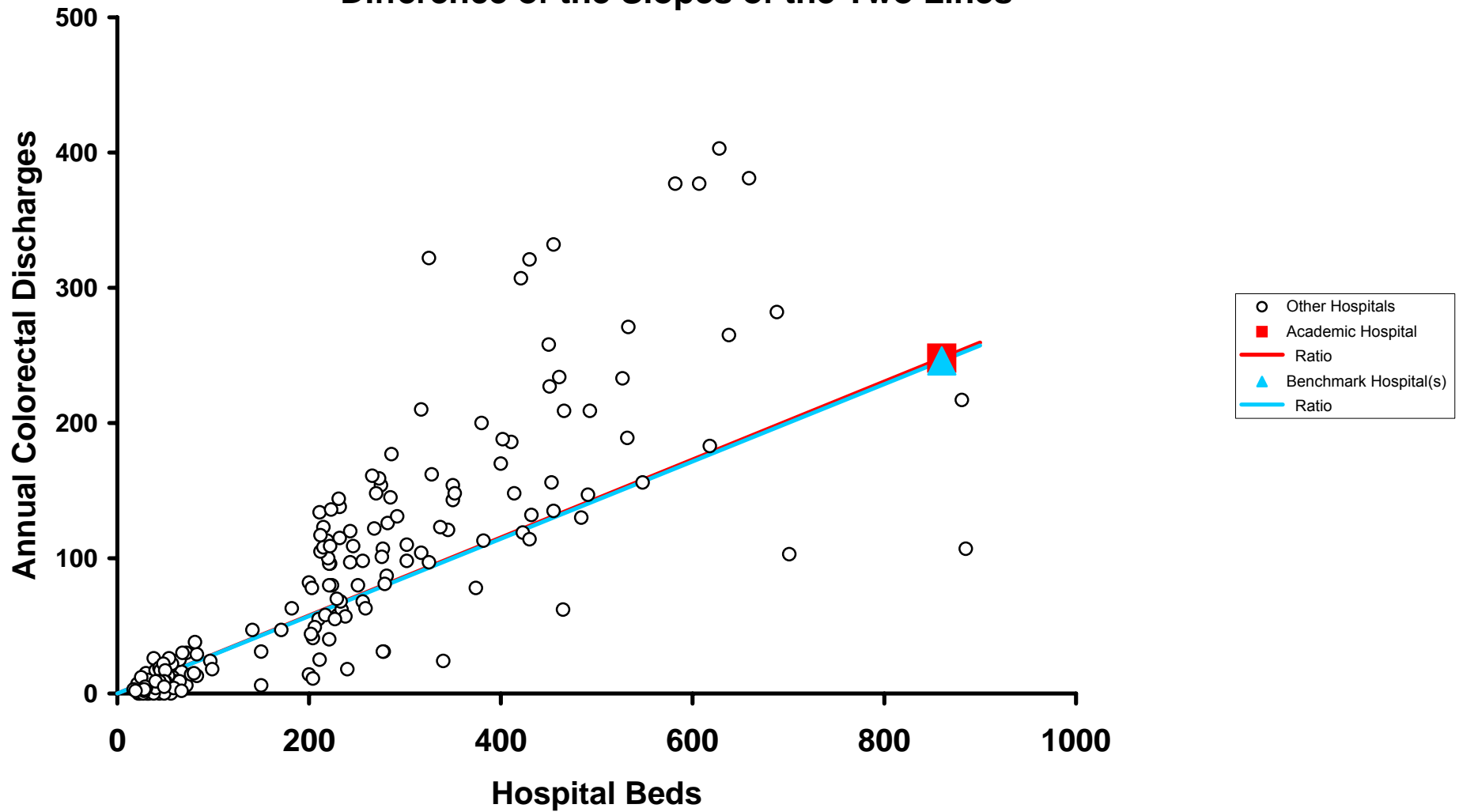|	
Yes	Trauma care (e.g., MS-DRG 082 - 087, 183 - 185, 562 - 563, 604 - 605, 913 - 914, 955 - 965, 927 - 929, 933 - 935)
Yes	Cardiac surgery (e.g., MS-DRG 001 - 002, 216 - 221, 228 - 236, 306 - 307)
Yes	Solid organ transplantation (e.g., MS-DRG 001, 002, 005 - 010, 652)
Yes	Cardiac catheterization (e.g., MS-DRG 216 - 218, 222 - 225, 231 - 234, 286 - 287)
Yes	Urological lithotripsy (e.g., MS-DRG 691 or 692, but do not just limit to hospitalizations)
Yes	Neonatal intensive care (e.g., MS-DRG 790 - 794)
Yes	Megavoltage radiation therapy (e.g., MS-DRG 849, but be sure to include the outpatient visits)
Yes	Magnetic resonance imaging

Enter the number of hospital discharges during the one year (365 days) period chosen above, 7/1/2004 to 6/30/2005. Enter how many different surgeons performed the procedure at least 3 times during the year at Academic Hospital. Include a patient if the DRG matches or if any of the ICD-9-CM procedure codes match, primary or secondary. The appropriate DRG and ICD-9-CM are listed below.

