Utilization of Cath Labs and Cardiovascular ORs at Hospitals with Large Heart Programs

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RESEARCH IN BRIEF

Administrators at large heart programs develop comprehensive cardiovascular (CV) institutes to increase patient volumes and enhance the quality of care physicians provide daily. While there is no published standard for the number of facilities needed per hospital to support specific procedure volumes, many CV executives conduct needs-assessments—composed of data regarding current and projected patient volumes—to determine appropriate numbers and types of labs according to each facility’s unique patient population. Since utilization standards differ among institutions, CV administrators tailor the composition and reporting structure of corresponding scheduling departments to meet their program’s needs. The following brief provides CV volumes, turnaround times (TATs), and mechanisms used to determine appropriate utilization capacity at three hospitals and health systems.

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THE ADVISORY BOARD COMPANY
WASHINGTON, D.C.
I. INTRODUCTION AND CATH LAB UTILIZATION BENCHMARKS

According to a 2001 report by a joint task force—composed of individuals from both Washington, DC-based American College of Cardiology (ACC) and Society for Cardiac Angiography and Interventions (SCAI)—over 6,100 physicians performed more than one million cardiac interventions from 2000 to 2001.\(^1\) These procedures were performed in approximately 2,100 cardiac catheterization laboratories (cath labs) in hospitals with and without cardiac surgery backup, as well as in freestanding labs.\(^2\) The following chart provides further information on the number of cardiovascular (CV) procedures performed at U.S. hospitals.

### Diagnostic cath procedures represent nearly 4 percent of all medical discharges

**Number of cardiovascular (CV) procedures performed by type, 2003**

<table>
<thead>
<tr>
<th>Procedure type</th>
<th>Number of discharges</th>
<th>Percent of all discharges</th>
<th>Average length of stay (ALOS) (in days)</th>
<th>Average charge of hospitalization (in dollars)</th>
<th>Percent died in hospital post-procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary artery bypass graft (CABG)</td>
<td>348,218</td>
<td>0.7</td>
<td>9.9</td>
<td>$94,200</td>
<td>3.3</td>
</tr>
<tr>
<td>Diagnostic cardiac catheterization, coronary arteriography</td>
<td>1,716,748</td>
<td>3.7</td>
<td>4.9</td>
<td>$45,700</td>
<td>1.8</td>
</tr>
<tr>
<td>Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator</td>
<td>358,493</td>
<td>0.8</td>
<td>6.0</td>
<td>$68,500</td>
<td>2.6</td>
</tr>
<tr>
<td>Other OR heart procedures</td>
<td>176,634</td>
<td>0.4</td>
<td>9.5</td>
<td>$94,200</td>
<td>10.4</td>
</tr>
<tr>
<td>Percutaneous coronary angioplasty (PTCA)</td>
<td>800,019</td>
<td>1.7</td>
<td>3.2</td>
<td>$42,800</td>
<td>1.2</td>
</tr>
</tbody>
</table>


ACC recommends physicians perform a minimum of 75 interventions per year

Experts at the ACC and SCAI believe that quality assurance is crucial to the functioning of cardiac cath labs. As such, they assert that for a physician to remain skilled in cardiac cath procedures, he or she must perform a minimum of 75 interventional procedures per year.\(^3\) According to the same research, a minimum of approximately 400 interventions should be performed in each lab per year, and those labs that share both adult and pediatric patients should support a minimum of approximately 75 pediatric interventions per year.\(^4\)

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2. ibid.
4. ibid.
The chart below details annual cath lab volumes for all sites by bed size. Please note that as this data was drawn from a previous Advisory Board research report—which cites a source to which we no longer have access—we were unable to determine whether the report included all cath lab cases in its calculations.

### Physicians at large hospitals perform 10 interventions per week

**Annual cath lab volumes and cases per day, 2002**

<table>
<thead>
<tr>
<th>Type of site</th>
<th>Average annual cases</th>
<th>Cases per day, seven days per week*</th>
<th>Cases per day, five days per week**</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sites (n=1,995 sites)</td>
<td>1,925</td>
<td>5.27</td>
<td>7.4</td>
</tr>
<tr>
<td>400+ beds (n=485 sites)</td>
<td>3,755</td>
<td>10.28</td>
<td>14.4</td>
</tr>
<tr>
<td>200-399 beds (n=900 beds)</td>
<td>1,690</td>
<td>4.63</td>
<td>6.5</td>
</tr>
<tr>
<td>&lt;200 beds (n=540 sites)</td>
<td>785</td>
<td>2.15</td>
<td>3.02</td>
</tr>
<tr>
<td>Non-hospitals (n=70 sites)</td>
<td>1,000</td>
<td>2.73</td>
<td>3.85</td>
</tr>
</tbody>
</table>

*Procedures per day calculated by dividing average annual cases by 365.  
**Procedures per day calculated by dividing average annual cases by 260.

