# Optimizing Value: A Time-Driven Activity-Based Costing and Workflow Study in Three Different Primary Care Models

**Amanda N. Sebring, BA, Sharon Diamond-Myrsten, MD, Jeffrey Trice, LSSBB, Charles J. Perry, Jr., MBA, Kelly F. Bell, MBA, M. Norman Oliver, MD, MA**
Department of Family Medicine, University of Virginia School of Medicine, Charlottesville, VA
**Mahek A. Shah, MD**
Institute for Strategy & Competitiveness, Harvard Business School, Boston, MA

## Background

The University of Virginia Family Medicine Department, in collaboration with the Harvard Business School, initiated a project to increase the value of care we provide to our patients. Lowering costs is an essential part of the value equation and requires knowing the true costs of providing care. We aim to compare the costs associated with three different primary care delivery models in order to find ways to decrease costs while maintaining high-quality care and improving the work life of clinicians and staff.

$$\text{Value} = \frac{\text{Quality}}{\text{Cost}} + \text{JOY}$$

### Key Participants for Project's Success

- Department Chair
- Medical Director
- Dept. Administrator
- Project Manager
- Medical Center Finance Analyst
- Operations and Systems Engineer

### Three Primary Care Delivery Models

1. **Standard Practice Delivery:** Conventional method of practice. No population outreach and minimal standard pre-visit chart preparation or workflow.
2. **PCMH Team Care:** Residency training program with 13 faculty, 22 residents, and 5 nurse practitioners working as three quasi-independent teams. Marked by standard pre-visit chart preparation, population health outreach, and integrated quality improvement initiatives.
3. **Family Team Care:** LPN gathers and documents HPI based on protocols specific to the patient's chief complaint prior to provider entering the exam room.

## Methods

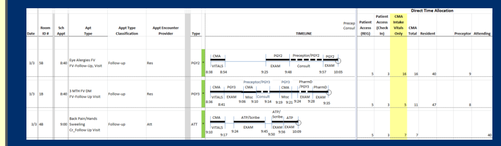
**Time-driven activity-based costing (TDABC)** is a comprehensive method that accounts for total cost of the resources used by the patient throughout a defined care cycle including:

- Determining which activities are performed.
- The individual responsible for doing each activity.
- The amount of time dedicated to each activity.
- Associated costs including salaries, benefits and administrative support, labs, medical supplies, and physical space.

### TDABC Process

- Complete a TDABC costing tool for each delivery model to calculate a cost per unit of time for each type of personnel.
- Perform direct observations and time studies.
- Create process maps and value stream maps.
- Use medical record and scheduling reports to analyze patient outcomes and clinical utilization.

Observation Data Example:



### Our Team's Innovative Addition to the Model

Cost analysis should also account for clinical efficiency and missed appointments (No Show Rate).

$$\text{Clinical Efficiency} = \frac{\text{Scheduled Hours Per Year}}{\text{Clinical Operating Capacity}}$$

***Clinical Operating Capacity Defined:*** *Space capacity divided by the number of rooms assigned to each provider.*

**Our Clinical Efficiency = 53.01%**

Opportunity!

## Results: Follow-up Visit Cost Comparison

| Primary Care Delivery Model | # of Exam Rooms Assigned to Each Provider | Clinical Efficiency | Clinic No Show Rate | Lab Costs Per Follow-up Visit | Physical Space Costs Per Follow-up Visit | Clinician Capacity Cost Rate (per minute) | Follow-up Visit Durations | Observed Average Clinician Time with Patient at Follow-up Visit[1] | TDABC Cost Per Follow-up Visit |
|---|---|---|---|---|---|---|---|---|---|
| Standard Practice Delivery | 1.5 | 67.75% | 6.6% | $8.41 | $6.18 | $2.23 | 20 min | 21 min | $150.06 |
| PCMH Team Care | 2 | 53.01% | 16.1% | $3.68 | $29.91 | $2.27 Attending<br>$1.39 NP<br>$0.64 Resident | 30 min[2] | 34 min | $179.34 |
| Family Team Care | 3 | 67.00% | 7% | $18.58[3] | $42.95[4] | $2.33 | 30 min | 14 min | $194.44 |
| **Predictive –** PCMH Team Care Clinic with Family Team Care Delivery Model | 2 | 81.20% | 16.1% | $3.68 | $26.05 | $2.27 Attending<br>$1.39 NP<br>$0.64 Resident | 20 min | 10 min | $135.23 |

1. Added 30 more minutes of clinician time to each visit for total cost evaluation. 10 minutes for pre-visit preparation and 20 minutes for post-visit needs including charting, care coordination, and result follow-up. Time additions derived from interviews.
2. Variable. Visit lengths are function of clinician training, patient age, and patient language.
3. Larger percentage of visits incurred charges for more expensive labs as compared to the other two clinics. Fewer pediatric patients. Higher proportion of follow-up visits as compared to other visit types thus higher attribution of lab costs.
4. Leased building with lower patient volumes.

### Validating the Model

We used the TDABC model to predict costs which were **within 3% of the operational expenses** for the PCMH Team Care clinic. Our process:

1. Calculate the TDABC cost per visit for six different visit types with five different encounter provider types (see below).
2. Multiply TDABC cost per visit by clinic volume.
3. Compare results to operational expenses.

| 2016 PCMH Team Care Clinic Utilization | | | Encounter Provider by Visit Type | | | | |
|---|---|---|---|---|---|---|---|
| Visit Type | # of Visits | % of Total Visits | Attending | Nurse Practitioner | PGY1 | PGY2 | PGY3 |
| Establish Care | 745 | 4.53% | 33.03% | 16.28% | 10.55% | 13.76% | 26.38% |
| Follow-Up | 7,498 | 45.47% | 33.90% | 24.92% | 3.38% | 12.71% | 25.08% |
| Preventive Care | 2,526 | 15.32% | 34.94% | 24.63% | 7.73% | 11.53% | 21.17% |
| Urgent | 5,053 | 30.64% | 29.01% | 26.06% | 4.99% | 13.98% | 25.96% |
| Procedure/Injection | 264 | 1.60% | 35.06% | 39.61% | 7.14% | 3.90% | 14.29% |
| Transitional Care | 386 | 2.43% | 19.23% | 42.31% | 6.41% | 11.54% | 20.51% |

### Next Steps

- Use of automated simulation modeling in conjunction with TDABC costing to predict operational outcomes of trialing a new delivery model to increase value.
- Identify scheduling opportunities to improve clinical efficiency.
- Evaluate outcomes of patient cohort at each of the primary care clinics.
- Determine appropriateness of rooming time and scheduled visit time to address patient needs.
- Increase value for our patients by decreasing costs, improving efficiency and joy in practice, and maintaining high-quality care.

## Conclusions

The TDABC model gives us the ability to calculate, compare, and predict the cost impacts of workflow and process change at three different levels: the discrete patient encounter, the continuum of care for a patient over a care cycle, and the healthcare organization.