The Outpatient Availability Score: An Alternative Approach to Measuring Demand

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Radiology business managers are challenged daily to maximize access, improve utilization, and enhance the efficiency of very costly resources. They rely on a variety of reports, metrics, and indicators to make operational decisions. Among the many metrics managers track today, one of the more inexact is the determination of outpatient appointment availability. The outpatient availability score (OAS) was developed to improve how access to resources is predicted in the department of radiology at Massachusetts General Hospital by accounting for patient preference. The OAS uses a range of predictors (thresholds) to determine the low, medium, and high likelihood that patients will find appointments suitable for them. The OAS can be customized to fit individual operations by adjusting these thresholds as fluctuations in demand dictate. The OAS is more useful than other current methodologies for measuring availability, such as next appointment availability or third next appointment availability, for the following reasons: (1) the OAS forecasts availability for an extended period of time, (2) the OAS forecasts the quantity of available appointments, and (3) the OAS is a better indication of the department's ability to satisfy patients' appointment needs. The OAS used in conjunction with other measures (such as the third next available appointment) of availability affords managers a clearer picture of access and the ability to deal proactively with demand to run more efficient operations.

Key Words: Appointment availability, access, demand, performance management, operations, key performance indicator, leading indicator

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Upward pressure for more imaging created by the availability of new technologies, an aging population, and new applications is counterbalanced by downward pressure exerted by payers trying to contain increasing costs. These forces, combined with increased competition from physicians and entrepreneurs, have created unprecedented financial and business challenges that require sophisticated tools to manage. Managers in departments of radiology or imaging centers must be able to monitor and respond to variations in the demand for the services they offer. Maintaining and analyzing key performance indicators enables radiology business managers to establish benchmarks, evaluate performance, and plan strategically.

The performance management program at the Massachusetts General Hospital Department of Radiology encompasses the collection and analysis of key performance indicators and their active use to improve operations. In this article, we review a new reporting tool, the outpatient availability score (OAS), that has substantially changed how we measure access to our services and how we actively manage our scheduling system to maximize access and balance the utilization of imaging resources across a multisite enterprise.

MEASURING ACCESS

Current methods of measuring access, such as the next available appointment, are not true measures of availability, because the chance occurrence of appointments due to cancellation or other unexpected events gives a false sense of access. The third next available appointment is a more sensitive reflection of access because it eliminates the chance occurrences of availability. [1] However, both methods are limited in how far in advance one can forecast availability as well as the quantity of available appointments. If we know when an appointment should be available, how many are there to choose from? How does access look the following week? Or month?

When communicating the next available or third next

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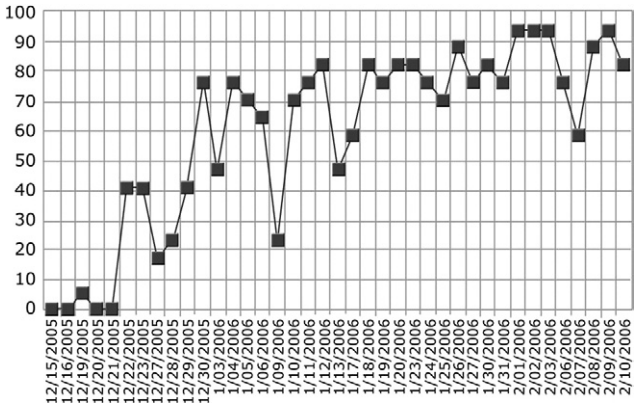


Fig 1. Percentage of free slots by business day—nuclear medicine. OAS graph for nuclear medicine (NUC MED) over 60 consecutive days.

available number, one assumes that a patient would or should schedule an appointment after the specified number of days, specifically, that the number of days to reach the next available or third next available appointment has been reached. This is not always the case. These methodologies inherently equate availability with preference. In other words, a single point in time at which access should be available does not translate to patient satisfaction or access to resources for everyone.

WHAT IS THE OAS?

The OAS report tracks outpatient appointment availability. The availability data are graphically represented as the percentage of free, unscheduled outpatient appointment times vs total available outpatient appointment times. The percentage is calculated for each day for 60 calendar days in advance, and the report is refreshed daily to account for interim appointment bookings. The numbers reported are a shorthand reference to the percentage of appointment times available on a given day, used to denote low, medium, and high availability. The OAS report is prepared for each imaging modality and each site of service.

