Technical Needs Assessment:

UWMC's Sensitivity Analysis Guides Decision-Making

By Michael Alotis

EXECUTIVE SUMMARY

- *In today's healthcare market, it is critical for provider institutions to offer the latest and best technological services while remaining fiscally sound. In academic practices, like the University of Washington Medical Center (UWMC), there are the added responsibilities of teaching and research that require a high-tech environment to thrive.*
- *These conditions and needs require extensive analysis of not only what equipment to buy, but also when and how it should be acquired. In an organization like the UWMC, which has strategically positioned itself for growth, it is useful to build a sensitivity analysis based on the strategic plan.*
- *A common forecasting tool, the sensitivity analysis lays out existing and projected business operations with volume assumptions displayed in layers. Each layer of current and projected activity is plotted over time and placed against a background depicting the capacity of the key modality.*
- *Key elements of a sensitivity analysis include necessity, economic assessment, performance, compatibility, reliability, service and training.*
- *There are two major triggers that cause us to consider the purchase of new imaging equipment, and that determine how to evaluate the equipment we buy. One trigger revolves around our ability to serve patients by seeing them on a timely basis. If we find a significant gap between demand and our capacity to meet it, or anticipate a greater increased demand based upon trends, we begin to consider enhancing that capacity.*
- *A second trigger is the release of a breakthrough or substantially improved technology that will clearly have a positive impact on clinical efficacy and efficiency, thereby benefiting the patient.*
- *Especially in radiology departments, where many technologies require large expenditures, it is no longer acceptable simply to spend on new and improved technologies. It is necessary to justify them as a strong investment in clinical management and efficacy. There is pressure to provide "proof" at the department level and beyond. By applying sensitivity analysis, we are able to spend our resources judiciously in order to get the equipment we need when we need it. This ensures that we have efficacious, efficient systems—and enough of them—so that our patients are examined on a timely basis and our clinics run smoothly. It also goes a long way toward making certain that the best equipment is available to our clinicians, researchers, students and patients alike.*

In today's healthcare market, it is critical for provider institutions to offer the latest and best technological services while remaining fiscally sound. In academic practices, like the University of Washington Medical Center (UWMC), there are the added responsibilities of teaching and research that require a high-tech environment to thrive. These conditions and needs require extensive analysis of not only what equipment to buy, but also when and how it should be acquired. In an organization like the UWMC, which has strategically positioned itself for growth, it is useful to build a sensitivity analysis based on the strategic plan.

The Sensitivity Analysis

A common forecasting tool, the sensitivity analysis lays out existing and projected business operations with volume assumptions displayed in layers. Each layer of current and projected activity is plotted over time and placed against a background depicting the capacity of the key modality.

The key elements of a sensitivity analysis include the following components:

- Necessity
- Economic assessment
- Performance
- Compatibility
- Reliability & Service
- Training

Necessity: Equipment/technology is not acquired just because it is available. There must be evidence that patients will benefit from the technology and that any alternative technologies have been thoroughly analyzed. Upgrades that can appreciably enhance our ability to provide better patient management and improve outcomes are reasons for system enhancements. In our environment, where having advanced technologies is important, we are quite likely to acquire breakthrough systems that can clearly provide greater diagnostic efficacy and clinical efficiency. Another factor that can stimulate an acquisition is capacity. If our volumes exceed our capacity causing scheduling difficulties and long patient wait times, we need to consider expansion options.

