Radiology Operations: What You Don’t Know Could Be Costing You Millions

By Sam Joffe, Donna Drew, Manju Bansal, and Michael Hase

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When asked what keeps them awake at night, hospital CEOs will typically mention issues such as operating room efficiency, long waits in the emergency department, reimbursement, and staffing challenges. Radiology is rarely mentioned. When it is discussed, the focus is usually on raising capital to expand the department and acquire new technology—and for good reason. Fueled by an aging population, rising healthcare consumerism, and new technologies, the volume of advanced imaging procedures such as computed tomography (CT), magnetic resonance (MR), and positron emission tomography (PET) has more than doubled over the past 5 years, and double digit annual growth rates are expected to continue well into the future.

Given this dramatic growth in demand, radiology departments often appear to be operating at or near full capacity. There are predictable complaints from staff, physicians, and patients that access to imaging services is difficult and the staff is stretched thin. The fact that outpatient radiology procedures are profitable further strengthens the case for capital expansion to improve service and grow profits.

But is capital expansion alone really the right approach? An operational analysis of over 400 hospital radiology departments over the past 3 years has found that many radiology departments are, in fact, operating far below their potential capacity. What are the departments so underutilized? And why aren’t the CEOs at these hospitals aware of the situation?

In reviewing hospital radiology departments, the analysis found a set of recurring themes that led to suboptimal performance, among them:

- Rapid growth in advanced imaging procedures has left hospital radiology departments struggling to keep up with demand, resulting in loss of patients to facilities that can offer service more quickly.
- While the departments appear to be working at full capacity, an operational analysis of over 400 hospital radiology departments in the US by GE Healthcare has determined that, paradoxically, many departments are in fact underutilized and operating far below their potential capacity.
- While CT cycle time in hospitals that were studied averaged 35 minutes, top performing hospitals operated the same equipment at a cycle time of 15 minutes, yielding approximately double the throughput volume.
- Factors leading to suboptimal performance include accounting metrics that mask true performance, leadership focus on capital investment rather than operations, under staffing, under scheduling, poorly aligned incentives, a fragmented view of operations, lack of awareness of latent opportunities, and lack of sufficient skills and processes to implement improvements.
- The study showed how modest investments in radiology operations can dramatically improve access to services and profitability.

EXECUTIVE SUMMARY

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- While the departments appear to be working at full capacity, an operational analysis of over 400 hospital radiology departments in the US by GE Healthcare has determined that, paradoxically, many departments are in fact underutilized and operating far below their potential capacity.
- While CT cycle time in hospitals that were studied averaged 35 minutes, top performing hospitals operated the same equipment at a cycle time of 15 minutes, yielding approximately double the throughput volume.
- Factors leading to suboptimal performance include accounting metrics that mask true performance, leadership focus on capital investment rather than operations, under staffing, under scheduling, poorly aligned incentives, a fragmented view of operations, lack of awareness of latent opportunities, and lack of sufficient skills and processes to implement improvements.
- The study showed how modest investments in radiology operations can dramatically improve access to services and profitability.
A dynamic equilibrium is established in which hospital radiology departments are operating well below their potential capacity, yet the more they focus on maximizing utilization and productivity, rather than volume and profits, the less likely they are to grow.

- Management reporting that masked true performance
- Leadership focused on capital investment rather than operations
- Under staffing and under scheduling
- Poorly aligned incentives for departments and individuals
- A lack of awareness of underlying opportunities
- A fragmented view of operations rather than a systemic view
- Lack of sufficient skills and/or effective processes for implementing improvement

To explore these issues further, consider the CT department at a typical 200 bed suburban community hospital. The hospital has a 16 slice scanner that was installed 3 years ago. When a patient calls to schedule a CT scan, the lead time averages 8 days. The department’s normal hours are 8:00 AM to 4:00 PM on weekdays and 9:00 AM to 1:00 PM on Saturdays. Appointments are scheduled in 30 minute blocks, for a possible of 90 total scheduled appointments each week. The actual volume for this department averages 113 cases per week and 5876 annually, including all add on and after hours cases. The CT department is staffed with a combination of full time and part time technologists equaling 2.6 full time equivalents (FTEs).

