Optimizing Outpatient Phlebotomy Staffing

Tools to Assess Staffing Needs and Monitor Effectiveness

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Context.—Short patient wait times are critical for patient satisfaction with outpatient phlebotomy services. Although increasing phlebotomy staffing is a direct way to improve wait times, it may not be feasible or appropriate in many settings, particularly in the context of current economic pressures in health care.

Objective.—To effect sustainable reductions in patient wait times, we created a simple, data-driven tool to systematically optimize staffing across our 14 phlebotomy sites with varying patient populations, scope of service, capacity, and process workflows.

Design.—We used staffing levels and patient venipuncture volumes to derive the estimated capacity, a parameter that helps predict the number of patients a location can accommodate per unit of time. We then used this parameter to determine whether a particular phlebotomy site was overstaffed, adequately staffed, or understaffed.

Results.—In this article, we present the applications of our approach in 1 overstaffed and 2 understaffed phlebotomy sites. After staffing changes at previously understaffed sites, the percentage of patients waiting less than 10 minutes ranged from 88% to 100%. At our previously overstaffed site, we maintained our goal of 90% of patients waiting less than 10 minutes despite staffing reductions. All staffing changes were made using existing resources.

Conclusions.—Used in conjunction with patient wait-time and satisfaction data, our outpatient phlebotomy staffing tool is an accurate and flexible way to assess capacity and to improve patient wait times.

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Optimizing Outpatient Phlebotomy Staffing—Mijailovic et al 929
METHODS

This study was approved by the Partners Human Research Committee.

Study Site

Brigham and Women’s Hospital is a 793-bed academic medical center located in Boston, Massachusetts. The clinical laboratory provides phlebotomy services for both inpatients and outpatients. Brigham and Women’s Hospital has a total of 38 outpatient phlebotomists that staff 14 outpatient phlebotomy draw sites and collectively perform an estimated 150,000 venipunctures annually. Staffing levels vary at each location, ranging from a single phlebotomist at our smallest draw site to 7 phlebotomists at our busiest site. The patient population at each draw site also differs, encompassing the full spectrum of clinical and research disciplines, including surgery, neurology, cardiology, and obstetrics, but excluding pediatrics.

Workflow at Outpatient Phlebotomy Sites

Although somewhat variable among phlebotomy locations, the typical workflow at our outpatient draw sites is as follows: (1) the patient arrives, hands in the laboratory requisition form at the check-in desk, enters his or her name and arrival time into a log book, and waits to be called; (2) the phlebotomist enters the providers’ orders into the laboratory information system, prints specimen labels, and places the requisition form and specimen labels into the ready basket; (3) the phlebotomist calls the patient based on arrival time and draws the specimen according to standard venipuncture procedure; and (4) the patient leaves and the phlebotomist sends the specimen(s) to the appropriate laboratory for testing (Figure 1).

Outpatient Phlebotomy Staffing Tool

We developed a management tool to assess the adequacy of our staffing levels at each outpatient phlebotomy site and identify opportunities to reallocate, decrease, and/or increase staffing to match demand. Similarly to our inpatient staffing model,8 we used staffing levels and patient venipuncture volumes to derive an estimated capacity, using the procedure described below. The patient venipuncture volume for a 3-month period (December 1, 2011–February 29, 2012) at each site was downloaded from our laboratory information system. The median and 90th percentile of patient volume at each site was determined in successive 30-minute time intervals during the hours of operation. Patient volumes were analyzed for each day of the week (Monday through Friday). The data from different days were combined in instances where patient volumes were similar across days of the week.

The estimated capacity was calculated as the product of the number of phlebotomists and the time interval (30 minutes), divided by the service time per draw (see Table for definitions). For example, if we determined that the service time per draw was 10 minutes and that 3 phlebotomists worked at our site of interest, the estimated capacity for that site would equal $(3 \times 30)/10 = 9$. In other words, the site would have the estimated capacity to draw 9 patients in a 30-minute time interval.

\[
\text{Estimated Capacity} = \frac{\text{No. of Phlebotomists} \times \text{Time Interval}}{\text{Service Time per Draw}}
\]

To determine a representative service time per draw (Figure 1), we observed phlebotomists at 4 different outpatient phlebotomy locations with varying patient populations and numbers of draw chairs during historically busy times of the day. A total of 169 draws were observed during a 16-day period (April 10 through 25, 2012). The service time was recorded to the nearest minute. Our observations showed that the median, 75th percentile, and 90th percentile of service time were 5, 8, and 10 minutes, respectively. We chose a service time of 10 minutes, corresponding to the 90th percentile, for our model (Figure 1).

We analyzed staffing levels at each of our 14 outpatient phlebotomy sites. Patient volumes, both median and 90th percentile, and estimated capacity were plotted in 30-minute time intervals throughout the day.