The graphs are created from data resident in the departmental radiology information system, IDXRad (Burlington, VT), and are displayed using Crystal Reports (San Jose, CA) reporting software (see Figure 1). The graphs allow for a quick assessment of backlog for 60 days at a time. Managers can "see" which days have more available slots than others. Multiple sites can also be graphed side by side, with each color coded, thus providing senior management with a representation of how patient volume is being "spread" over multiple sites (Figure 2). For those sites that monitor appointment availability for a full week, weekends are differentiated from weekdays by background shading. This allows managers to determine if spikes in the OAS graph are influenced by weekend availability.

HOW IS THE OAS REPORTED?

To communicate the results of the graphs concisely, specific percentages of outpatient appointment availability are targeted for reporting. Instead of choosing just 1 percentage point as a marker, a range of points is used to describe low, medium, and high availability. The per-

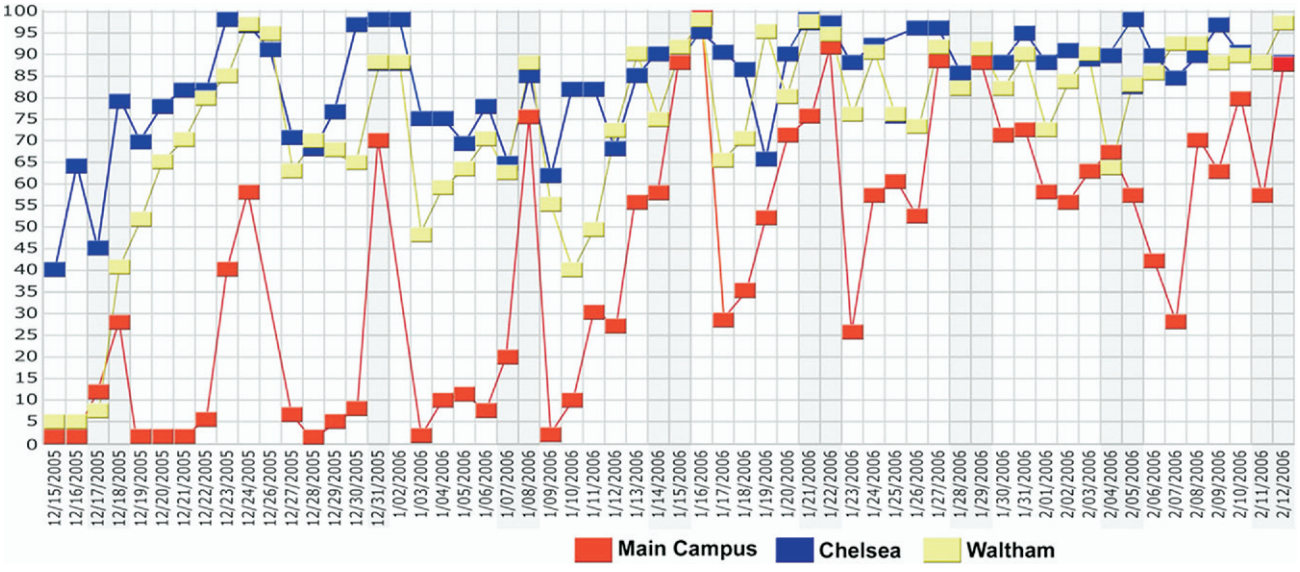


Fig 2. Percentage of free slots by business day—computed tomography. OAS graph for computed tomography (CT) over 60 consecutive days for 3 separate sites of service. Weekends are denoted by vertical background shading.

