The Impact of Tech Aides in Radiology

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EXECUTIVE SUMMARY

- *As the staffing shortage continues to impact radiology departments and outpatient imaging centers, managers look for ways to solve staffing issues internally. Lehigh Valley Hospital and Health Network investigated the feasibility of adding a position of radiology tech aide. This proposal was driven by a desire to improve retention of staff, improve employee satisfaction and reduce turnover.*
- *A 6-month pilot program was conducted at the network's highest-volume facility. One tech aide underwent extensive training and eventually began performing some of the tasks identified in the analysis.*
- *Each area within radiology worked with an intern to identify each step in its work process. Each step identified led to the question, "What happens if?" The workflow process provided a detailed look a the number of steps required for a technologist to perform a study from start to finish.*
- *In May 2002, the administrator submitted a project proposal to management engineering to evaluate radiologic technologists' workloads and identify tasks that could be performed by a tech aide. Activity-Based Management (ABM) – a process that emphasizes activities over resources – was utilized to study work activities. The analysis identified the appropriate tasks and revealed that 5 FTEs were needed to assist the technologists in all areas of radiology.*
- *A workflow was completed for each area within radiology. Some areas identified bottlenecks, which caused delays in the process and some redundant work for the staff.*
- *Data were presented to the network administration. Staffing realities, labor pool availability within the existing network staff, and detailed task identifications also were provided.*
- *A total of 5 FTE tech aides were approved. The final program included in-depth tech-aide training; effective and open communication between management and technologists; and a collaborative, education-oriented relationship between technologists and tech aides.*

As the staffing shortage continues to impact radiology departments and outpatient imaging centers, managers look for ways to solve staffing issues internally. At Lehigh Valley Hospital and Health Network, an 817-bed institution located on 3 sites in eastern Pennsylvania, we chose to investigate the feasibility of adding a position of radiology tech aide. This proposal was driven by a desire to improve retention of staff, improve employee satisfaction and reduce turnover.

Background

A number of factors contributed to the discussion about a radiology tech aide that occurred around the same time. These factors led to the implementation of a pilot program in March 2002.

In 2001, the Lehigh Valley Hospital network conducted an employee satisfaction survey, and the scores among radiology staff indicated a need to address staff support issues. Interestingly, the radiology management group identified management style as its focus for improving scores.

The fiscal year 2002 vacancy rate was 20% for radiologic technologists. Since there had not been issues with turnover in the past, this was a statistic we did not collect before 2002.

The vascular lab and its secretary were merged into radiology. When this secretary left in 2000, we tried to incorporate the lab into the radiology model, which did not have secretaries/clerks for each area. Although the lab was in the 75th percentile of Solucient benchmarks–a measurement system that allows healthcare facilities to compare their performance and service against industry standards–the lab staff was resistant to these changes.

Three nuclear medicine technologists left at the same time. In addition, the volume in computed tomography (CT) scan continued to grow at a phenomenal rate, so we began to staff the area 24 hours a day. With the addition of a

multi-slice CT scanner, 1 technologist on middle shift could not keep pace with the demand. The CT manager and administrator decided to add a part-time tech aide for the off hours that were busy in CT. CT scan was below the 25th percentile in Solucient benchmarking, so this part-time FTE was approved.

Throughout the staff interviews, we discovered there were tasks common to all areas, as well as tasks that were time-consuming for the technologists.

In May 2002, while the pilot program was underway, the administrator submitted a project request to management engineering. The request proposed an evaluation of radiologic technologists' workloads and identification of tasks that could be performed by a tech aide. There was a summer intern who wanted to be involved in a logistical study, and the administrator recruited him.

The proposed project included:

- Analyzing the process flow in radiology.
- Recommending redesign of workflow.
- Determining the best use of staff positions by analyzing work activities.
- Analyzing the tech aide position.
- Recommending work content and flow for the tech aide.

Activity-Based Management (ABM) was utilized to study work activities and make recommendations for removing non-value added work. ABM emphasizes activities over resources. Its aim is to maximize productivity through efficient and effective performance of these activities.

Proposed results for this project included:

- Reduction of patient wait time.
- Increase in number of patients per day.
- Maintain or reduce labor expenses per procedure.
- Increase staff satisfaction.

