Best Practices for ED Throughput

Jody Crane, MD, MBA

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Cambridge, MA

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Session Objectives

After this session, participants will be able to:

- Describe strategies based on ER volume that can be implemented in your ER to efficiently treat low acuity patient (i.e. Levels 4, 5 and some 3s).
- Identify specific strategies that could be applied in your ED
Perfecting Throughput in the ED

- Properly characterizing demand
- Understanding and maximizing productivity of your key resources
  - Physicians
  - Nurses
  - Beds
- Taking a systems perspective in terms of your operational approach
Demand/Capacity Matching

- This is the first step in improving performance in the ED
- The arrivals must be understood by hour of day, day of week, even season in some cases
- Then align your staffing based on the levels of variation in your arrivals
- You must understand the service rate of your key servers and understand queuing theory in order to align your capacity properly

Basic Approach Aligning Resources

1. Define the arrival *Demand*
2. Characterize the *Variation* in arrivals
3. Define the server *Productivity* (physician, nurse, midlevel, resident, bed)
4. Understand the *Variation* in server capacity
5. Align capacity to demand with a *Systems* perspective
6. Measure your results and act
1. Define the Arrival Demand

- Arrival demand defines the demand for healthcare delivery
- Is the primary driver for physician, midlevel, and resident staffing
- Is only part of the equation for nurses as occupancy and boarding must be considered

2. Characterize the Variation in Demand - Hourly Variation

- Peak usually starts between 8a and 11am
- Usually ends between 9pm and 11pm
- Typically between 4:1 and 6:1 peak vs overnight arrivals
- Pediatrics and low acuity – higher evenings
2. DOW Variation by Acuity

- Volume varies significantly by day of week in most institutions
- Weekend volume is usually lower than weekday volume
- Mondays are usually the **busiest** and also have the **highest acuity**

![Average Weekly Patient Demand](image)

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2. Characterize the Variation in Demand - Seasonal Variation

- Seasonal Variation can be problematic if not considered
- Ultimately affects the size of your ED and the operational approach
- Peds follows this profile
- Need specific strategies to staff appropriately – part time staffing, preferential vacations, snowbird scheduling

![Summer](image)

Summer
10/hr

![Winter](image)

Winter
12/hr

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3. Define the Server Productivity

1. Assess the volume over a week and divide by the total staffing hours

\[
\frac{665 \text{ pts/wk}}{266 \text{ md hrs/wk}} = 2.5 \text{ pts/hr}
\]

2. *Peak productivity* is arriving volume less waiting room accumulation divided by physician or nurse hours

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3. Peak Productivity

\[
\text{[44 pts - (8pts – 0 pts)]} = 36
\]
\[
\text{---------------------------} = \frac{36}{24} = 1.5 \text{ pts/hr}
\]

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3. Time and Motion

1. Perform a time study
2. Follow nurses and physicians around as they work throughout the week and time everything they do
3. This will give you how much time they spend on patients
4. And…where to improve

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3. Time and Motion

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<table>
<thead>
<tr>
<th></th>
<th>Miles/Shift</th>
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<td>44</td>
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<tr>
<td>Doc</td>
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<td>28</td>
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<td>Nurse</td>
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<tr>
<td>Doc</td>
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</table>

3. EM Time Studies

| CTAS 1  | 73.6 |
| CTAS 2  | 38.9 |
| CTAS 3  | 26.3 |
| CTAS 4  | 15   |
| CTAS 5  | 10.9 | Pts/Hr |
| Weighted Avg | 26.0 | 2.3 |
| 120%   | 31.2 | 1.9   |

*Over 11,000 visits


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3. EM Time Studies

Table 4. Correlations and standardized beta values for key workload predictors.

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<thead>
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<th>Validation sample (n=371)</th>
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<td>Univariable</td>
<td>Multivariable model</td>
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<tr>
<td></td>
<td>r</td>
<td>p</td>
</tr>
<tr>
<td>Procedure performed</td>
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<td>&lt;0.001</td>
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<td>CTAS image level</td>
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<tr>
<td>Arrival by ambulance</td>
<td>0.33</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Innes, GD. “Prospective time study derivation of emergency physician workload predictors,” CJEM 2005;7(5):299308

3. Nurse Staffing Ratios

Lawsuit: Ohio nurse was ‘worked to death’

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3. Nurse Staffing Ratios

1. Many nurse staffing paradigms are driven off of bed ratios (4 beds per nurse)
2. Nurse staffing will depend on occupancy
3. Variation in Occupancy

![Graph showing variation in occupancy by time of week.]