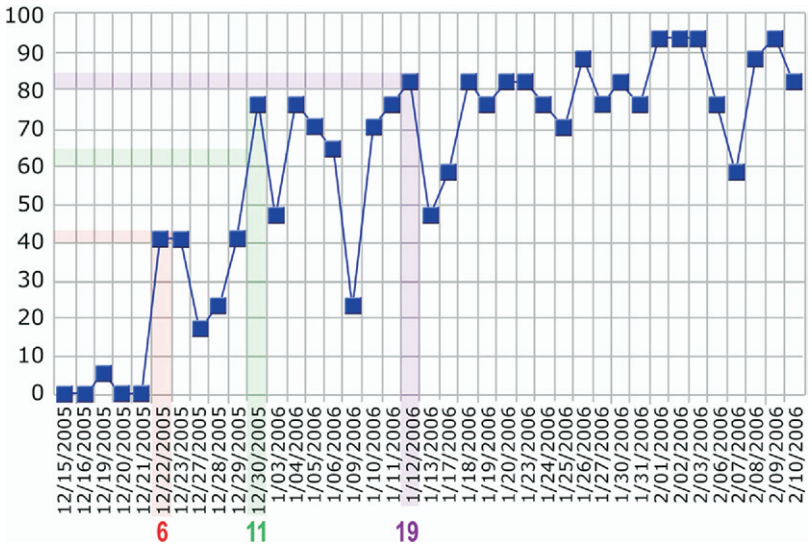


Fig 3. Percentage of free slots by business day—nuclear medicine. OAS graph for nuclear medicine with 40%, 60%, and 80% appointment availability highlighted. In order to determine the number of days needed to reach a percentage point, locate the desired percentage on the left most vertical axis and draw a horizontal line to the right until it meets the availability curve. At the point of intersection, move straight downward to find the associated date of availability. Count the number of days from the beginning of the graph needed to reach this date and record. Repeat for the other chosen percentage points.

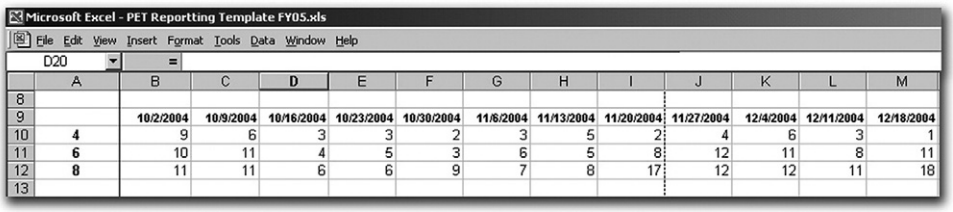
centages chosen from empirical experience are 40%, 60%, and 80%; the OAS is thus commonly referred to at our practices as the 4-6-8 score. The score is the number of days needed for a modality to cross these 3 percentage points. For example, in Figure 3, nuclear medicine would have a 4-6-8 score of 6-11-19: it took 6 days to cross the 40% mark, 11 days to cross the 60% mark, and 19 days to cross the 80% mark.

The higher the numbers overall, the larger the backlog and demand for services. Managers transcribe these numbers weekly to an Excel (Microsoft Corporation, Redmond, Wash) spreadsheet (along with other reporting data), which allows for trending and comparison of the 4-6-8 figures (see Figure 4 for an example of the weekly reporting statistics spreadsheet).

KEY FEATURES OF THE OAS

Key features of the OAS include the following:

- The report runs daily—every morning—and is accessible via the Massachusetts General Hospital intranet.
- The report's availability is displayed from tomorrow to 60 days in the future.
- The report shows outpatient appointments only.
- Graphs are grouped by modality; if multiple sites exist, they are color coded for differentiation.
- Graphs depict the percentage of free, unscheduled outpatient appointments.
- Graphs are not an indication of utilization, primarily because the examinations depicted have yet to occur.
- Graphs can help predict future utilization, but sensitivity drops as days in the future increase, because the template is not static but constantly changes.
- For some modalities, the graphs have been tailored to show availability for specific examination types. For example, in breast imaging, screening and diagnostic mammography availability are broken out separately (similar to multiple sites).


Microsoft Excel - PET Reportting Template FY05.xls

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13													

Fig 4. Weekly recorded 4-6-8 scores for positron emission tomography (PET).

CHALLENGES OF THE OAS

Some challenges of the OAS include the following:

- The graphs do not adjust throughout the day, so new appointments and cancellations or other chance occurrences are not seen instantaneously.
- If a manager removes or adds appointment times to the scheduling template, this information needs to be communicated immediately to update the report.
- Peaks and drops in appointment availability may be hidden in reporting. For example, in Figure 3, availability drops below 40% for 3 consecutive days before it rises again past the 60% marker. Although the 4-6-8 score is correctly given as 6-11-19, one would wrongly infer that availability has been steadily rising. One step to remedy this phenomenon is to define a peak or a rise above a level of ability only if it stays at that level for a minimum of 2 days. This again would have to be tailored to specific practices.