Analyzing the Staffing Model Results

Our goal was to ensure that each site had enough capacity to accommodate the patient volume at the 90th percentile. Therefore, at sites where the 90th percentile of patient volume was above...
estimated capacity (i.e., patient volume exceeded the number of patients the tool determined the phlebotomy location could accommodate) at a particular time, we concluded that the location was understaffed at that time of day. Similarly, at sites where the 90th percentile of patient volume was below estimated capacity at a particular time, we concluded that the location was overstaffed at that time of day.

**Outcome Metrics: Patient Wait Time and Patient Satisfaction**

We chose 3 representative phlebotomy sites (sites 1, 2, and 3) at which to make staffing changes based on several factors including historically high patient volumes, relatively high frequency of patient, physician, and/or phlebotomist complaints, and imbalances between staffing levels and patient volume (either overstaffing or understaffing). Patient wait times (Figure 1; see Table for definition) were collected from sign-in sheets, filled in by either the patient or the phlebotomist, or from requisition forms, stamped by the phlebotomist with patient arrival and call-in times. Our goal was to achieve a wait time of less than 10 minutes for 90% of patients. The percentage of patient wait times less than 10 minutes was calculated per 30-minute time interval, combining all days of the week where appropriate.

Pre- and post–staffing change patient wait times were collected at site 1 for 4-week periods from April 16 to May 14, 2012 (n = 1119), and October 9 to November 14, 2012 (n = 1349), respectively. Patient wait times from October 13 to 22, 2012, were excluded because of inconsistent staffing levels during that time period. Site 2 post–staffing change patient wait times were collected between noon and 4 PM (the time the staffing change was made) from April 22 to May 3, 2013 (n = 488). Site 2 pre–staffing change patient wait times were unavailable. Pre– and post–staffing change patient wait times at site 3 were collected for 4-week periods from October 31, to November 30, 2012 (n = 558), and from December 4 to 28, 2012 (n = 319), respectively.

In addition, patient satisfaction surveys (Figure 2) were administered at site 3. The surveys asked patients 6 questions concerning customer service, wait time, phlebotomist skill, cleanliness, privacy, and overall satisfaction. Patients were asked to respond to the questions using a 5-point Likert scale (excellent, very good, good, fair, or poor). In addition, patients were asked to estimate their wait time (<5, 5–10, 15, 20, 25, or >30 minutes). Patient responses and reported wait times at site 3 were collected pre– (n = 57) and post– (n = 63) staffing changes, from October 31 to November 19, 2012, and from November 20 to December 28, 2012, respectively.

**RESULTS**

**Site 1**

Using our staffing tool, we determined that site 1 (n = 4219 blood draws) was understaffed from 7 to 8:30 AM and from 3 to 5 PM (Figure 3). We therefore increased staffing in the early morning (7–8:30 AM) and afternoon (12:30–5 PM) to ensure that at least 2 phlebotomists were working through-

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<table>
<thead>
<tr>
<th>Day of visit (please circle)</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
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</thead>
<tbody>
<tr>
<td>Age of patient (please circle)</td>
<td>0–6 mo</td>
<td>6 mo–2 yr</td>
<td>3–12 yr</td>
<td>13–18 yr</td>
<td>19–35 yr</td>
<td>36–65 yr</td>
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<tr>
<td>Before being called into the phlebotomy room, approximately how many minutes did you wait? (please circle)</td>
<td>&lt;5 minutes</td>
<td>5–10 minutes</td>
<td>15 minutes</td>
<td>20 minutes</td>
<td>25 minutes</td>
<td>30 minutes</td>
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<tr>
<th>Please rate the following:</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<tbody>
<tr>
<td>Courtesy of the laboratory staff and how well they answered your questions</td>
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<td>Length of time between your arrival and when you were seen by the phlebotomist</td>
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<td>Skill of the laboratory phlebotomist</td>
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<td>Overall comfort, cleanliness, and condition of the area</td>
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<td>How well your privacy was respected when the phlebotomy staff communicated with you</td>
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<td>Your overall satisfaction level</td>
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out the day. Prior to implementing these staffing changes, we observed a high percentage (as high as 38% at 7:30 AM and 36% at 4 PM) of patients waiting longer than 10 minutes in the early morning (7–8:30 AM) and late afternoon (3–4:30 PM) (n = 1119) (Figure 4). After implementing the above changes, we achieved our goal of 90% of patients waiting less than 10 minutes for all hours of the day (n = 1349) (Figure 4).

**Site 2**

Our staffing tool indicated that site 2 (n = 8983 phlebotomy draws) was overstaffed between noon and 4 PM (Figure 5). Accordingly, we decreased staff during this time interval and relocated 1 phlebotomist to the understaffed site 1. Despite this reduction, we were able to maintain our goal, with 93% (454 of 488) of patients waiting less than 10 minutes between noon and 4 PM.