There are 3 hospitals in the Lehigh Valley Hospital network. Since the largest volume is at the Cedar Crest site (669 beds), this was selected as the site at which to perform the study. In addition, our aim was to collect all the information and make recommendations between June and August 2002–the period of time the summer intern was available.

ABM Analysis

The administrator and managers used ABM to identify tasks by job and value or non-value added work. Management

Figure 1
Tasks of Highest Concentration of Activity

Numbers are based on an 8-hour day for 1 FTE in diagnostic radiology, CT scan, ultrasound, nuclear medicine, interventional radiology, and the vascular lab.

Technologist/Nurse

Activity	Time Spent	FTE
X-ray/Scan Patients	27:55	3.49
Phone Calls	5:07	0.64
Paperwork/Computer	3:26	0.43
Wet Reads	2:33	0.32
Other Responsibilities	2:14	0.28
Wait for Patients	1:51	0.23
Pre/Post Test Prep	0:58	0.12
Wait for Physicians	0:58	0.12
Transport Patients	0:49	0.10
Supplies/Inventory	0:43	0.09
Scheduling Issues	0:34	0.07
Patient Care	0:29	0.06
Prepare Isotopes	0:24	0.05
Total	**48:01**	**6.0**

Figure 2
Tasks of Highest Concentration of Activity

Tech Aide

Activity	Time Spent	FTE
Phone Calls	17:12	2.15
Paperwork/Computer	8:14	1.03
Transport Patients	6:24	0.80
Wet Readings	4:48	0.60
Pre/Post Test Prep	3:36	0.45
Patient Care	3:02	0.38
Other Responsibilities	2:33	0.32
Supplies/Inventory	1:22	0.17
Scheduling Issues	0:48	0.10
Prepare Isotopes	0	0
Wait for Physicians	0	0
Wait for Patients	0	0
X-ray/Scan Patients	0	0
Total	**47:59**	**6.0**

Figure 3
Lehigh Valley Hospital–Radiology
Activity Analysis Worksheet
8-hour Day–1 FTE

	Diagnostic		CT Scan		Ultrasound		Nuclear Medicine		Interventional		Vascular Lab		Total Hours		FTE	
Activity	**Tech**	**Aide**	**Tech**	**Aide**	**Tech**	**Aide**	**Tech**	**Aide**	**Tech**	**Aide**	**Tech**	**Aide**	**Tech**	**Aide**	**Tech**	**Aide**
X-Ray Scan Patients	50% 4:00	0	58% 4:38	0	50% 4:00	0	69% 5:31	0	70% 5:36	0	52% 4:10	0	27:55	0	3.49	0
Phone Calls	15% 1:12	30% 2:24	5% 0:24	20% 1:36	15% 1:12	45% 3:36	4% 0:19	60% 4:48	10% 0:48	50% 4:00	15% 1:12	10% 0:48	5:07	17:12	0.64	2.15
Transport Patients	3% 0:14	20% 1:36	2% 0:10	10% 0:48	2% 0:10	20% 1:36	1% 0:05	20% 1:36	0	0	2% 0:10	10% 0:48	0:49	6:24	0.1	0.8
Wet Readings	10% 0:48	30% 2:24	11% 0:53	30% 2:24	10% 0:48	0	0	0	0	0	1% 0:05	0	2:33	4:48	0.32	0.6
Supplies/ Inventory	3% 0:14	5% 0:24	0	0	1% 0:05	2% 0:10	0	0	5% 0:24	10% 0:48	0	0	0:43	1:22	0.09	0.17
Paperwork/ Computer	6% 0:29	10% 0:48	15% 1:12	30% 2:24	10% 0:48	20% 1:36	3% 0:14	8% 0:38	5% 0:24	30% 2:24	4% 0:19	5% 0:24	3:26	8:14	0.43	1.03
Pre/Post Test Prep Room Cleaning	0	0	2% 0:10	10% 0:48	0	0	0	0	7% 0:34	10% 0:48	3% 0:14	25% 2:00	0:58	3:36	0.12	0.45
Patient Care	0	0	0	0	0	0	2% 0:10	8% 0:38	0	0	4% 0:19	30% 2:24	0:29	3:02	0.06	0.38
Other Responsibilities	3% 0:14	5% 0:24	0	0	1% 0:05	3%	14% 1:07	4% 0:19	1% 0:05	0	9% 0:43	20% 1:36	2:14	2:33	0.28	0.32
Scheduling Issues	0	0	0	0	5% 0:24	10% 0:48	2% 0:10	0	0	0	0	0	0:34	0:48	0.07	0.10

engineering provided training for this type of analysis. The administrator decided ABM was the best tool to use to identify potential tasks for the tech aide, since everyone was familiar with it. One of the managers agreed to perform the analysis.