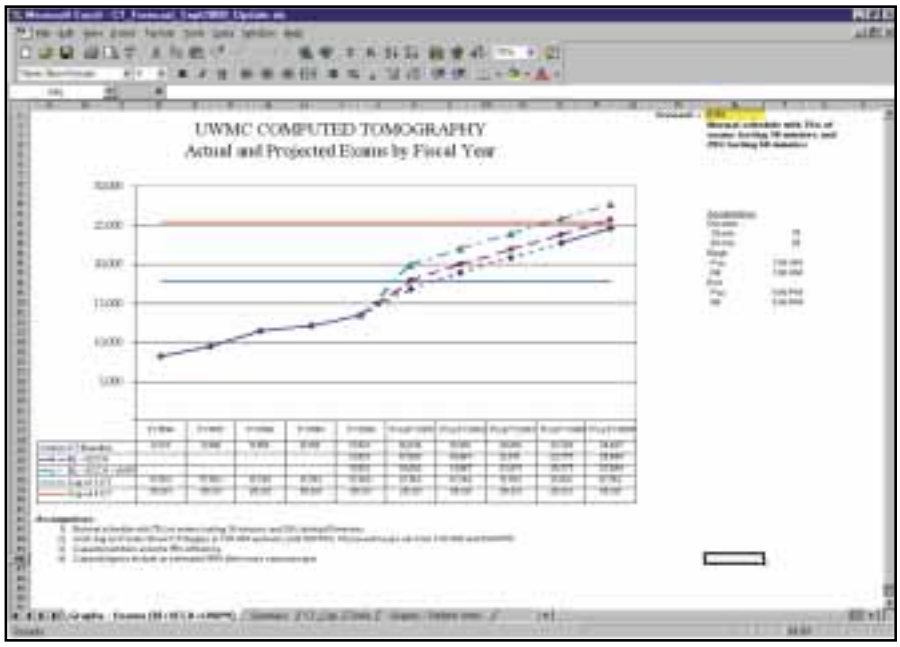

Figure 1. The blue and red lines mark thresholds for third and fourth CT Scanners based on FY 2000 actuals and projections through 2005.

Economic Assessment: A business plan and break-even analysis should be developed. If a new piece of equipment operates at a loss, you can't "make it up on volume." The aim of any new equipment acquisition should be to reduce variation and costs in the clinical practice. Our criteria include the requirement that a new piece of equipment must pay for itself within 24 months. All purchase quotations are submitted to purchasing consultants like MD Buyline or ECRI to provide us with the information we need to get the best possible price.

Performance: When evaluating diagnostic imaging equipment, performance criteria usually include patient safety, image quality, processing speed, ergonomics and other varying technical measures. In our RFP process, we will specify minimum criteria that are characteristic of the modality and weight those criteria relative to their importance.

Compatibility: UWMC is a fully integrated PACS environment; therefore, any new imaging unit must conform to the latest DICOM standard. Vendors are required to submit their DICOM conformance statements for review by our PACS Scientific Team. Unless there are strong technical factors pointing to the selection of a particular vendor's offering, it is often advantageous to select the brand of equipment you already own. Not only will this help assure compatibility, it will also provide uniformity in operation for the technical staff and in service support.

Reliability and Service: The reliability of the equipment and promptness of service response should be guaranteed in writing with penalties specified for failure to comply. We require no less than 98 percent uptime and a service response of not more than 60 minutes. Hook clauses specifying warranty extensions or financial penalties are included in our standard purchase agreements. We also query current users of each vendor's product regarding their experience in this area.

Training: Training of technical staff must be provided, including any necessary travel and lodging. When practical, extensive training must be provided for at least one in-house clinical engineer who will act as a first line of defense for any equipment failure.

Necessity: Capacity and Clinical Efficacy Trigger Acquisitions

There are two major triggers that cause us to consider the purchase of new imaging equipment, and that determine how to evaluate the equipment we buy. One trigger revolves around our ability to serve patients by seeing them on a timely basis. If we find a significant gap between demand and our capacity to meet it, or anticipate a greater increased demand based upon trends, we begin to consider enhancing that capacity. A second trigger is the release of a breakthrough or substantially improved technology that will clearly have a positive impact on clinical efficacy and efficiency, thereby benefiting the patient. Below are two cases that illustrate these scenarios.

Volumes and Capacity Analysis Help Evaluate CT Buying Decision

At UWMC we have developed both quantitative and qualitative tools to help us with every aspect of the sensitivity analysis. Below are examples of analytical tools we use to determine the saturation point at which we will acquire a new CT scanner.

The diagram above is a CT scanner forecast with three possible scenarios.

Figure 2. Both the first and fifth available appointment times are monitored for lead-time. A prolonged wait time in excess of four days triggers extended hours, mobile service, or initial consideration of an addition unit or performance upgrade.