Sources: IMV Report, *Benchmark Report: Cardiac Cath Labs*, (2002); previous Advisory Board research.

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### II. CV OR Utilization Benchmarks

According to experts at the Springfield, Illinois-based Illinois Health Facilities Planning Board (IHFPB), facilities that support surgical cardiac interventions must maintain a series of procedural and volume requirements. These requirements are particularly crucial in certificate of need (CON) states, such as Florida, Illinois, and New York. Though the utilization requirements and benchmarks among all states differ slightly, most states maintain fairly consistent requirements. The chart on the following page provides information on cardiac surgery utilization benchmarks for all CON states. Though the data outlined in the chart represents the minimum utilization standards for hospitals that maintain dedicated CV operating rooms (ORs), it can be inferred that all existing hospitals with these facilities are at least meeting—if not exceeding—the listed utilization standards.

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6 *ibid.*
Most states require hospitals to support between 200 to 400 open heart procedures per year

**CV surgery utilization benchmarks for CON states, 2006**

<table>
<thead>
<tr>
<th>State</th>
<th>Adult CV surgery minimum utilization standards (in number of procedures per year)</th>
<th>Pediatric CV surgery minimum utilization standards (in number of procedures per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska</td>
<td>350</td>
<td>Unknown</td>
</tr>
<tr>
<td>Florida</td>
<td>300</td>
<td>Determined on a regional basis</td>
</tr>
<tr>
<td>Georgia</td>
<td>200</td>
<td>Unknown</td>
</tr>
<tr>
<td>Illinois</td>
<td>200</td>
<td>75</td>
</tr>
<tr>
<td>Iowa</td>
<td>350</td>
<td>75</td>
</tr>
<tr>
<td>Kentucky</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>Michigan</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>350</td>
<td>Unknown</td>
</tr>
<tr>
<td>New Jersey</td>
<td>350</td>
<td>150</td>
</tr>
<tr>
<td>New York</td>
<td>500</td>
<td>50</td>
</tr>
<tr>
<td>Tennessee</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>Virginia</td>
<td>400</td>
<td>Unknown</td>
</tr>
<tr>
<td>West Virginia</td>
<td>250</td>
<td>Unknown</td>
</tr>
</tbody>
</table>


In addition to the above statistics, administrators at several nationally recognized academic medical centers (AMCs) periodically publish statistics related to their annual cardiac surgery volumes. The chart below summarizes cardiac surgery statistics for several institutions named among U.S. News and World Report’s top heart programs in 2003.

Most heart programs support more than 2,000 cardiac interventions per year

**CV surgery annual volumes for select top heart programs, 2003**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Bypass surgeries</th>
<th>Coronary interventions</th>
<th>Congential procedures</th>
<th>Valve surgeries</th>
<th>Vascular surgeries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brigham and Women’s Hospital</td>
<td>1,100</td>
<td>2,400</td>
<td>Unknown</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td><a href="http://www.brighamandwomens.org">www.brighamandwomens.org</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleveland Clinic</td>
<td>1,010</td>
<td>2,904</td>
<td>443</td>
<td>2,254</td>
<td>24,368</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td><a href="http://www.clevelandclinic.org">www.clevelandclinic.org</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duke University Medical Center</td>
<td>950</td>
<td>1,878</td>
<td>Unknown</td>
<td>800</td>
<td>450</td>
</tr>
<tr>
<td>Durham, N.C.</td>
<td><a href="http://www.dukehealth.org">www.dukehealth.org</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massachusetts General Hospital</td>
<td>858</td>
<td>2,077</td>
<td>56</td>
<td>420</td>
<td>305</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td><a href="http://www.massgeneral.org">www.massgeneral.org</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources: “Components of Top Heart Programs,” (April 2004); Various hospital websites as listed above, April 2008.
III. OBSERVATIONS

The following chart summarizes pertinent cath lab and CV OR utilization data for three hospitals and health systems profiled in this report.