WHY 40%, 60%, AND 80% LEVELS?

The percentages equating to low, medium, and high availability (40%, 60%, and 80%, respectively) were chosen on the basis of years of experience tracking our operations and comparing feedback from referring physicians and their staffs about the perceived availability of imaging services. Below 40% availability, referring physicians begin to experience difficulties because there is a lower chance that a patient will find a convenient time, compared with when the measure is at the 60% or 80% mark. Low availability does not mean that all appointments are booked; rather, some appointments are available, but these are generally the less desirable ones that are less likely to be accepted by patients. Since the introduction of this methodology approximately 1 year ago, we have found these markers reflective of how patients and referrers perceive scheduling. For example, the longer it takes a modality to reach 40%, the more complaints we receive regarding poor access. Each operations manager has developed a good sense for the relationship between the shape of the availability curve and how "tight" the operation feels. This varies between modalities on the basis of the nature of the clinical conditions being imaged.

OTHER PERCENTAGES AS INDICATORS

Experience has shown that for some modalities, low, medium, and high availability are not always best captured by the 40%, 60%, and 80% marks. Several factors contribute to why a modality may choose to measure itself by a different set of percentages or choose not to use 4-6-8 altogether:

- Advance booking of appointments: Screening mammography patients have the opportunity to book their next routine mammograms 1 year in advance. Coupled with an especially high demand, screening mammography's 80% availability level has been as far out as 6 months. This affects outpatient availability indicators by pushing them out past 60 days. Beyond 60 days, the accuracy of the report as a leading indicator of volume drops. Empirical experience has shown that appointments made this far in advance are often forgotten or rescheduled. To better gauge availability and to keep the indicators under 60 days, we use 20%, 40%, and 60% (2-4-6) instead of 4-6-8.
- Walk-in facilities: Modalities that primarily schedule outpatient examinations the same day they occur derive little or no benefit from 4-6-8 or any other sort of outpatient appointment availability tracking.

WHY USE THE OAS?

The OAS Predicts Patients' Preferences

This method of measuring is a departure from current practices, such as next appointment availability and third next appointment availability, in which specific appointment times are used to measure backlog. The OAS reflects the overall number of open appointments regardless of when the appointments are free. Although the OAS does not indicate when a specific time is open, it does indicate when a patient would have a better chance to pick an acceptable time. Considering that patients do not always pick the first time offered, knowing the range of low to high opportunity for choice is important in understanding patients' satisfaction.

Standardization Across the Department

Another advantage of 4-6-8 is that reporting availability in radiology has become standardized. There is less confusion in deciphering when a modality's graph line crosses a percentage point than in determining which next appointment is or is not available. Therefore, the variation in how one person reports availability compared with another has been reduced.

Customization by Practice

Although multiple modalities may use the 40%, 60%, and 80% marks as their indicators, each may differ in its perception of the ideal number of days it takes to cross the marks. For example, computed tomography (CT) strives for a 4-6-8 score of 5-10-15, whereas magnetic resonance imaging aims for a score of 7-14-21. Each practice customizes its ideal score as it best fits its operation. Using this benchmark, managers can track scores by how they vary from their ideal targets.

Appropriate Resource Allocation

Using the OAS, managers are able to judge if more (or fewer) appointment times or more or less staffing is

needed on the basis of the trends seen in their appointment availability. Each manager's level of comfort with an ideal OAS score forms the basis of developing a department-wide standard of service to our customers.

In imaging modalities such as CT and magnetic resonance imaging, 2 consecutive weeks in which it takes more than 15 days to reach the 40% mark are a signal that access to services is declining. Operation managers then can proactively move to either add more appointment times or extend operating hours. In this way, the OAS serves as an effective leading indicator.

As we collect more data, we fine tune the process of reporting even further. This measurement is especially useful when compared with historical data, because it can show trends in demand and provide insight into additional capacity needs, providing another data point from which to make capital expenditures decisions.