Discharges	Surgeons	Clinical Classifications Software (CCS) description of the procedure(s)
144	12	AAA; Aortic resection, replacement or anastomosis (CCS 52)
284	5	CABG; Coronary artery bypass graft (CCS 44)
248	19	Colorectal resection (CCS 78)
575	18	Craniotomy in adults, not for trauma (DRG 1, 2, or 543; MS-DRG 23 - 27)
271	11	Hip replacement, total and partial (CCS 153)
304	19	Hysterectomy, abdominal and vaginal (CCS 124)
151	3	Lung resection (CCS 36)
164	9	Nephrectomy, partial or complete (CCS 104)

Craniotomy is based on DRGs. The other procedures use the CCS grouping of ICD-9-CM. To facilitate your data exporting, each CCS's
ICD-9-CM can be copied from the columns below. Alternatively, click on   http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccsfactsheet.jsp

AAA	CABG	Colorectal	Hip Replacement	Hysterectomy	Lung Resection	Nephrectomy
3834	3610	4571	8151	683	3220	554
3844	3611	4572	8152	6831	3221	5551
3864	3612	4573	8153	6839	3222	5552
3971	3613	4574	8169	684	3223	5553
3973	3614	4575	0070	6841	3224	5554
3979	3615	4576	0071	6849	3225	
	3616	4579	0072	685	3226	
	3617	458	0073	6851	3229	
	3619	4841	0074	6859	323	
	362	4849	0075	686	3230	
	363	485	0076	6861	3239	
	3631	4861	0077	6869	324	
	3632	4862	0085	687	3241	
	3633	4863	0086	6871	3249	
	3634	4864	0087	6879	325	
	3639	4865		689	3250	
		4869			3259	

Productivity Ratio Equals Percentage Difference of the Slopes of the Two Lines

Annual Colorectal Discharges vs. Hospital Beds

Legend:
- ○ Other Hospitals
- ■ Academic Hospital
- — Ratio
- ▲ Benchmark Hospital(s)
- — Ratio

Productivity Ratios for Academic Hospital

	AAA	CABG	Colorectal	Craniotomy	Hip Replacement	Hysterectomy	Lung Resection	Nephrectomy
Beds	50%	-50%	0%	210%	-30%	-10%	120%	210%
County	140%	-20%	60%	**410%**	10%	40%	250%	**410%**
Region	120%	-20%	50%	360%	0%	30%	220%	360%
Surgeons	90%	-30%	30%	310%	-10%	10%	190%	310%
Tech.	140%	-20%	60%	**410%**	10%	40%	250%	**410%**

Data envelopment analysis chooses automatically those outputs and inputs that make Academic Hospital appear as efficient as possible. Those are the output and input combinations highlighted in bold red. The super-efficiency score of the hospital equals 100% plus the listed bold red value. Productivity ratios equal the ratios of (hospital's output / hospital's input) expressed as percentage differences from that of the corresponding benchmark hospital(s). For inputs, focus on the largest (most positive) values, as those are the bottlenecks to increased surgery. For outputs, focus on the smallest (most negative) values, as those are the specialties with the weakest market capture.

Gaps for Academic Hospital

	Weight	AAA	CABG	Colorectal	Craniotomy	Hip Replacement	Hysterectomy	Lung Resection	Nephrectomy
Hospital 0		144	284	248	575	271	304	151	164
Hospital 12	0.77	43	215	130	106	202	176	28	21
Hospital 126	0.13	52	270	120	35	147	171	48	27
Hospital 153	0.24	85	577	156	115	274	235	62	53
Benchmark (Weighted combination)		60	340	153	114	241	214	43	32
Difference		-84	56	-95	-461	-30	-90	-108	-132
Gap		-58%	20%	-38%	-80%	-11%	-29%	-72%	-80%

The same weight is applied to all procedures at each hospital. The weights are a direct consequence of the selection of inputs and outputs to make Academic Hospital appear as efficient as possible. The gap is the ratio of the difference to the current count of cases. A negative gap infers that more cases are being done than expected from the benchmark hospital(s). A positive gap shows the potential of Academic Hospital to increase its workload for the specialty.