<table>
<thead>
<tr>
<th>Utilization benchmark</th>
<th>Hospital A 800-bed, not-for-profit academic medical center (AMC) located in the South</th>
<th>Hospital B 700-bed, not-for-profit teaching hospital located in the Northwest</th>
<th>Hospital C 400-bed, not-for-profit teaching hospital located in the South</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of catheterization laboratories (cath labs)</td>
<td>6</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Annual cath lab volumes</td>
<td>6,200</td>
<td>3,000</td>
<td>8,000</td>
</tr>
<tr>
<td>Cath lab turnaround times (TATs) in hours</td>
<td>0.25</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Number of cardiovascular operating rooms (CV ORs)</td>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Annual CV surgery volumes</td>
<td>700</td>
<td>520</td>
<td>550</td>
</tr>
<tr>
<td>CV surgery TATs in hours</td>
<td>3.5</td>
<td>5.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>

The following observations were drawn from interviews with administrators overseeing CV services and/or cath labs at three teaching hospitals:

Observation #1—Facility needs-assessments determined by combination of measurements, including current and projected patient volumes.

Administrators at all profiled institutions were unable to provide information regarding the composition of the initial facility needs-assessments conducted for their facilities because most of these original evaluations were conducted in the late 1960s. However, they indicate that for every subsequent needs-assessment performed, administrators measure a variety of statistics to appropriately determine the number of dedicated CV facilities required to keep pace with changing patient demographics. For example, administrators profiled in Section IV recently reevaluated the institution’s cath lab and CV OR workflows. In doing so, they measured current patient volumes, patient length of stay (LOS), and national rates of cardiac disease to determine whether or not to construct additional dedicated CV facilities. When administrators profiled in Section V performed a similar facilities assessment in 1994, they measured facility needs based on the hospital’s current and emerging strategic plans. For example, CV executives recently added minimally invasive valve surgery into the CV continuum of care and as a part of this initiative authorized construction of a new cath-bypass hybrid lab.

Observation #2—Cath-bypass hybrid labs anticipated to increase physician and patient utilization, decrease TATs.

All profiled administrators recently developed—or are currently constructing—cath-bypass hybrid labs in order to increase facility utilization and decrease turnaround times (TATs). Administrators all agree that these labs—which typically support up to seven additional cath lab procedures each week—may increase patient throughput while maximizing physician and patient utilization of dedicated CV facilities. For example, administrators profiled in Section IV are confident that the addition of a hybrid lab will prevent case overflow to Saturdays, and will simultaneously motivate physicians to be as productive as possible during the week.
Observation #3—Administrators tailor CV scheduling processes to the specific needs of their heart programs by redesigning departmental reporting structures.

All profiled administrators admit that they are displeased with the current organization of their centralized hospital scheduling departments and believe that altering these departmental reporting structures to add more accountability to CV executives may increase physician satisfaction and operational efficiency. Though administrators agree that there is no “right answer” regarding how to best restructure scheduling department workflows to align more strongly with CV services, they suggest implementing a system that best fits with the individual heart and vascular program characteristics. For example, administrators profiled in Section IV are considering altering the organizational structure of the hospital centralized scheduling department to allow CV administrators to oversee all CV appointment coordination. These administrators feel that direct CV department oversight of scheduling staff will restrict clinician access to patient schedules, thereby consolidating cost centers and providing enhanced patient privacy.

Similarly, administrators profiled in Section V recently developed a cath lab operations council to oversee scheduling for all cath and electrophysiology (EP) suites. This council is composed of physicians and various medical leaders and, due to its nature as a collaborative body, has thus far minimized conflict between the numerous clinicians. Thus, though CV administrators all approach scheduling policies in different ways, they feel it is important to implement a solution that best fits with the unique needs and physician climate of your institution.

The following profiles provide CV volumes and TAT data and outlines the mechanisms used to determine appropriate utilization capacity at three hospitals and health systems.

### IV. PROFILE: Dedicated cath labs and CV ORs maintained at 90 percent capacity

Hospital executives established a cardiac health program in the late 1980s and shortly thereafter added a faculty and clinical EP program. Currently, the heart and vascular institute is one of the most recognized comprehensive CV programs in the country, having repeatedly won top national awards for its innovation, research, and quality of patient care.

Currently, clinicians at the heart and vascular institute provide comprehensive CV care through a variety of dedicated facilities, including the following:

- Cath labs (4)
- CV ORs (5)
- EP labs (2)
- Hybrid cath-bypass lab (1)

<table>
<thead>
<tr>
<th>Institution type:</th>
<th>800-bed, not-for-profit academic medical center (AMC) located in the South</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source:</td>
<td>Manager, cardiac catheterization laboratory (cath lab) and electrophysiology (EP)</td>
</tr>
</tbody>
</table>
| Number and types of facilities: |  • Cardiovascular (CV) ORs (6)  
                           |  • Cath labs (4)  
                           |  • EP labs (2)  
                           |  • Hybrid cath and bypass suite (1) |
| Annual cath procedure volumes: | 6,200 |
| Cath lab turnaround time (TAT): | 15 minutes (case completed until next start) |
| Annual CV surgery volumes:  | 700 |
| CV surgery TAT:            | 3.5 hours (as measured from the start of the procedure to its completion) |
Utilization of Cath Labs and Cardiovascular ORs at Hospitals with Large Heart Programs