The Utilization and Productivity Trap

When evaluating operating reports, senior executives see a department that is operating at 126% utilization (113 cases per week given 90 scheduled slots) and very high staff productivity (2260 exams per year for each FTE). Barring an exceptionally long wait or gross mistreatment, patient satisfaction surveys for the department are generally favorable. All appears well. Comments and survey results from referring physicians and radiology staff, however, indicate that the department is extremely busy, access to appointments is difficult, space is tight, and the staff is overworked. Physicians and hospital administrators all agree that radiology services are critical and the department needs to be expanded.

Unfortunately, focusing on utilization and productivity as defined above can actually hurt the performance of the department. The utilization metric (actual exams divided by the number of scheduled slots) accepts as a given that there are 90 exam slots per week. In fact, the actual CT scan itself takes 3 to 7 minutes per case, plus several minutes of pre-scan and post-scan activities. While 30 minutes is the most common slot time at hospitals across the US, Table 1 shows that, given the appropriate resources, numerous hospitals run CT operations at 20, 15, or even 12 minute intervals.

Achieving shorter slot times is difficult for several reasons. Additional staff, ancillary services, and a high level of coordination are required. As improvements are implemented, numerous new bottlenecks appear that may require a change in organization and incentives that cut across departments, and the transition itself can be difficult. Paradoxically, if slot times are shortened and the number of slots expanded, utilization (actual exams divided by the number of scheduled slots) actually decreases, even though volume increases.

Similarly, focusing on staff productivity has led many hospitals to under staff their radiology departments, worsening overall performance. Inevitably, due to financial pressures, market cycles, or even attrition, staff levels will be reduced at some point. The result of staff reduction is that while overall volume may go down, staff productivity (exams per FTE per year) actually increases. Although the remaining staff members are working to their limit and are highly productive, overall throughput and access to radiology services diminish. As demand exceeds throughput, the lead time to schedule an exam increases, and inevitably some potential patients will choose to have their CT exams done elsewhere. This patient leakage continues until demand once again matches throughput. A dynamic equilibrium is established in which hospital radiology departments are operating well below their potential capacity, yet the more they focus on maximizing utilization and productivity, rather than volume and profits, the less likely they are to grow.

Hospitals in this state march on, serving their radiology patients to the best of their ability, but naively unaware of how many outpatients they are losing due to slow access, or even a reputation for slow access. Patients that go elsewhere do not show up as red flags on any management reports. In some cases, patients have trouble just getting a phone call

<table>
<thead>
<tr>
<th>Scheduling Slot Time</th>
<th>Percentage of Facilities</th>
</tr>
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<tbody>
<tr>
<td>30 minutes</td>
<td>59%</td>
</tr>
<tr>
<td>20 minutes</td>
<td>17%</td>
</tr>
<tr>
<td>15 minutes</td>
<td>23%</td>
</tr>
<tr>
<td>12 minutes</td>
<td>1%</td>
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</tbody>
</table>
Why is it that a call to order a $29 polo shirt from a catalog retailer is consistently answered within 3 rings, while a call to a leading medical center for an important and expensive MR scan might leave a caller on hold for 20 minutes?

Stuck in the Mud

In addition to the difficulties with access, as well as mistaken notions of productivity and utilization, a variety of other factors conspire to keep throughput well below capacity.

Lack of Leadership Attention. Senior leadership is rarely aware or interested in the finer details of radiology operations. Instead, what they see in the market at large is rapid growth of high value radiology procedures, compelling them to plan for expansion.

The fact that referring physicians and radiology staff are complaining of a work overload further strengthens the case. All too often, lack of capacity is an easy explanation for all problems. Nearly everyone is in favor of expansion, and it is certainly easier and politically more expedient to promote expansion, rather than to take on the difficult and messy work of improving operations. Naturally, hospital board members, politicians, and other luminaries would rather attend a ribbon cutting ceremony than an ops review.

Lack of Staff. Radiology departments often cite a lack of staff as a barrier to growth. The labor market for skilled technologists is tight, and hospitals usually offer limited flexibility in adjusting compensation packages to attract staff. The cost of hiring additional staff is carefully weighed, and may not be justified given the pressure on budgets and headcount. The case will often be made that additional staff cannot be justified since they won’t be fully utilized, or that the need is greater elsewhere in the hospital.

From an economic perspective, these arguments are simply not robust. The proper calculation is to compare the marginal cost of the new employee to the marginal revenue expected (net of additional expenses). In the case of advanced modalities such as CT and MR, additional staff enables a valuable cash generating asset, such that only 1 or 2 extra exams per day may cover the added cost.