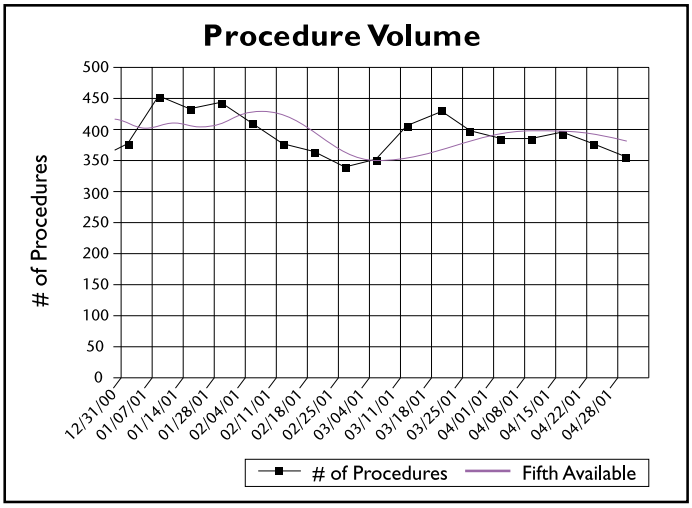

Figure 3. Procedure volumes are monitored weekly and displayed with a four-week rolling average. Volumes over 500 cases per week may trigger the deployment of additional physician and technical staff.

As each fiscal period unfolds, we monitor our volumes and compare them with projections on a weekly basis. In addition to volume, we monitor patient access by tracking scheduling wait times. It is possible that wait times may trigger the acquisition of a new scanner before a volume trigger is reached. This is because volume can become stalled even when there are open appointment times. When a scanner begins to reach maximum bookings, patients and their physicians often demand prime-time appointments. Although you may have a 6 p.m. slot available, the referring physician may find this time to be inconvenient and refer the patient to a competitor. We have therefore set relatively short thresholds for wait times and will operate with extended hours or contract with a mobile CT provider when necessary.

Extended hours of operation or use of mobile services are not always the most effective means for meeting access issues. Extending hours often leads to overtime pay and, in addition to being expensive, mobile units are often limited in technical capabilities and are not conducive to high throughput. It is for these reasons and some others, that we also monitor productive hours per procedure.

Tracking productive hours per procedure is done on a monthly basis and excludes vacation and sick leave. Upward ticks in the graph can help you locate and analyze any changes that are effecting the operation. Downward movements of the line can also validate new operational improvements.

Substantially Improved Technology: Evaluating Real-Time Compound Ultrasound

Significant technological advances can trigger the decision to acquire imaging systems where existing systems would otherwise not be replaced or upgraded. In the case of ultrasound, while factors such as compatibility, ergonomic design and other elements of technology assessment are important, none of the improvements individually, or taken in total, is as important as improvements in image quality. Enhanced image quality translates into better clinical efficacy, which in turn drives clinical efficiencies such as throughput and safety. Introduced in 1999, real-time compound ultrasound, which brought a new method of image formation by scanning with multiple lines of sight, dramatically improved image quality and clinical efficiency.

Plugging-In the Basic Concepts

Necessity: At the same time our existing ultrasound units were in need of upgrade or replacement, real-time compound ultrasound was being introduced. Our clinicians evaluated the new systems and reported that the technology dramatically improved image contrast and detail resolution. This resulted in greater tissue differentiation as well as improved visualization of borders and interfaces. Diagnostic accuracy and confidence was improved to the extent that exam times were either shortened or more information was being gathered. The performance was clearly superior to the previous generation technology.

Economic Assessment: Our ultrasound department largely comprised systems from the same company. This meant that we could upgrade existing units rather than buying new ones, or get top dollar trade-in value for older systems. The lowest possible purchase price was negotiated using pricing information from MDB and our position as a premier academic medical center. The new compound ultrasound technology promised faster throughput that was