Variety of statistics determine outcomes of facility needs assessments for CV ORs and cath labs

CV administrators note that the impetus to develop the heart and vascular center was solely educational: administrators wanted to develop a clinical program to supplement medical school cardiac education. Thus, the heart and vascular institute was not constructed as a result of increasing patient demand for CV services, though administrators feel that high local demand for these services was a secondary factor in the program’s conceptualization. Since the heart and vascular center was initially created as an academic clinical program, administrators at the time of its construction did not conduct any formal needs-assessments to determine the types and numbers of dedicated CV facilities based on patient volumes. However, since the facility has earned multiple national awards, administrators recently reevaluated the current facility design to ensure complete patient and physician utilization of all CV ORs and labs. As a part of this reevaluation, CV executives measured the following statistics:

- Current patient volumes
- LOS
- National rates of cardiac disease
- Percentages of patient volumes per CV facility
- Surgery and intervention TATs

Recent needs-assessment shows all CV ORs and cath labs at 90 percent utilization

Upon calculating the most recent needs-assessment, CV administrators discovered that all dedicated CV facilities—including the four cath labs and five CV ORs—were nearing complete physician and patient utilization. Administrators speculate that their current 90 percent utilization rates are likely a result of increasing local demand for CV services and an overall national trend toward obesity in the United States. Administrators believe that patient volumes at the heart and vascular center will continue to increase, and as such, they recently authorized a complete redesign of CV facility efficiencies and workflows to prepare for this anticipated rise in demand. As a part of the workflow redesign, a new floor will be constructed by 2010. Once the new floor is operational, administrators plan to relocate the cath labs to the floor and move the EP program into the old cath labs. Administrators believe this transition will allow them to expand the size of the EP labs to accommodate more patients.

Furthermore, administrators have not yet decided how to best redesign the CV OR efficiencies, but they note that when the anticipated transition of the cath labs to the new floor occurs, they will have ample space on the existing floors to create an additional CV OR.

Cardiac surgery accounts for one-fifth of all program volumes

While clinicians treat patients requiring many different types of cardiac or vascular procedures, more than one-third of all patients who visit the heart and vascular center require treatment for ischemia and peripheral vascular disease (PVD). The chart on the following page provides the breakdown of patient populations at the heart and vascular institute.
Physicians perform approximately 6,200 interventions, 700 CV surgeries

CV executives operate the cath labs and CV ORs Monday through Friday and on Saturdays from 8:00 a.m. to 3:00 p.m. While most procedures are performed on week days, administrators indicate that cardiologists and cardiothoracic surgeons perform approximately 6,200 cardiac caths and 700 open-heart surgeries per year. The chart on the following page further details the utilization rates for cath lab procedures and open-heart surgeries.

In addition to offering cardiac caths and open-heart surgeries, clinicians perform a variety of EP and minimally invasive CV procedures, including valve surgery and heart transplants. The chart on the following page provides further information regarding patient volumes by procedure type.
Utilization of Cath Labs and Cardiovascular ORs at Hospitals with Large Heart Programs

### Staff perform over 26,000 echos annually

<table>
<thead>
<tr>
<th>Procedure type</th>
<th>Annual patient volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac interventions</td>
<td>880</td>
</tr>
<tr>
<td>Cardiac rehab procedures</td>
<td>3,500</td>
</tr>
<tr>
<td>Echocardiograms (echos)</td>
<td>26,000</td>
</tr>
<tr>
<td>EP studies and procedures</td>
<td>300</td>
</tr>
<tr>
<td>Heart transplants</td>
<td>18</td>
</tr>
<tr>
<td>Inpatient cardiac caths</td>
<td>6,200</td>
</tr>
<tr>
<td>Outpatient cardiac caths</td>
<td>7,200</td>
</tr>
</tbody>
</table>

Source: Advisory Board interview, April 2008.