CASE EXAMPLE: THE OAS IN POSITRON EMISSION TOMOGRAPHY COMPUTED TOMOGRAPHY

Issue Identification

In the fall of 2005, positron emission tomography (PET)/CT OAS statistics seemed to be on the rise. The 60% figures were consistently breaking the 15-day mark, and the 80% figures were hovering well above 20 days. This meant that patients wanting appointments were being presented with a schedule that was not 60% free (a majority of the appointment times still open) until roughly 3 weeks out (recall that 5 business days equal 1 week). In fact, on October 16, 2005, the OAS showed a 60% mark of 19 days out, which is more than 3 weeks (Figure 5). The level of flexibility was too constraining for our PET/CT patients and referring physicians.

Issue Confirmation

The decrease in availability was identified by keeping a careful eye on the weekly trends in 4-6-8 statistics (Figure 6). To further illustrate the trends, a 10-day period moving average (illustrated by thicker lines) gives even an unfamiliar user a clear picture of the steady decrease in slot availability.

Resolution

The solution chosen to remedy this issue was to add more outpatient appointments to the template. We determined that the template could be further expanded by extending weekday hours and by offering outpatient appointments on the weekends. To accomplish this, additional full-time equivalents had to be added. Because we monitored the OAS consistently, we recognized early on that the demand for PET/CT was steadily increasing. During the 2006 fiscal year budgeting process, conducted during March and April 2005, we proactively requested additional PET/CT staff members to help us accomplish the planned expansion of the PET/CT template.

Beginning in March 2006, one extra appointment time was added each weekday. The current hours of operation were extended to accommodate the additional appointment times. In addition, appointments were of-

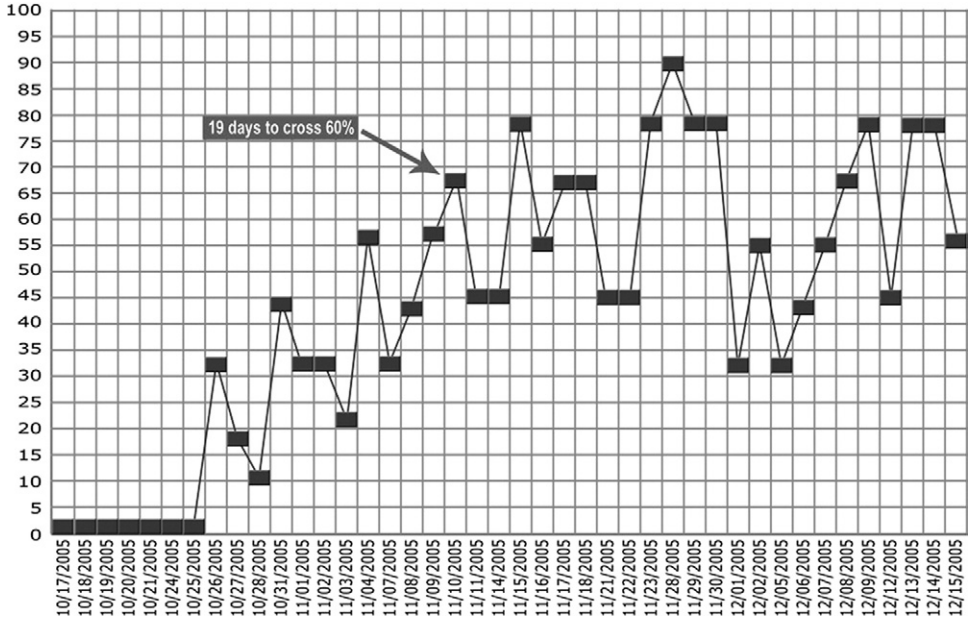

Fig 5. Percentage of free slots by business day—positron emission tomography/computed tomography. OAS graph for PET/CT. Sixty percent free outpatient appointments are marked on the availability curve.