An ABM analysis previously had been performed throughout the department in 2000. At that time, interviews were conducted with key technologists and managers from diagnostic radiology, CT scan, ultrasound, nuclear medicine, interventional radiology, and the vascular lab to determine the activities performed and the estimated time percentage spent on each activity. We limited the task list to 8 to 10 items of greatest importance. Some examples of these tasks were:

- Taking phone calls.
- Obtaining wet readings.
- Arranging for patient transport.

For the tech aide project, we decided to repeat this analysis. When possible, the interviews were conducted with the same staff that participated in the original project. Due to changes in equipment, technology, and process, some of the activities changed in importance and/or in the time spent performing them. During the interviews, we discussed some of the tasks the technologists were currently performing that could be shifted to a tech aide. Time estimates along with the number of tech aide full time-equivalent employees (FTEs) needed to perform the tasks were assigned (Figures 1, 2, and 3).

Throughout the staff interviews, we discovered there were tasks that were common to all areas and time-consuming for the technologists. These included:

- Answering the phone.
- Paperwork and computer-entry work.
- Obtaining wet readings.
- Waiting for patients.
- Pre/post test prep.
- Patient transport.
- Supplies and inventory.

The remaining tasks were those that could only be performed by the technologists:

- X-ray/scanning patients.
- Scheduling issues.
- Direct patient care.
- Isotope/contrast preparation.

Through this analysis, we determined that we would need at least 5 FTEs to assist the technologists in all areas of radiology.

The workflow process gave us a detailed look at how many steps it took for a technologist to perform a study from start to finish.

Pilot

Due to the number of technical vacancies, we choose to pilot the program in nuclear medicine during March 2002. This tech aide eventually would become part of the team that we anticipated hiring. The aide was assigned to a senior technologist, who served as her primary contact person.

The tech aide's first 3 weeks were spent observing the department in general and getting to know the staff. Next, she was assigned to each nuclear medicine room and the technologist working in that room for 2 days. During this time, she gained a general understanding of the procedures. She also was instructed on patient care issues, paperwork, and computer work involved with the studies; how to obtain wet readings; and how to answer the many phone calls received regarding nuclear medicine exams.

After approximately 5 weeks of training, the tech aide felt knowledgeable enough to anticipate some of the needs of the technologists and the patients, and she began to work independently. She would begin each day by stocking linens in all the procedure rooms and checking in with the staff to determine their immediate needs. She was readily available to the staff throughout the rest of the day to assist them as needed. The pilot lasted approximately 6 months and was quite successful. The aide was able to take on many of the duties of the technologists that took them away from their main job function of scanning and spending uninterrupted time with the patients.

Management Engineering Tech Aide Analysis

Management engineering's first step in the project was to look at the work the technologists were performing. The summer intern assisted in this process by gathering information that would be used to create workflow diagrams for each area.

Each area within radiology worked with the intern to identify each step in its work process. Each step identified led us to ask the question, "What happens if?" The workflow process gave us a detailed look at how many steps it took for a technologist to perform a study from start to finish. For example, when we did the flow for the emergency department diagnostic department, there were 16 steps in the process from the time the request was received until the films were taken to the file room. The steps performed by the technologist are represented by orange on the workflow. These include setting up the room, performing the x-ray, and processing the films. The other steps identified as tasks a tech aide could perform, such as patient transport and collecting films, are identified by bright yellow on the workflow (Figure 4). The remaining steps, light yellow on the workflow, are process steps that must occur for the exam to be completed.

A workflow was completed for each area within radiology. Some areas identified bottlenecks in their process, such as proper patient location included on the request. These bottlenecks cause delays in the process and some redundant work for the staff.

Because the intern, who did not have intimate knowledge of our operations, led these discussions, we were forced to examine our process closely. His probing questions required us to include all those "what happens if" findings into the workflows. Through this exercise, we were able to identify tasks that could be performed by a tech aide.