### Appropriate OR capacity maintained, yet use of mobile cath lab anticipated

Hospital executives believe that they currently maintain appropriate CV OR capacity: as clinicians conduct approximately 700 surgical procedures annually and operate 6 dedicated CV ORs, surgeons schedule approximately 2 surgeries per week in each CV OR. Furthermore, CV leaders anticipate that they will maintain appropriate capacity for all cath lab procedures until the new physical space is constructed; however, administrators recently discussed renting a mobile cath lab unit over the next few years to eliminate any potential volume build-up that may result from construction on the new facility. Administrators have not yet decided to rent this facility, but note that it may be an important feature in regulating patient and physician utilization. For example, physicians in a private practice who have cath lab privileges at the hospital recently hired a physician to care for rural patients. This physician practices at the hospital only once per week, but on those days brings an additional six to eight patients to the cath labs from outlying community hospitals that are not able to offer this type of medical care. The weekly addition of new cases to the schedule often causes TATs to increase slightly, which administrators believe favors renting a mobile cath lab.

### Direct oversight of CV procedure scheduling very important for teaching facilities

Currently, staff in the hospital’s centralized scheduling department are responsible for coordinating all patient appointments, and hospital executives—including the COO and VP of operations—oversee these individuals. Though this process has been in place since the hospital first opened, CV administrators believe—particularly because they are expanding the heart and vascular institute—that the director of CV services and the cath lab manager should directly oversee CV procedure scheduling. Direct departmental oversight of CV scheduling is beneficial for many reasons: a major consideration is that as an academic facility, attending physicians currently allow fellows, residents, interns, and medical school students access to the patient scheduling database. Since it is currently centralized in a different department, there is no formal policy governing access to patient schedules. CV administrators prefer to oversee the scheduling process for all CV procedures to restrict access to the database, consolidate program cost centers, and increase operational efficiency within the department. For these reasons, CV executives highly recommend restructuring the scheduling department to enable more direct reporting to clinical administrators.
V. PROFILE: Hybrid cath-bypass lab anticipated to maximize facility utilization

CV administrators established a heart and vascular institute in the mid 1990s to consolidate duplicate services offered at each of the health system’s three affiliated hospitals. Administrators pursued this consolidation to increase the surgery volumes performed at a single facility, which they believe has since improved both the quality and the perception of quality of CV services offered.

At the time of consolidation, administrators envisioned that the facility would operate as a heart institute, with staff focusing solely on cardiac care. In 2004, however, medical leadership staff redefined the institute’s scope and purpose to incorporate vascular care into the facility to provide treatment for PVD. Since 2004, the institute has focused both on cardiac and vascular services, and it currently maintains the following types and number of dedicated CV facilities:

- CV ORs (4)
- Cath labs (4)
- EP labs (1)
- Hybrid cath-bypass lab (1)
- Interventional radiology labs (3)

<table>
<thead>
<tr>
<th>Institution type:</th>
<th>700-bed, not-for-profit teaching hospital that is part of a 3-hospital, 900-bed, not-for-profit health system located in the Northwest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source:</td>
<td>Director, heart and vascular institute</td>
</tr>
</tbody>
</table>
| Number and types of facilities: | • CV ORs (4)  
                      • Cath labs (4)  
                      • EP labs (2)  
                      • Hybrid cath-bypass lab (1)  
                      • Interventional radiology (IR) labs (3) |
| Annual cath procedure volumes: | 3,000                                                                                          |
| Cath lab TAT:      | 1.5 hours (as measured from the start of the procedure to its completion)                       |
| Annual open-heart surgery volumes: | 520                                                                                           |
| CV surgery TAT:    | 5 to 6 hours (as measured from the start of the procedure to its completion)                   |

Volume projections, scope of procedures determine initial facility needs

When administrators consolidated heart and vascular services into one centralized program, they performed a series of needs-assessments to determine the number and types of labs required to meet patient demand for CV services. These assessments were performed by calculating a variety of measurements, including those listed below.

- Current CV volumes for each hospital
- Number and types of physicians involved in the space
- Volume projections for consolidated facility

Furthermore, CV administrators organized a technology team which evaluated all new CV technology on the market at that time. Administrators note that technology is an important aspect to consider when redesigning service line workflows or efficiencies, as new equipment—which allows procedures to be performed faster and more efficiently—may decrease TATs but limit the physical space in which physicians work. Thus, technological assessments are crucial to initial CV facility utilization evaluations.
Current facility needs correlate with current and emerging strategic plans

In addition to determining the number and types of dedicated CV facilities needed by measuring projected demand and the number of physicians who utilize the space, cardiology executives note that current utilization determinations depend on the health system’s strategic plans for CV services. For instance, when the heart and vascular institute was developed in 1994, medical leaders collaborated with a large external health system to oversee the operations of the new institute in hopes that this partnership would increase both cath and surgical volumes. In June 2007, administrators terminated this partnership, primarily because the investment was not producing the results that administrators anticipated. In a renewed effort to increase patient volumes and the visibility of the health system as a major provider of CV care in the local area, health system officials hired a new cardiac surgery medical director. After only one year of employment, the new director has exceeded health system volume projections by over 60 percent. Thus, CV administrators anticipate transitioning into a period of high cardiac surgery volumes—approximately 1,000 cases per year—and, as such, doubled the number of CV ORs from 2 to 4 in 2007 to accommodate this expected increase in patient volumes.