Additionally, there are several other benefits that a new hire provides, including improved access to services, reduced burden on existing staff, and more flexibility in the labor structure. While the benefits of additional staff are readily apparent, they can only be realized if the entire operation can adjust to accommodate additional patients. If bottlenecks in the operation, other than lack of staff, prohibit additional volume, or if the additional patients are not reimbursed outpatients, then a financial gain from new staff cannot be realized.

Missing or Misaligned Incentives. It’s a simple fact of life that change rarely happens without the right incentives. While radiology directors who improve throughput and service are viewed favorably, there is little direct incentive for them to make these improvements. Rarely do directors receive a bonus related to objective measures of departmental performance. Natural metrics such as volume and profits are usually viewed as beyond their control and are replaced by flawed metrics such as utilization and productivity, as discussed above.

So, while radiology directors have few positive incentives to actively promote growth, they face significant backlash if they do not maintain a delicate balance among their key constituents—radiologists, referring physicians, staff, patients, and hospital management. While the overall institution will benefit from increased throughput, certain constituents may not be willing to make the required changes, thus thwarting the entire effort.

Further, while most radiology staff members are hard working and fully committed, they have little incentive to
From a financial perspective, as well as an access to service and quality of care perspective, advanced imaging equipment represents an expensive asset whose use and financial return should be maximized.

Dollars and Sense

From a financial perspective, as well as an access to service and quality of care perspective, advanced imaging equipment represents an expensive asset whose use and financial return should be maximized. In an ideal situation, the throughput of the scanning room would be maximized by having patients completely prepped in advance, moved to the exam room for their scan, and then moved immediately out of the room to make way for the next patient.

Assuming there is demand (a lead time more than 3 days is a sign of latent demand), achieving high throughput requires several factors:

- Adequate space for pre-scan and post-scan activities
- Adequate number of trained technologists to operate the scanner at its full capacity on a continuous basis
- Adequate staff and facilities, such as scheduling, transport, radiologists, and waiting rooms
- Scheduled slot times that drive the operation at full capacity

One common challenge is sustaining patient flow throughout the day. Figure 1 shows CT exam volume by time of day at an average hospital. High throughput is achieved in mid-morning and late afternoon, but not at other times of the day. Leveling the load and sustaining a 15 minute cycle time throughout the day (4 exams per hour) would approximately double throughput.

Ultimately, supporting higher volumes boils down to sustaining shorter cycle times. As shown in Figure 2, while CT cycle time at evaluated hospitals averaged 35 minutes, top facilities sustain operations at a 15 minute cycle time.

A simple calculation can demonstrate the favorable return on investing in radiology operations. Reimbursement for a typical CT procedure is $300. Adding sufficient staff to support a reduction in cycle time from 30 minutes to 20 minutes would approximately double throughput.

![Figure 1. Leveling the load and maintaining flow at 4 exams per hour through the day can approximately double throughput.](image-url)
would allow an additional 45 procedures per week, a gain of $702,000 annually. Achieving this gain would typically require 2 additional FTEs, with a cost of about $75,000 each, or $150,000 total. If demand exists and the department is able to handle the additional throughput, hiring additional staff will pay for itself many times over. Few investments in the hospital offer such a strong financial return, together with improved access, as investments in radiology operations.

Even with steady growth in radiology volume, there are most likely latent opportunities to improve access and profits. Radiology departments that are growing at a rate below the market growth rate are actually losing ground, as shown in Figure 3.

**Conclusion**

While the overall goal of increased throughput is relatively simple, the process to get there is not. The process starts with a rigorous assessment of current operations in order to truly understand how the department is functioning. Then, individuals representing referring physicians, radiologists, radiology administration, senior leadership, radiology staff, scheduling, nursing, and transport need to be engaged in a formal improvement process.

Given the rapid growth of radiology in recent years, and the many forces that combine to inhibit optimal operations, most radiology departments would benefit significantly from a well-conceived and executed program. Improvements, however, will only be sustained if incentives, staffing, organizational structures, and other operating mechanisms are permanently updated. Our experience indicates that the most important success factor for long term radiology performance improvement is sustained engagement of senior leadership.

Radiology is neither the most urgent problem facing hospitals nor the largest source of revenue, but it may provide the best opportunity to grow profits and improve access quickly with modest capital investment.

**References**


**Figure 2.** While CT cycle time at the hospitals evaluated averaged 35 minutes, top-class hospitals sustained CT cycle time of 15 minutes.