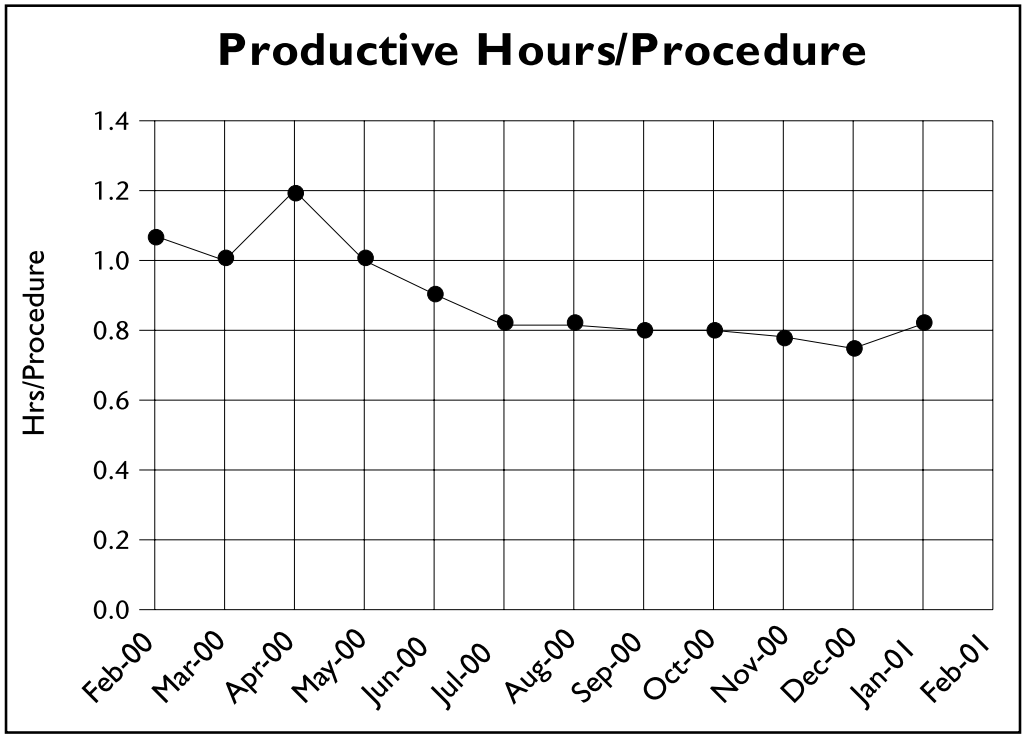

Figure 4. Monitoring productive hours per procedure gives you another view of the efficiency of your operation.

conservatively factored into our business plan and easily met our 24-month payback criteria. With all of our ultrasound units at the same level of technology, variation in performance and cost of operation were eliminated and productivity was increased.

Performance: The compound imaging scanners met or exceeded all performance criteria and fit our ergonomic profile, as all the controls were nearly identical to our existing units.

Compatibility: Introducing this equipment into a department with systems from the same company posed no compatibility problems and our existing ultrasound mini-PACS was a "plug-and-play" scenario. The DICOM conformance statement was identical to the previous generation of equipment.

Reliability and Service: Our experience with this vendor's service was very positive and they agreed to the terms of our purchase agreement with no quibbling about the performance hook clauses. A core engineering and manufacturing facility was in close proximity as well. While not a critical factor, this gave us an additional level of comfort that in the event of a problem we would get a particularly rapid response.

Training: The vendor was responsive to our needs and provided training as well as CME courses for our technical staff. This type of added value is a key component of our ongoing relationship with this vendor.

◆◆◆

Especially in radiology departments, where many technologies require large expenditures, it is no longer acceptable simply to spend on new and improved technologies. It is necessary to justify them as a strong investment in clinical management and efficacy. There is pressure to provide "proof" at the department level and beyond. By applying analysis such as these, we are able to spend our resources judiciously in order to get the equipment we need, when we need it. This ensures that we have efficacious, efficient systems–and enough of them–so that our patients are examined on a timely basis and our clinics run smoothly. It also goes a long way toward making certain that the best equipment is available to our clinicians, researchers, students and patients alike.

Michael Alotis is an internal administrative consultant for the University of Washington Medical Center in Seattle, Wash. His current projects include implementation of a new electronic medical record as well as value analysis and QA&I activities. Prior to this appointment, Alotis served fourteen years as the administrative director of medical imaging services at UWMC. He will complete a master's degree in healthcare administration at the University of Washington this May. Alotis may be contacted at mikeaa@u.washington.edu.