Furthermore, CV administrators recently initiated a marketing campaign in the local community to advertise the hospital’s addition of minimally invasive valve surgery. To support this new strategic plan, CV administrators authorized the addition of a new CV hybrid room, which will support a broad scope of services, including cath, bypass, and endovascular procedures. Similarly, administrators recently discovered increased demand among community residents—through volume projections and qualitative feedback—for EP procedures, including ablations and pacemaker implantations. To meet this increased demand, CV executives finalized plans for an additional EP lab, which is scheduled for completion in early 2009.

Approximately 10 cath procedures, 2 open heart surgeries performed daily

CV administrators indicate that physicians perform approximately 3,000 cath lab procedures and 520 open-heart surgeries annually. Though volumes are highest Monday through Friday, all four cath labs and all four CV ORs are operated seven days per week, including on the weekends to accommodate overflow or emergent cases. Thus, during 5-day weeks, physicians perform approximately 58 cath procedures and 10 open-heart surgeries. The chart below further details the utilization rates for cath lab procedures and open-heart surgeries.

<table>
<thead>
<tr>
<th>Procedural volumes</th>
<th>Cardiac caths</th>
<th>Open-heart surgeries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases per year</td>
<td>3,000</td>
<td>520</td>
</tr>
<tr>
<td>Cases per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(seven days per week)</td>
<td>8.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Cases per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(five days per week)</td>
<td>11.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Cases per week</td>
<td>57.5</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Source: Advisory Board interview, April 2008.
New hybrid lab to maximize physician productivity, appropriate CV capacity

CV administrators believe that the addition of a new hybrid lab and an EP lab will maximize cath lab and CV OR utilization rates across the heart and vascular institute. As physicians perform approximately 60 cath procedures per week, each cath lab supports approximately 15 procedures per week. Staff indicate that while these utilization rates are consistent with averages for hospitals with large heart programs in their experience, they feel that adding a hybrid lab—which will support an additional seven cath procedures per week—will prevent case overflow to Saturdays, which will likely maximize physician productivity during the week.

Cath lab TATs “normal”; cardiac surgery TATs currently one hour over regional norm

While administrators believe that they currently maintain appropriate capacity for cath lab procedures as well as CV surgeries, medical leaders note that the biggest challenge they face relates to the health system’s high TATs for cardiac surgery. Administrators measure TATs from the time patients enter the OR or cath lab until they are taken to the CV intensive care unit (ICU) or step-down units. Their current TATs for cardiac surgery are currently exceeding the regional average of six hours. Administrators admit they are concerned with the current length of procedures, and suggest that cardiac surgeons are exceeding “normal” time limits by approximately one to two hours. As compared to data from neighboring facilities, lengths of procedures at this hospital are currently three standard deviations from the regional norm.

Administrators hopeful cross-scheduling in hybrid OR will decrease surgery TATs

To decrease these TATs, CV administrators recently hired a new group of cardiac surgeons from a neighboring facility, who—due to their expertise and reputation of timeliness—are predicted to decrease CV surgery TATs by approximately one to one and a half hours. Furthermore, CV executives are confident that the addition of a hybrid OR will motivate physicians to remain within scheduled timeframes for cardiac surgeries, since the space will be cross-scheduled with cath procedures. In dedicated CV ORs, surgical staff often have little motivation to remain on-schedule, since they are the only staff that operate in the space. As such, they are not preoccupied with inconveniencing other physician teams. In a hybrid model, however, different physician teams share the physical space. This shared model will likely motivate surgeons to perform more on-time procedures so as not to inconvenience other physician teams also scheduled in the room.

Staff and service line collaboration recommended for successful CV scheduling

When health system executives consolidated CV services in 1994, they developed a cath lab operations council to oversee scheduling for all cath and EP labs at the institute. Since the heart and vascular institute employs various types of physicians, creating a collaborative scheduling council minimizes scheduling conflicts and maximizes available lab time. The cath lab operations council is composed of the following individuals:

- Administrative director, heart and vascular institute
- Cardiac RNs
- Cardiologists
- COO
- Electrophysiologists
- Manager, cath lab
CV administrators are very pleased with this council and highly recommend creation of a similar collaborative scheduling body to other CV administrators. According to health system executives, the council has been effective at not only overseeing all block-scheduling for cath and EP lab procedures, but has successfully transitioned the department scheduling system from one that is manager-based—in which physicians and support staff rely on their managers to schedule all procedures—to one that is coordinated with direct input from clinicians. Administrators note that allowing clinical staff to express their opinions in the scheduling process has thus far resulted in heightened job satisfaction. Due to the success of the cath lab operations council, CV administrators are currently developing a similar committee for surgical procedures, and anticipate that this council will be operational within the next year.