**Site 3**

This particular site (n = 2395 phlebotomy draws) was understaffed between 8:30 AM and 4:30 PM (Figure 6); however, space constraints prevented us from having more than 1 phlebotomist at any given time. Thus, the only feasible intervention was to use a phlebotomist to cover the lunch break (noon–1 PM), when there previously was no phlebotomist working. As expected, this resulted in a significant decrease in patient wait times between noon and 1:30 PM; 88% of patients waited less than 10 minutes (Figure 7). Patient wait times throughout the remainder of the day were virtually unchanged, as average patient wait time was 12 minutes both pre- and post-staffing change and median patient wait time was 10 minutes both pre- and post-staffing change (data not shown).

Patient satisfaction surveys were also administered at site 3. The percentage of patients reporting wait times greater than 10 minutes dropped from 21% (13 of 57) to 11% (7 of 63) after implementation of the staffing changes, with no patient-reported wait times exceeding 25 minutes (Figure 8). Though not dramatic, the percentage of patients classifying the wait time as excellent increased from 75% to 83% post-staffing change (data not shown).
COMMENT

As hospitals cope with rising health care costs, clinical laboratories are expected to improve services using limited resources.\textsuperscript{2,5–7} Our laboratory was successful in using Lean principles to streamline processes and improve quality without increasing costs.\textsuperscript{2,5} The present study represents a continuation of our effort to improve overall patient satisfaction with phlebotomy services, particularly patient wait time.\textsuperscript{2,5,8} We deployed a novel approach to standardize the evaluation of staffing levels in outpatient phlebotomy, independent from variations in patient population, process workflows, and number of available draw chairs.

Our staffing tool used common, readily available data, such as staffing levels and patient venipuncture volumes, to identify understaffed and overstuffed phlebotomy sites. These data could be collected electronically or manually, as described in this article. Furthermore, the flexibility of our model allowed for a range of staffing interventions, depending on the goals of each individual clinical laboratory or as a function of varying patient population and available resources. For example, we chose to staff phlebotomy sites to the 90th percentile of patient volume to achieve our wait-time goal, whereas other labs may choose to use a lower or higher percentile, depending on their objectives and resources.

In addition to using patient wait time as an endpoint, we used patient satisfaction surveys to assess other qualitative aspects of the patient experience, including customer service, phlebotomist skill, cleanliness, privacy, and overall satisfaction.\textsuperscript{2} We aim to perform patient satisfaction surveys yearly at most of our phlebotomy locations. At site 3 we had an opportunity to use patient satisfaction surveys that were administered in close proximity to the staffing change. We saw improvement in patient satisfaction at site 3 related to patient wait time, though other variables were essentially the same pre- and post-staffing changes (data not shown). The lack of an impact on the other areas of patient satisfaction can be explained by the fact that we assessed satisfaction for all patients throughout the day, though our change in staffing occurred only during lunch, from noon to 1 PM. It should also be noted that we are unable to retrospectively determine whether or not patients estimated their wait times accurately because patient surveys were
anonymous. Nonetheless, we have found that patient satisfaction surveys can yield useful data and will continue to use this metric.2

Optimized phlebotomy staffing could also improve clinicians’ and phlebotomists’ satisfaction by decreasing the number of patient complaints and ensuring faster laboratory turnaround time. Our staffing changes resulted in fewer clinicians’ complaints at site 3 and, according to phlebotomists at site 1, an improved work environment (anecdotal observations). We plan to consistently monitor clinician and phlebotomist satisfaction moving forward by extending our existing inpatient incident reporting system to outpatient phlebotomy.

There was a limitation in our analysis of the wait-time metric at site 2, as wait-time data pre–staffing change were unavailable because of inconsistent data collection. However, it should be noted that site 2 was overstaffed before the intervention and 93% of patients waited less than 10 minutes after our staffing changes, suggesting that this particular site would most likely have met our goal of 90% of patients waiting less than 10 minutes in the preintervention period.

There are also several limitations to our method of optimizing staffing levels. First, the staffing tool is unable to address some intrinsic limitations such as lack of space to accommodate additional phlebotomists or patient chairs, as was the case with our site 3. Next, there may be logistic constraints to implementing staffing changes for short periods of time (ie, less than 4 hours) because moving staff between sites is inefficient because of travel time. Further, institutional support may be needed to secure additional staffing in settings that do not permit internal shifting of resources. However, our management tool could provide objective data to justify these requests for additional staff, particularly in those circumstances when standard process improvement maneuvers have been exhausted.

In summary, continuing our process improvement effort in our phlebotomy services,2,5 we have created an accurate, adaptable, and easy-to-use tool that can systematically optimize staffing levels across multiple outpatient phlebot-
omy sites. We have also identified useful metrics to assess the effectiveness of staffing intervention such as patient wait time, patient satisfaction, and potentially clinician and phlebotomist satisfaction. Our management tool can be used in tandem with workflow optimization efforts\(^2\) to improve phlebotomy services and patient satisfaction.

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**References**