Implementation

Once all the data were collected, we worked with management engineering to prepare a report on its findings and recommendations. During this process, we had to reconcile the ABM analysis, which called for 6 FTEs, with the management engineering analysis, which called for 4 FTEs. We agreed upon 5 FTEs, including the existing tech aide position. This agreement was crucial, as the report was essential to gain approval for the 4 additional, unbudgeted tech aide positions.

Staffing realities strengthened our case. In addition to the national shortage, there are projected severe shortages that will occur as a large population of radiologic technologists retires over the next 10 to 15 years. The human resources department was spending about $10,000 in advertising per month to recruit technologists. The radiology department also was spending a significant amount of money on agency staffing and scholarships for student graduates.

Since tech aides do not require the education and certification needed by technologists, the expectation was an available labor pool of tech aides were already employed in the institution.

The tasks we identified for the tech aides were:

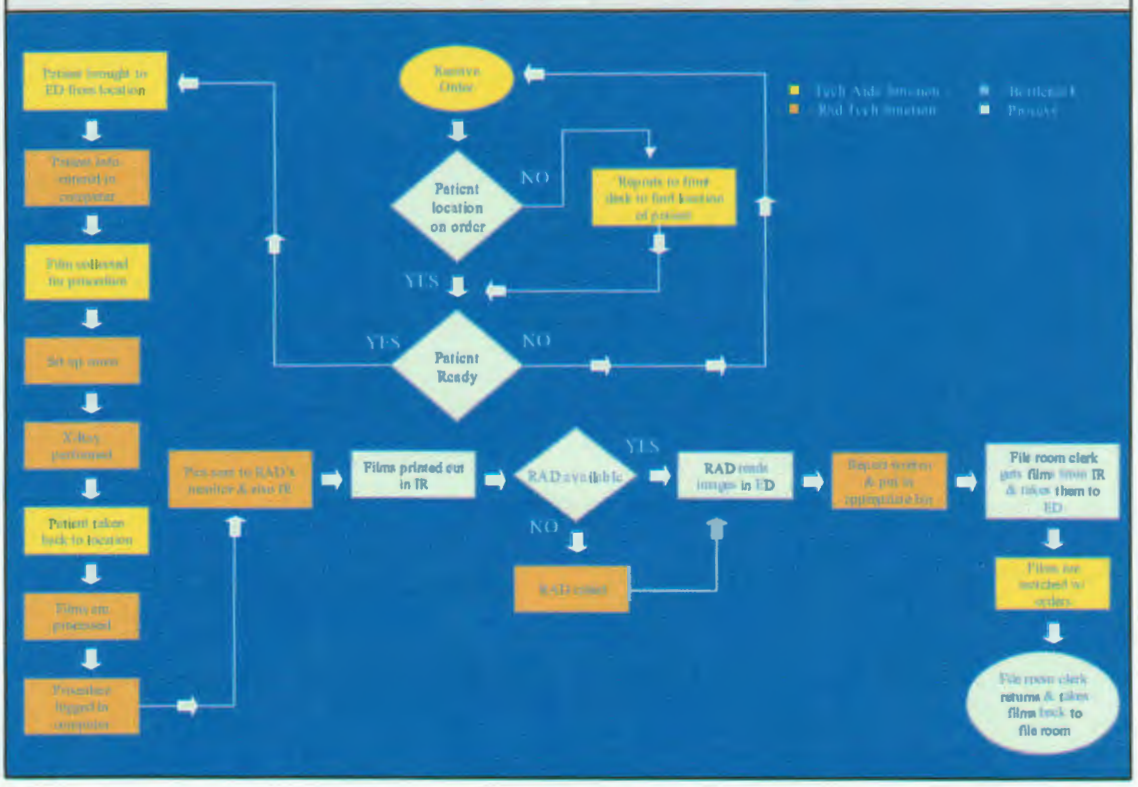
- Triage phone calls.
- Schedule patients for procedures.
- Verify with the unit that the patient is ready to be transported for the procedure/exam.
- Make transport request.
- Transport patients between the patient waiting area and procedure area and return when study is completed.
- Take films to the Reading Room for wet or STAT readings.
- Take studies to File Room when complete.
- Make copies of films.
- Stock rooms with supplies.
- Enter orders into radiology information system for technologists.
- Enter begin and end procedure times into radiology information system.