VI. PROFILE: Formal scheduling policy prevents potential physician turf wars

Hospital administrators first opened a heart and vascular institute in the late 1960s to meet an increasing demand for CV services in the local community. This center was one of the state’s first cardiac care programs, and in the early 1980s, was expanded to include cardiac cath and EP procedures. Physicians at the heart and vascular institute currently perform a variety of cath, EP, and vascular procedures, including the following:

- Ablations
- Angioplasties
- Endovascular stent grafts
- Minimally invasive bypasses
- Open-heart surgeries
- Valve replacements

Physicians perform the aforementioned procedures within a variety of dedicated CV facilities, including the following:

- Cath labs (5)
- CV ORs (3)
- EP labs (3)

Additionally, CV administrators maintain a 24-bed cardiothoracic ICU (CTICU) where staff provide follow-up care to post-op open-heart patients.
Initial facility needs measured by current and projected volumes, physician utilization

Since the heart and vascular institute was developed in the late 1960s as a result of increased local demand for CV care, current hospital administrators are not familiar with the mechanisms used to determine the number and types of labs required to support the patient population. Due to the fact that patient volumes have remained relatively constant since the late 1980s, medical leaders are not familiar with the formal mechanisms used to evaluate the initial need for cath labs and dedicated CV ORs. However, administrators speculate that at the time, CV administrators accounted for a variety of factors in determining the number and types of CV facilities, including the following:

- Current and projected demand
- Hospital available physical space
- Number of physicians operating in the space

Highest-volume procedures, patient demographics dictate necessity of swing lab

Though administrators are not familiar with the mechanisms initially used to determine the appropriate number of cath labs and CV ORs, they currently rely on procedural volume data and patient demographics to determine what, if any, changes should be made to the current number of dedicated CV facilities. For example, administrators recently measured patient volumes by procedure type and discovered that percutaneous coronary interventions (PCI), drug-eluting stent (DES) insertions, and EP ablations are the procedures with the highest patient volumes at their institution. Since interventional procedures comprise the majority of local demand for CV care, administrators recently decided to create a swing lab from one of the dedicated EP labs to maximize utilization and physician efficiencies. Though the lab is not scheduled to open until September 2008, CV administrators believe that reacting to annual procedure volume data is beneficial, as it enables staff to authorize the necessary facility design changes in advance of any projected volume increases. In this way, staff may anticipate fluctuations in demand for CV care and may correspondingly alter the types and number of labs in preparation for changing patient demographics.

Large heart program supports nearly 8,000 cath procedures per year

CV administrators maintain a large heart program: physicians perform approximately 8,000 cath lab procedures and 550 open-heart procedures each year. All dedicated CV facilities—including the cath labs, EP labs, and CV ORs—are open Monday through Friday. Though volumes are highest during the week, administrators electively schedule Saturday procedures for urgent inpatient cases. On Sundays, staff operate the CV facilities on a call schedule, which accommodates only the most emergent patients. The chart below further details the number of procedures—both cath and surgical—performed per day and per week.

<table>
<thead>
<tr>
<th>Procedures volumes</th>
<th>Cardiac caths</th>
<th>Open-heart surgeries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cases per year</strong></td>
<td>8,000</td>
<td>550</td>
</tr>
<tr>
<td><strong>Cases per day</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(seven days per week)</td>
<td>21.91</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Cases per day</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(five days per week)</td>
<td>30.8</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Cases per week</strong></td>
<td>153.8</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Source: Advisory Board interview, April 2008.
Administrators foresee creation of a ninth cath lab as beneficial to maximizing capacity

Though administrators believe that the addition of the swing lab in September 2008 will free availability for more cath lab procedures, CV executives anticipate that the creation of an additional cath lab will be beneficial to maintaining constant patient throughput, given the hospital’s recent increase in demand for cardiac cath procedures. Administrators believe that they maintain the appropriate number of cath and EP labs for their current volumes; however, they foresee a potential need for a ninth cath lab in the future. Administrators note that a ninth cath lab would enable physicians to perform timely procedures while maintaining a high standard of care by minimizing patient wait time. Though administrators have not yet formally considered the addition of this facility, they anticipate implementing this lab by 2014.