3. Nurse Staffing Ratios

1. Many nurse staffing paradigms are driven off of bed ratios (4 beds per nurse)
2. Nurse staffing will depend on occupancy
3. Occupancy is directly proportional to LOS, but work is largely per patient

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Example

4 hour LOS

4 pts/hr

16 beds

4 RNs

Example

2

4 hour LOS

4 pts/hr

16 beds

4 RNs

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Example

<table>
<thead>
<tr>
<th>16 beds</th>
<th>2 RNs</th>
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<tbody>
<tr>
<td>2 pts/hr</td>
<td>4 hour LOS</td>
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</table>

Same amount of work that 4 nurses had!

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Consider the Impact of Boarding

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4. Understand Variation in Service Capacity

- Individual variation – “slow” nurses and doctors
- Patient-mediated – Codes and other critical patients, admissions, nursing home patients
- Staffing gaps
  - Lunch and other breaks
  - Vacancies
  - Vacation
  - Call-outs
  - Meetings, conferences
Keep Your Staff Working!

- Give your physicians *uninhibited* access to patients
- Docs should only be doing the following:
  - Initial assessment, work-up and therapy
  - Procedures
  - Reassessment, disposition, and definitive therapy
- Nurses should only be doing nursing activities:
  - Assessment
  - Medication administration
  - Other direct patient care of moderate to high complexity
- All other activity is waste

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**Emergency Medicine Provider Productivity**

*An Information Paper*

The work or life of no one type or patient versus another. in the American College of Emergency Physicians’s (ACEP) first ED management book, *Emergency Department Organization and Management*, published in 1975, on page 20 of Chapter 3, Staffing the Emergency Department, the following quote is found: “Generally, four physicians can usually cope with a patient load of up to 50,000 patients per year.” Assuming 40 hours per week (a common workload in the early days of EDs) and working 48 weeks per year, that’s 200 patients per hour. The author goes on to say that this assertion of course assumes adequate nurse staffing and ancillary support services. Indeed, it was not difficult to find the same statement appears to be the earliest published statement addressing emergency physician productivity. The same statement appears in the 2nd Edition of the book published in 1978.

In 1983, Dr. John van de Leur, one of the contributors to the ACEP ED management tool and the editor of the edition mentioned above, writing in *Management of Emergency Services*, says that approximately 2 patients per hour is the most appropriate emergency physician workload in the United States. The same year, in the *Emergency Medicine Clinics of North America* chapter titled “The Emergency Department,” Dr. Robert H. Blum, Jr., who is also quoted as saying “most emergency physicians should see no more than 2.8 to 3.1 patients per hour.”

Dr. Todd Packard, writing in 1992 in *Managing the Emergency Department: A Team Approach*, references the *Third Annual Physician Practice Costs and Income Survey*, which found that emergency physicians are on average 2.3 patients per hour. Dr. Packard goes on to conclude that 3 patients per hour is a reasonable approximation of an appropriate caseload but that the number probably ranges “...between 1.8 and 5 patients per hour.”
For moderate Acuity EDs, 2.5 patients per hour should not be exceeded.

1.8 to 2.8 patients per hour
2.1 to 2.2 patients per hour, you should consider increasing staffing
Maximize the lowest cost staffing alternatives first
Team or Zone-based Care

An ED I recently visited was 30,000 sf with nursing zones, but no Doc zones. The average Doc walked 7 miles per shift! Yes, true...

- However, teams can very effective:
  - Decreased staff movement due to proximity of rooms
  - Greatly enhanced communication
  - Clear handoffs and signals due to few numbers of unique staff interactions
- Teams can be opened as units
  - Helps maintain standard Nurse/Doc ratios
  - Easier to deal with increasing volumes

Danish ED Physician Time Study

- 25% Direct Care
- 5.8% Indirect Care
- 24% Communicating
- 31% Documenting
- 6% Transport
- 8% Personal/Other

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4,000 Clicks

- 43% of time on data entry
- 28% on direct care
- 12% Results review
- 13% Communication
- 3% Other

Scribes – Outback Style

- Increased productivity 0.32 pts/hr (0.16-0.65)
- Provider income increased $105 Aus ($80 US) per scribed hour
Productivity – Before and After Scribes

Case Study #6: Emergency Department Scribe Program

SUMMARY:
- Increase physician productivity (ICP estimates 96 to 120 minutes at 3 hours emergency physician shift in spar or documentation)
- Increase physician staff satisfaction
- Free physician to focus on patient care rather than documentation

SOLUTION:
- Designed EMR emergency physician as EDP Scribe Program Coordinator
- Program Coordinator developed relationship with area directors to develop "proactive scribe pool"
- Shifts focused on general medical, ER, internal medicine, etc. all be assigned to same year
- Developed a phone screening process with hospital
- Conducted initial one-on-one meetings with all approved candidates
- Responsibilities included: attendance and performance