The technologists would review the orders and tell the tech aides time slots to schedule the patients. The tech aides would make all the arrangements. Based on peak time trends, the tech aides were scheduled to work from 7:30 A.M. to 7:00 P.M. Monday through Friday, with one tech aide 8:00 A.M. to 4:30 P.M. on Saturday. The tech aides would cover holidays from 11:00 A.M. to 7:30 P.M. There were additional coverage hours for CT scan on evenings, nights, and weekends. During periods when the tech aides were not staffed, the technologists would return to performing the tech aide tasks.

After the process flows were completed, it was easy to define staff roles for the technologists and the tech aides.

Due to the logistical problems, the technologists had spent a lot of time on the phone with nursing units tracking down the patients. When the unit called back, the technolo-

Figure 4
Flow Chart for Emergency Department Radiology–LVH-CC



gists were interrupted while performing a procedure. The front desk reception staff notified the technologist when the patient arrived. If the technologist was busy, the receptionist had to remember to call multiple times until they got in contact with the technologist.

There is a significant distance between the patient waiting area and some of the radiology departments. The technologists had to run the patients back and forth. During that time, they were away from the area and not available for phone calls. In the process flows, the actual time to walk from one area to another was documented (Figure 5).

After the process flows were completed, it was easy to define staff roles for the technologists and the tech aides in addition to the staffing levels for the tech aides:

- 1 tech aide for CT scan.
- 1 tech aide shared between diagnostic and interventional radiology.
- 1 tech aide for the vascular lab.
- 1 tech aide for nuclear medicine.
- 1 tech aide floater assigned to ultrasound, cover for PTO/sick, and provide coverage until 7:00 P.M.

These decisions were made based on the number of inpatient orders by hour of the day and physical relationship of the department. Since nuclear medicine is a floor below the rest of radiology, it didn't seem to make sense to share that tech aide. There also was enough volume of work to justify assigning 1 tech aide to that area (Figures 6 and 7).

We decided to have all tech aides rotate through all areas instead of dedicating them to an area. This was done for a number of reasons. First, it was felt that the really busy areas like CT scan would burn these folks out. Second, we would have no "back-up" when that person was off or sick. By keeping the job tasks to logistics, we felt it would be easier to train and orient the tech aides. If we wanted to teach the tech aides how to order supplies or open sterile sets, there would be a much longer and steeper learning curve.

Since we had a tech aide job description and pay grade, we only had to modify the job to include all the logistical tasks we agreed upon. An orientation program was designed and the competency was modified to reflect all the tasks as well. The manager responsible for nuclear medicine and the vascular lab volunteered to manage the tech aide staff.

At the weekly manager meeting, we reviewed the orders by hour of day and the peak times for each area, and we agreed to the shifts for the tech aides. This staff would also rotate Saturdays and holidays.

(1) 7:30 A.M. – 4:00 P.M.
(1) 8:00 A.M. – 4:30 P.M.
(1) 8:30 A.M. – 5:00 P.M.
(1) 9:00 A.M. – 5:30 P.M.
(1) 11:00 A.M. – 7:30 P.M floater

The managers also agreed to a 4-week training period for each area in radiology, especially since we knew the tech aides would probably not have any radiology experience. We already use wireless phones in the hospital, so we purchased 5 phones for the tech aides to prevent them from being tied to a desk and to provide them with a communication tool.

In justifying the addition of 5 FTEs, management engineering staff developed two grids for us. One was overtime hours for fiscal year 2002. We thought we could reduce overtime by the addition of the tech aides, whose total salaries were estimated at $102,440. It was difficult to separate overtime hours due to the logistical tasks and overtime hours due to coverage for vacant positions. We chose to use the Solucient benchmarks and the potential increase in productivity by the additional studies a technologist could perform if a tech aide was performing the logistical tasks (Figure 8). Management engineering support staff prepared a report of all our findings for the administrator to submit with a request for the 5 FTEs.