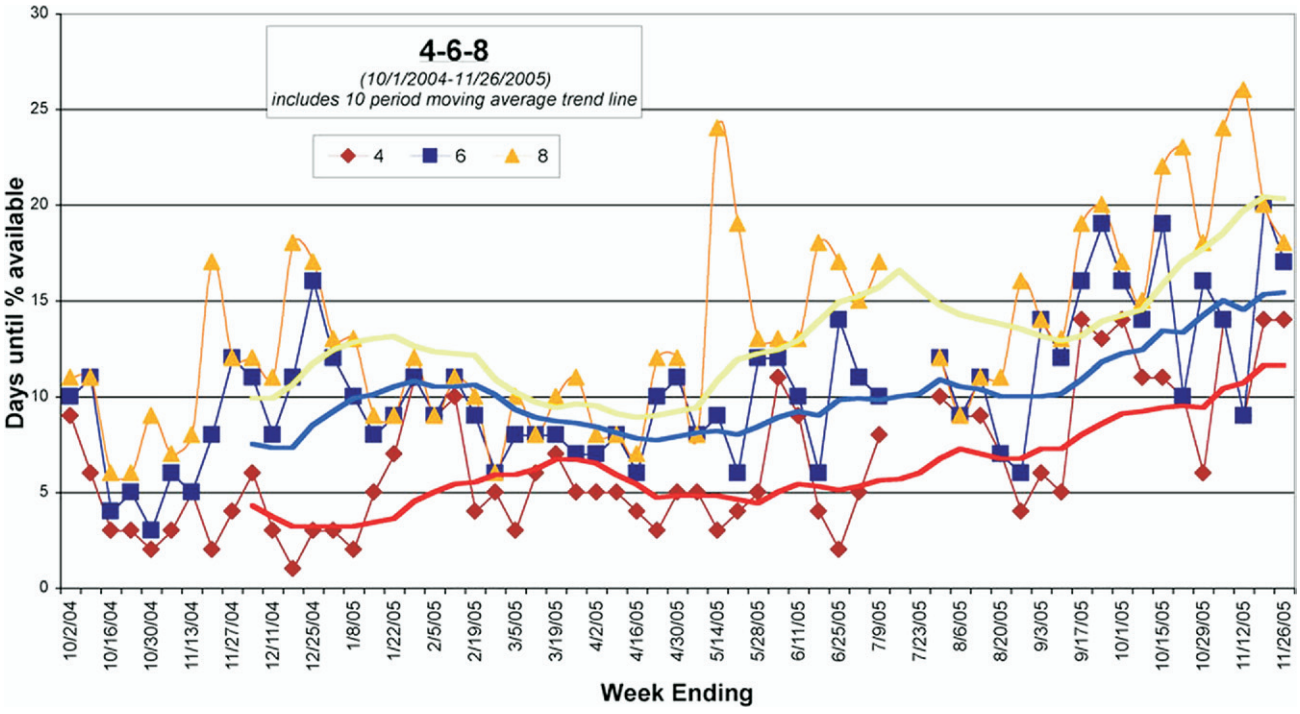

Fig 6. Weekly trended 4-6-8 scores for PET/CT. Ten-day moving average trend lines for 3 separate percentage points illustrate a decrease in appointment availability.

fered on 2 Saturdays per month. Both of these actions lowered the OAS score and therefore improved outpatient appointment availability (Figure 7).

CONCLUSION

As imaging technology advances, the ability to keep pace with demand is an ongoing challenge. Developing an accurate leading indicator for demand is a concern for many radiology departments. Even more challenging is identifying how availability equates to customer satisfaction: Will patients take the next available appointments? If they do not, how long will they wait to take appointments that are convenient for them? What risk do we face of losing referrals because we cannot accommodate patients' preferences?

Current methodologies (eg, the next available and third next available appointments) for tracking demand attempt to equate availability as "beginning" at a specific point in time. Implicit in these types of predictors are 2 assumptions: (1) appointments cannot be booked or are not booked before the target date, and (2) appointments are booked once the target date is reached. This begs the question of whether a single target date captures the ordering preferences of all patients. Furthermore, what is the truer measure of availability: when we tell patients that we have availability, or which appointments are actually taken? In other words, a series of appointments at inconvenient or unpopular times could suggest greater availability on the basis of our indicators. However, the reality is that patients do not choose these appointment times. Therefore, from the patients' perspective, it seems that there is a lack of availability.

Predicting outpatient availability is more art than science. We should not assume a one-size-fits-all approach to assessing availability. Radiology managers can benefit from a variety of tools to help them gauge their business. Measuring outpatient availability via the OAS methodology can be an effective tool in assessing demand. The OAS introduces the concept of predicting patient preference as a measure for backlog. The OAS offers flexibility by allowing the user to define what is and what is not an appropriate measure of low, medium, and high outpatient availability. This is done in 2 ways: (1) managers can pick which percentage points of outpatient availability fit their practices (eg, 20%, 40%, and 60% vs 40%, 60%, and 80%), and (2) managers can select the appropriate target values of the number of days to reach their selected percentages.