RESULTS:
- Increase in emergency physician productivity of 17% in the ER (exclusive of inter portal
  patients over 90 minutes after charting criterial contact)
- Physician shifts with scribes decreased on average times 30 minutes per patient while at the same
  time ED volume increased and total hospital read time
- Decreased time to admission in patients who were admitted during time (565)
- Positive individual patient comments and increase in overall patient satisfaction scores
- Increased physician satisfaction

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CLINICAL PRACTICE

Impact of Scribes on Performance Indicators in the Emergency Department

Rajiv Aryu, MD, Danielle M. Salovich, Pamela Ohman-Strickland, PhD, and
Mark A. Mertin, DO

Abstract

Objectives: The objective was to quantify the effect of scribes on three measures of emergency physician productivity in an adult emergency department (ED).

Methods: For this retrospective study, 243 clinical shifts (of either 10 or 12 hours) worked by 13 EPs during an 18-month period were selected for evaluation. Payroll data sheets were examined to determine whether these shifts were covered, uncovered, or partially covered for less than 4 hours by a scribe; partially covered shifts were grouped with uncovered shifts for analysis. Covered shifts were compared to uncovered shifts in a clustered design, by physician. Hierarchical linear models were used to study the associations between percentage of patients with which a scribe was used during a shift and EP productivity as measured by patients per hour, relative value units (RVUs)/hr, per hour, and times mean time (TAT) to discharge.

Results: RVUs per hour increased to 5.24 units (95% confidence interval: 3.99 to 6.50, p=0.0001) for every 10% increase in scribe usage during a shift. The number of patients seeing the EP per hour increased from a mean 15.48 to 17.09 (p=0.001) for every 10% increase in scribe usage during a shift. TAT was not significantly associated with scribe use. These associations did not hold significance after accounting for physician assistant (PA) use.

Conclusions: In this retrospective study, EP use of a scribe was associated with improved overall productivity as measured by patients treated per hour (Pt/hr) and RVUs generated per hour by EPs, but not as measured by TAT to discharge.

ACADEMIC EMERGENCY MEDICINE 2010, 17:490-494 © 2010 by the Society for Academic Emergency Medicine

Keywords: performance indicators, scribes, relative value units

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Adding beds isn’t the only answer!

This ED is a lot harder to staff....
Do All Patients Need Beds?

- Reasons vertical patients need beds:
  - Evaluation
  - Private consultation
  - Treatment
  - Monitoring
  - All other bed time is NVA
- This allows you to offload your bed bottleneck

Get your ED patients in/out with ‘virtual’ beds

Mary Washington Hospital is trying out a “virtual bed system” that, when compared to the controls, decreased the average time to triage by 39%, decreased the turnaround time for treat and released patients by 40%, and decreased door to physician times by 52%.

The system was developed by two physicians, including Jody Crane, MD, MBA, assistant director and business director of the Fredericksburg (VA) Emergency Medical Alliance, a private contract emergency medicine group at Mary Washington.

It involves having all a patient’s nursing conducted upfront so a patient is never waiting for anything except discharge. Crane says. The patient initially is seen and evaluated by a physician/nurse team who determines the patient’s needs, he says.

“Pain is addressed immediately, and any orders which need to be processed are done right behind triage,” Crane says. Immediate orders include EKGs; medications such as those for asthma, pain, or allergies; urine specimens; splints; and even contrast for computed tomography. The labs are processed by a phlebotomist and ED tech team behind the triage area. “From
Radiology

- **Current Best Practice:**
  - Ambulatory patients walk to radiology
  - Rad handles transport for ED patients
  - PO contrast use has been greatly reduced in favor of IV only
- Clear communication patient is ready and signals indicating when results are back
- Clear signals for resource saturation usually indicated by threshold waiting times and back-up procedures
- Measure performance – Order to Results
  - Plain Films – 60 min
  - Plain CT – 60 min
  - CT with IV Contrast – 90 min
  - U/S – 60 min
Links to Oral Contrast for Appy Articles

6. http://emergency-medicine.jwatch.org/cgi/content/full/2006/626/2

Lab

- Best Practices
  - Should have clear access to patients immediately upon order input
  - Phlebotomists with first-come, first-serve mentality, if ED staff responsible, make sure they are trained in correct technique and have the capacity
  - Dedicated or colored Tube System or Stat Lab onsite
- Point of Care Testing is done in all FSEDs and will test the ability of hospital-based EDs to compete.
**What’s out there?**

- **I-Stat - 3 min**
  - (H/H, Chem 8, CKMB, Trop I, BNP, PT/INR, ABG, Lactate)

- **Biosite – 10 min**
  - Myoglobin, CK-MB, Trop I, BNP, D-dimer

- **Piccolo – 12 min**
  - BMP, CMP, Electrolytes

- **Chempaq**
  - POC CBC with diff!