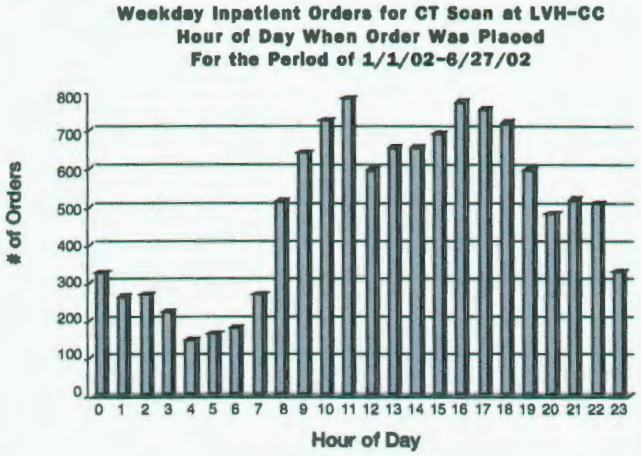
Once we received the approval, the 4 additional jobs were posted. There were 30 applicants from the hospital for these positions. We used a job grade that existed in the hospital for a technical partner. This is a person who provides support to

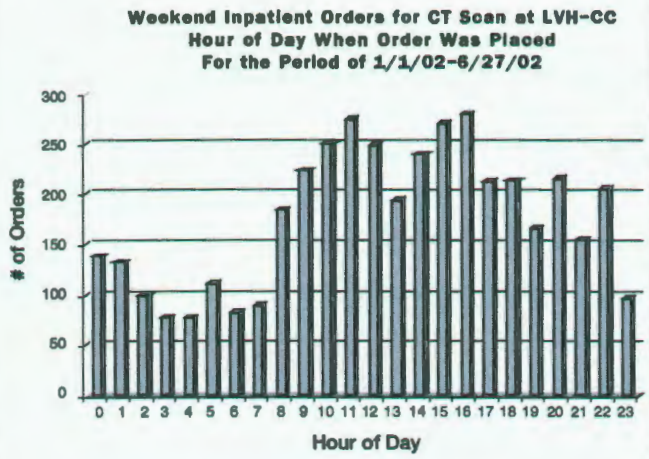
Figure 5
Distances

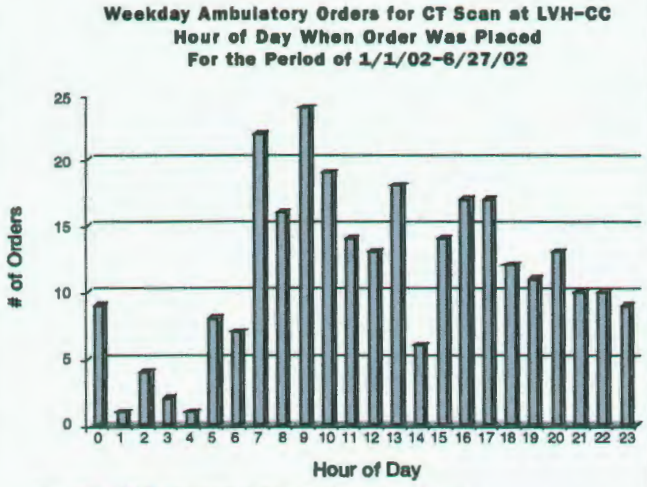
Time (in minutes) required to walk from one area to another.

Area	Reception	Patient Waiting	Diagnostic	IR	CT	Us	VAS
Reception	x						
Patient Waiting	0:04	x					
Diagnostic	0:04	0:07	x				
IR	0:27	0:30	0:17	x			
CT	0:24	0:34	0:34	0:08	x		
US	0:35	0:27	0:23	0:12	0:10	x	
VAS	0:35	0:27	0:30	0:15	0:14	0:17	x
NucMed	2:02	1:15	2:04	1:25	1:33	1:15	1:10

Figure 6
CT Scan Radiology Orders







Source: PDS Custom Objects/Account Order

the nursing staff on the floors. The salary grade was above the receptionist and file room jobs in the department, and it provided a career path for interested clerical staff.

Two managers screened, interviewed, and selected the candidates. Since they were all internal hires, we had start dates within 3 weeks. One of the managers scheduled the training and rotations, and the project was finally off the ground at the beginning of October 2002.

One very important step was the communication with the technologists from all the areas. The technologists from all areas were involved in the ABM analysis. The same group was used to help us design the orientation program. It was important that they saw this as a positive addition to the team. It was also important to get the technologists to train the tech aides for a successful program. There was only 1 area that was not sure they really needed a tech aide, but that has changed in the last 6 months, and that area now shares the "floater" tech aide.