The next phase for the OAS is to make it time specific. Prime time appointments, as defined by each operation, will be differentiated with their own OAS as well. This advance will further allow managers to fine tune the process of gauging and managing availability.

Although the OAS cannot answer all questions regard-

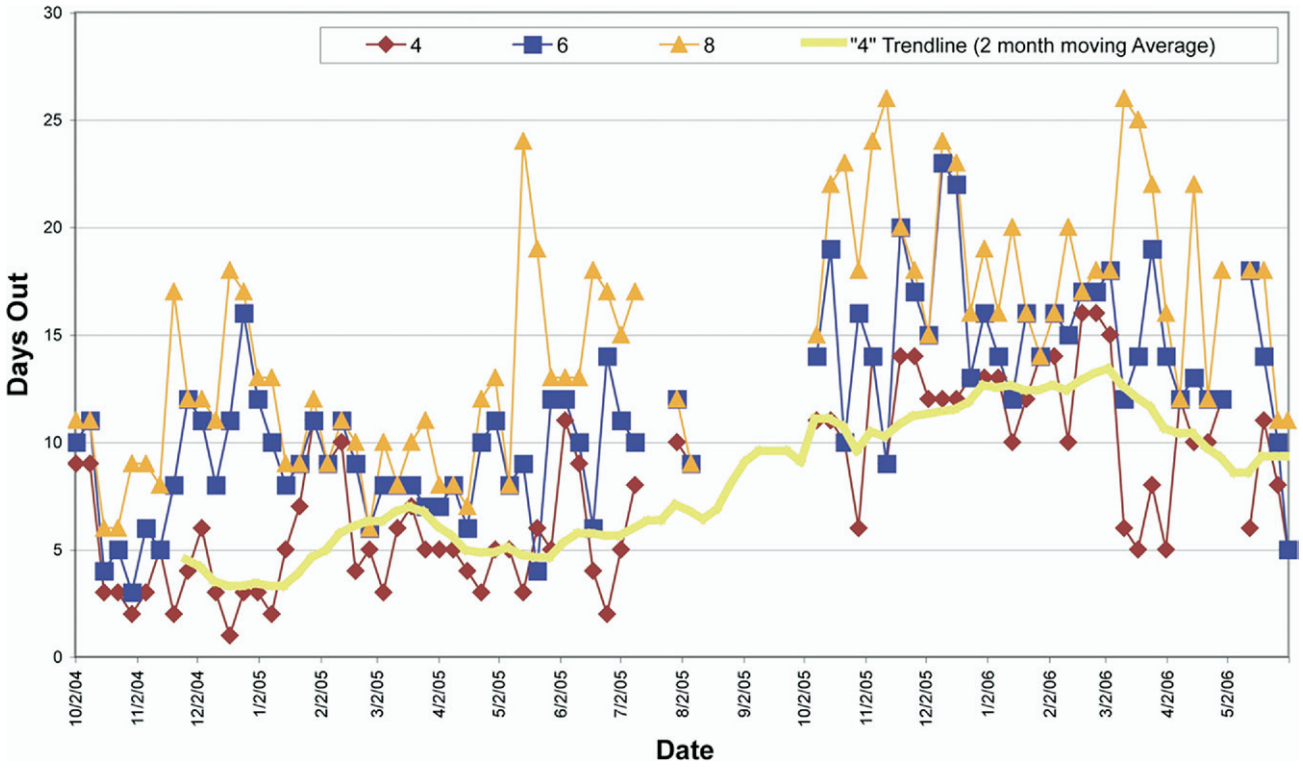

Fig 7. Positron emission tomography/computed tomography availability. Weekly trended 4-6-8 scores for PET/CT with 2-months moving average trend lines. The increase in availability at 40% is evident after the addition of more appointment times beginning in March, 2006.

ing demand, and not every practice may have the infrastructure to leverage this method, it is a creative way to proactively deal with demand and should be part of the toolkit of radiology managers in running and understanding their business.

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