- **Rapid strep, mono, influenza...**

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**HEMOGLOBIN**

Noninvasive > Continuous

Total Hemoglobin (SpHb®) is a breakthrough measurement that allows clinicians to noninvasively and continuously monitor hemoglobin—facilitating earlier and better clinical decisions, improved patient safety, and reduced cost of care.
Point of Care Testing?

- You must be careful when considering this!
- You must validate the patient pathways and testing you are going to use prior to purchasing the technology or you will regret it!
What About Chest Pain? 3 hours?

1. Arrival
2. Reception
3. Waiting Room (???)
4. Triage
5. Waiting Room (???)
6. Bed
7. Doc Eval
   1. Exam
   2. EKG
   3. CBC, CMP, Card Enz
   4. CXR
8. Wait for Results (???)
9. Request bed after Trop back
10. Await Admission

What About Chest Pain? 30 min?

- Immediate bedding
- MD Eval while EKG and IV placed, Blood drawn for I-Stat, order bed
- Testing
  - I-Stat Chem 8 – 3 min
  - I-Stat Trop – 10 min
  - CXR – 10 min
- Depart
- Requires Teamwork, Process Planning and coordination from the inpatient side!

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5. Take a Systems Perspective

- ED operations can be viewed as a *network* of queues, each of which must be properly configured to align capacity with demand.

```
S_1 → S_2 → S_d
```

```
S_3
```

5. Operational Models and Physical Layout

- Most efficient EDs allow for connection of physicians and/or midlevels at the front end and take great care to limit other variables such as bed or nursing availability
- PIT – Sacramento
- RME – CEP
- RATED/Super Track – MWHC
- Provider Directed Queuing – Chris Deflitch, Hershey, Penn State
- qTrack – Joe Guarisco, Ochsner Health
- Split Flow – Cochran, Roche, Banner Health

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Super Track and Volume Bands

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Intake Teams and Volume Bands

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<thead>
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5. Geography

“If ED beds are a rate-limiting step, which they are for many EDs, then you actually need more staff to drive efficient throughput than you would if you had all the beds you needed.”

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6. ED #1: 20,000 Visits, T&R, T&A LOS

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ED #1: 20,000 Visits, LWOBS

Average Daily Leave Without Being Seen (LWOBS) Rates

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ED #2, 20,000 Visits, T&R LOS

Average Daily Length of Stay (LOS) - Treat & Release Patients

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ED #2, 20,000 Visits, LWOBS

Case Study:
Anywhere 75,000-visit Peds ED
Peds ED LWOBS vs Door to Doc

\[ R^2 = 0.66 \]

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Peds ED Hourly LWOBS

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Peds ED Day of Week Arrivals

Average Volume by Day of Week

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PEDs ED Acuity Mix by ESI Level

ESI Distribution

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Peds ED Low Acuity Arrivals

Low Acuity Volume by Hour of Day

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Peds ED Low Acuity

Average Daily Physicians - Demand vs Staffed Capacity

ESI Distribution

Prod – 1.5 pts/hr
Volume – 3 pts/hr

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Peds ED Low Acuity

Prod – 0.5 pts/hr
Volume – 3 pts/hr

Peds ED Main ED #1

Prod – 0.89 pts/hr
Volume – 3 pts/hr
Peds ED Main ED #1

**Average Daily Physicians - Demand vs Staffed Capacity**

**Average Daily Nurses (Total) - Demand vs Staffed Capacity**

**Average Daily MLP - Demand vs Staffed Capacity**

**Prod – 0.5 pts/hr**

**Volume – 3 pts/hr**

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Peds ED Main ED #2

**Average Daily Physicians - Demand vs Staffed Capacity**

**ESI Distribution**

- ESI Level 1: 3.48%
- ESI Level 2: 33.82%
- ESI Level 3: 46.08%
- ESI Level 4: 13.91%
- ESI Level 5: 3.24%

**Prod – 1.1 pts/hr**

**Volume – 4 pts/hr**

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Peds ED Main ED #2

Prod – 0.46 pts/hr
Volume – 4 pts/hr

Future Directions

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Low Acuity - Option 1

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Low Acuity Option 2

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Summary

- Optimizing throughput requires attention to the key servers in the ED, Physicians, Nurses, Beds
- Aligning capacity to demand is critical to maintaining flow
- There are targeted ways to enhance flow on each of the key servers
- Keeping a systems perspective will ensure your improvements work for your patients

What Are You Sinking About?

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