The manager who led the tech aide team met with the tech aides each week to work out issues or problems right away. The administrator met with all the areas to talk about the program and identify where we needed help. The administrator also spoke to all the radiologists to communicate the tech aide role in the department. We asked that if there were any concerns or problems, for someone to please call any manager right away so we could address it. We also told everyone we would probably need to make modifications as the program grew and we would use their input to make those decisions.

Summary

The tech aide program has been in place now for more than a year at Lehigh Valley Hospital. The tech aides are an integral part of the radiology department. One of the tech aides is going to nuclear medicine school under a scholarship program we have at the hospital. We have added some additional part-time tech aide hours in CT scan as the off-hour volume continues to grow.

This year, we evaluated the flow and tasks at the Muhlenberg site. Instead of adding tech aides at that site, we added 2 FTEs in the file room, since the technologists at that site were performing a lot of the file room functions. Using the ABM tool, it was easy to identify these tasks.

We continually evaluate the program for ways we can improve it. With the addition of a new RIS and a PACS system in June, we will need to make more changes, since the process flows will once again change.

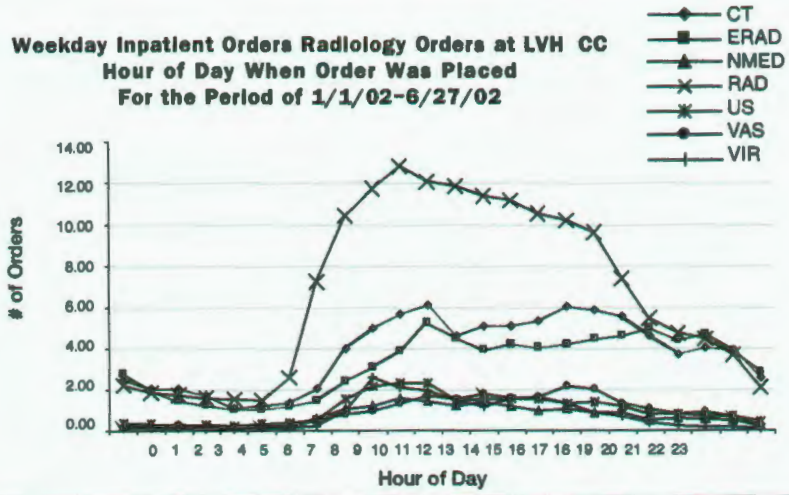
The employee satisfaction survey was repeated in May 2003 just for radiology staff. The management style section of the survey improved 10.9% over the 2001 survey. The vacancy rate is beginning to drop. The vascular lab, for example, is fully staffed at all sites for the first time in years.

The impact on the staff has been very positive:

"This program has been beneficial to the department,"

Figure 7
Radiology Orders

Weekday Inpatient Orders Radiology Orders at LVH CC
Hour of Day When Order Was Placed
For the Period of 1/1/02-6/27/02



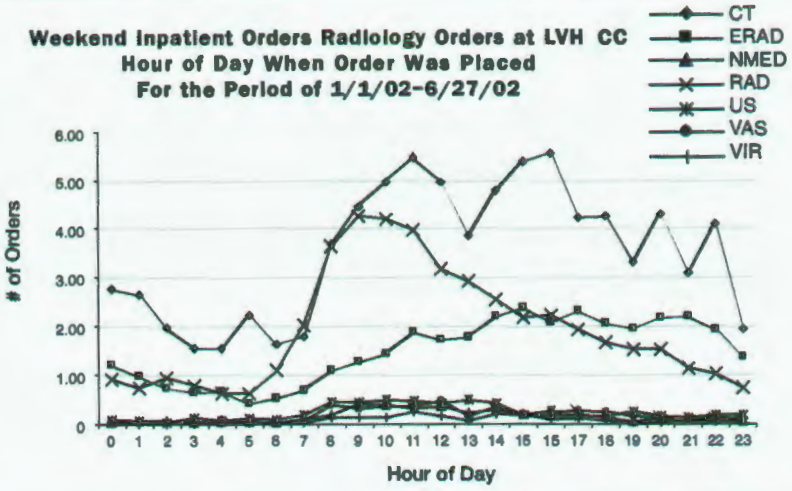
Weekday Inpatient Orders for Period 1/1/02-6/27/02

	Total	Avg/Day
CT Scan	11785	92.07
ERAD-ED Radiology	10004	78.16
NMED-NucMed Radiology	2195	17.15
RAD-Radiology	20445	159.73
US-Ultrasound	3085	24.10
VAS-Vascular Lab	2821	22.04
VIR-Interventional Radiology	2332	18.22