**Source:** GE Healthcare

**Figure 3.** Radiology departments growing slower than the local market are losing ground.

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Questions

Instructions: Choose the answer that is most correct.

1. What has fueled the double-digit annual growth rates for advanced imaging procedures such as CT, MRI, and PET?
   a. Rising healthcare consumerism
   b. New technologies
   c. An aging population
   d. All of the above

2. What did the operational analysis of over 400 hospital radiology departments over the past 3 years find?
   a. Many departments are operating above their capacity
   b. Many departments are operating far below their potential capacity
   c. Most departments are operating at their capacity
   d. None of the above

3. When underutilization of a department occurs, which of the following is most likely the cause?
   a. Under staffing and under scheduling
   b. Management reporting that masks true performance
   c. Leadership focused on capital investment rather than operations
   d. All of the above

4. Which of the following may occur even when a department is operating at a high utilization level with very high staff productivity?
   a. Referring physicians may report that access to appointments is difficult
   b. Patients may report favorable levels of satisfaction
   c. Staff reports that the department is very busy and they are overworked
   d. All of the above

5. What is the most common slot time at hospitals for CT operations?
   a. 30 minutes
   b. 20 minutes
   c. 15 minutes
   d. 12 minutes

6. Which of the following is necessary for a department to achieve shorter slot times for CT operations?
   a. Additional staff
   b. A high level of coordination
   c. Additional ancillary services
   d. All of the above
7. If slot times are shortened and the number of slots expanded:
   a. Volume increases
   b. Utilization decreases
   c. Staff productivity remains the same
   d. Both a and b

8. What term describes the actual exams divided by the number of scheduled slots?
   a. Productivity
   b. Utilization
   c. Volume
   d. None of the above

9. If the number of staff is reduced, the overall volume may go down, but:
   a. Slot time actually increases
   b. Slot time is not affected
   c. Staff productivity actually increases
   d. Access to services increases

10. Which of the following may result when the lead time to schedule an exam increases?
    a. Some potential patients will choose to have their exams done elsewhere
    b. Referring physicians will report high levels of satisfaction
    c. Radiologists deliver reports more rapidly
    d. All of the above

11. According to the authors, when a major academic medical center with an international reputation was operating well below their potential capacity:
    a. Only 45% of the calls to the radiology department were answered within the first minute
    b. 21% of incoming calls were abandoned
    c. All calls were consistently answered within 3 rings
    d. Both a and b

12. Senior leadership in healthcare facilities often think that an easy explanation for all problems related to utilization is:
    a. Lack of staff
    b. Lack of capacity
    c. Missing incentives
    d. None of the above

13. Radiology departments often cite a lack of staff as a barrier to growth.
    a. True
    b. False

14. From an economic perspective, it may be wise to compare the marginal cost of a new employee to the:
    a. Marginal revenue expected
    b. Overtime pay for current employees
    c. Reimbursement rate for advanced modalities
    d. None of the above

15. What are some of the benefits of hiring additional staff?
    a. Improved access to services
    b. Reduced burden on existing staff
    c. More flexibility in the labor structure
    d. All of the above

16. While radiology directors who improve throughput and service are viewed favorably, rarely do they receive a bonus related to objective measures of departmental performance.
    a. True
    b. False

17. While most radiology staff members are hard working and fully committed, they have little incentive to increase throughput.
    a. True
    b. False

18. The throughput of the CT scanning room would be maximized in an ideal situation by having patients:
    a. Completely prepped in advance
    b. Moved to the exam room for their scan
    c. Moved immediately out of the room to make way for the next patient
    d. All of the above

19. Which of the following factors are required to achieve high throughput?
    a. Adequate space for pre-scan and post-scan activities
    b. Scheduled slot times that drive the operation at full capacity
    c. Adequate staff and facilities
    d. All of the above

20. If sufficient staff is added to a department to support a reduction in cycle time from 30 minutes to 20 minutes, how many additional procedures could be done?
    a. 25 procedures per week
    b. 45 procedures per week
    c. 65 procedures per week
    d. 85 procedures per week

21. According to the authors, radiology departments that are growing at a rate below the market growth rate are actually losing ground.
    a. True
    b. False

22. According to the authors, what is the most important success factor for long term radiology performance improvement?
    a. Substantial financial investment
    b. Physician and staff support
    c. Sustained engagement of senior leadership
    d. None of the above
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