Recent drop in surgical volumes inhibits proper utilization of all CV ORs

When administrators constructed the heart and vascular institute, they created three CV ORs to support high demand for open-heart and thoracic surgeries. Since that time, however, hospital executives experienced a significant decrease in the number of CV surgery patients. This decrease is most likely due to the recent emergence of a large local competitor and the larger industry trend toward minimally invasive procedures, which have reduced the need for open-heart surgery. Administrators note that this decline in surgical patients has negatively impacted proper full utilization of all three CV ORs. Currently, physicians perform approximately two open heart procedures total per day, distributed among three CV ORs. Surgical volumes are not high enough to perform one procedure in each room per day and, as such, CV administrators are experiencing improper utilization of their current facilities. While administrators note that it is beneficial to maintain an extra CV OR—in case of patient emergencies or scheduling miscommunication—they are in the process of deciding how best to restructure current efficiencies to better utilize the extra room.

New marketing campaign targets competitor patients, emphasizes TATs

Though the recent decline in surgical patient volumes is troubling, administrators do not view this decrease in a negative way; rather, they consider it a means by which to improve their current community outreach and advertise the hospital’s high quality of care. Administrators recently developed a marketing campaign targeting patients of their major competitor to educate them on the high standard of care at the heart and vascular institute and emphasize their efficient, 90-minute door-to-balloon TATs in the cath labs. By advertising to current and potential patients, CV executives believe they can increase patient volumes—both for interventional and surgical procedures—to fill capacity for all three CV ORs. Since they have recently implemented the campaign, administrators are not able to indicate whether or not it has been effective; however, they are confident that a marketing campaign that accentuates efficient TAT statistics will increase patient interest in hospital CV services.

Administrators recommend decentralizing cardiac surgery scheduling

CV executives currently do not oversee scheduling for cardiac or vascular surgeries: staff at the centralized hospital scheduling department coordinate all surgical appointments. Though this system has been traditionally successful, CV administrators feel it would be best to alter scheduling responsibilities and transition this role to dedicated staff within the CV departments. Decentralized scheduling would involve physicians in the process, thereby increasing their job satisfaction and willingness to collaborate with other clinicians who share the same space. CV administrators have not yet formally discussed consolidating surgical scheduling within the cardiology and vascular departments, but will consider this strategic plan a priority in the next year.
Developing a formal, written policy for cath lab scheduling a necessity

CV administrators directly oversee the process of cath lab scheduling, but admit that they have recently had difficulties scheduling rooms according to physician preference. For example, CV administrators currently employ 50 physicians in the heart and vascular center. One of these physicians performs the same number of cardiac cath interventions per year as a five-physician private practice group that is also employed with the hospital. For these reasons, this physician requested to be scheduled in two cath labs. However, this physician preference for two rooms—rather than just one—has led to discontent among other cardiologists and interventional radiologists who feel that they should also be scheduled in two rooms. To prevent turf wars and physician conflict from developing, medical leaders prefer to organize a series of administrative meetings to formalize a written scheduling policy for the cath labs. Thus far, the hospital VP has not yet agreed to these meetings, but administrators believe formalizing a written scheduling cath lab policy will enhance the quality of interventional care provided at the heart and vascular center. As such, CV executives highly recommend developing a written schedule policy and disseminating it to all affiliated cath lab physicians.
Research Methodology

During the course of research, Original Inquiry staff searched the following resources to identify pertinent information:

- Advisory Board’s internal and online (www.advisory.com) research libraries
- Factiva™, a Dow Jones company
- Industry journals and publications, including the following:
  - Annals of Thoracic Surgery (ATS) at www.ats.ctsnetjournals.org
  - Dimensions in Critical Care Nursing (DCCN) at www.dccnjournal.com
  - Healthcare Financial Management (HFM) Magazine at www.hfma.org/hfm/
  - Journal of Cardiovascular Nursing (JCN) at www.jcnjournal.com
  - Journal of the American College of Cardiology (JACC) at www.content.onlinejacc.org
  - Pediatrics at www.pediatrics.aappublications.org
- Internet, via search engines and multiple websites, including the following:
  - Agency for Healthcare Research at Quality (AHRQ) at www.ahrq.gov
  - American Academy of Pediatrics (AAP) at www.aap.org
  - American College of Cardiology (ACC) at www.acc.org
  - American Hospital Directory (AHD) at www.ahd.com
  - The Society for Cardiovascular Angiography and Interventions (SCAI) at www.scai.org

Based on leads generated from the above sources, researchers contacted administrators overseeing cardiovascular (CV) services or catheterization laboratories (cath labs) at large heart programs.

Professional Services Note

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