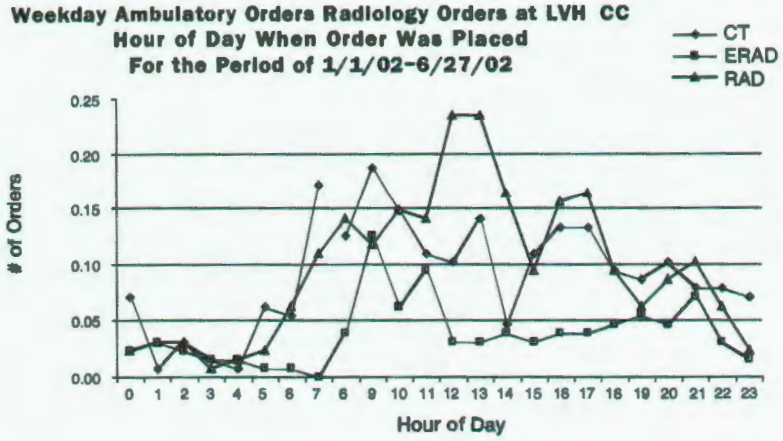
Weekend Inpatient Orders for Period 1/1/02-6/27/02

	Total	Avg/Day
CT Scan	4226	84.52
ERAD-ED Radiology	4584	91.68
NMED-NucMed Radiology	458	9.16
RAD-Radiology	5928	118.56
US-Ultrasound	719	14.38
VAS-Vascular Lab	544	10.88
VIR-Interventional Radiology	244	4.88

Weekend Inpatient Orders Radiology Orders at LVH CC
Hour of Day When Order Was Placed
For the Period of 1/1/02-6/27/02



Weekday Ambulatory Orders Radiology Orders at LVH CC
Hour of Day When Order Was Placed
For the Period of 1/1/02-6/27/02



Weekday Ambulatory Orders for Period 1/1/02-6/27/02

	Total	Avg/Day
CT Scan	277	2.16
ERAD-ED Radiology	118	0.92
RAD-Radiology	298	2.33

Source: PDS Custom Objects/Account Order

Figure 8
Productivity Impact

			BI weekly Average–FY02				
CO#	Cost Center	Unit of Service	Procedures	Worked Hours	Worked Hours/ Procedure	Tech Skilled Functions Hours/ Procedure	Logistics Functions Hours/ Procedure
02	Vascular	Procedure	308.69	426.83	1.38	1.07	0.31
02	Ultrasound	100 Procedures	383.04	441.77	1.15	0.57	0.59
02	CT Scan	100 Procedures	1,308.35	789.91	0.60	0.33	0.28
02	Rad-Diagnostic	100 Procedures	3,369.85	2,350.63	0.70	0.34	0.35
02	IR	100 Procedures	171.62	521.16	3.04	2.09	0.94
02	Nuc Med	100 Procedures	365.69	584.42	1.60	0.99	0.61

Potential Productivity Increase						
	Vascular	Ultrasound	CT Scan	Diagnostic	IR	Nuc Med
Increased Hours/Shift available for techs*	1.79	4.08	3.66	4.06	2.49	3.05
Services/Hour provided FY02**	0.72	0.87	1.66	1.43	0.33	0.63
Current Volume/8 hour shift	**5.79**	**6.94**	**13.25**	**11.47**	**2.63**	**5.01**
Potential Volume/8 hour shift	**7.08**	**10.47**	**19.31**	**17.28**	**3.45**	**6.92**

*If only performing tech-skilled functions.
**Based on scorecard: average of hours worked/average number of procedures per scorecard period.
Increased Hours/Shift based on percentage of logistic processes techs no longer would do per 8-hour shift.

says one radiologic technologist "The aides allow us to keep x-raying patients and make us more efficient. They make phone calls and expedite the flow through the department so the technologists don't have to take time away from the patients."

"The tech aides help me with the non-technical aspects of my job," adds a CT technologist. "This allows me to spend more time with the patients and concentrate on doing the scans."

"I'm glad I made the move from the file room," says a tech aide "I enjoy working with the technologists and interacting with the patients. This is something I didn't get to do working in the File Room. Everyday is a learning experience."

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