# Demand and Capacity in Triage

How do we meet variable demand with fixed resources? Dr. L. Cheng

#### Overview

- Service capacity is a perishable commodity
- We need to understand the variability of both our demand + capacity
- What strategies can we use?
- We need to create reliable, resilient and flexible systems!

#### Poor reliability in health care

- Your survival following acute MI is dependent on the time of day and the day of the week!
  - JAMA August 2005





## variability

Time

#### What queuing theory tell us...



#### Demand/capacity management

Improve your ability to predict
Shaping demand
Optimize staffing resources
Standardized process (less variation)
Surge capacity plans

#### ED Dashboard

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	- Triage Door2Dr Lab			Rad Admit Discharge Order			rs Resources Ave. LC Pt. Cou Ave. Lt		05: 01:51 ant: 18 ab TAT: 00:11			Charge Nurse: Bickmore, Ann Marie Triage Nurse: Hoss, Susan												
													Critical	Lab Aler	00.30 ts				View	Nun	se.Pati	ent Ratio		
	Rm	1	Sex	Age	Comp	plaint			LOS	Reg	Stat	MÜ	Res	RN	ord	L	U	R	E RT	CN	Cons	Comme	nts	
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Can help with early warning and pre-emptive tactics but only with pre-defined triggers and responses in an integrated fashion.

#### Shaping Demand

 $\geq$ Can we smooth the demand at triage?

- Scheduling return visits to non-peak hours
- Relocate demand (triage bypass)
- Promote self-service (self-reg. kiosks)





### Optimize staffing resources

- Match staffing levels + schedules to volume as much as possible
- Back-up triage nurse with specific trigger levels
- Flexible staffing model / cross-train
- Use slack time to do supportive tasks (prepare supplies/equipment etc.)

## Queuing models for triage

				60,366				
	% rescue squad arrivals			30%	, , , , , , , , , , , , , , , , , , ,			
	Measured average RN triag	e duration		7.0	min			
	Calculated average RN tria	ge standard d	eviation	2.0	min			
	Measured average triage ro	om duration		10.0	min			
	Calculated average triage r	oom standard	deviation	5.0	min			
	Average amount of time/hr	triage rooms	are not utiliz	5.0	min			
Daily Data (Over 1 r	nonth)	Sun	Mon	Tue	Wed	<b>Thurs</b>	<u>Fri</u>	<u>Sat</u>
ED Volume		163	178	159	156	164	167	167
Triage Volume		114	125	111	109	115	117	117
Please Mark "High" o	or "low" Volume Days	Low	High	high	Low	Low	Low	Low
Low Volume Days		<u>12mn-1a</u>	<u>1a-2a</u>	<u>2a-3a</u>	<u>3a-4a</u>	<u>4a-5a</u>	<u>5a-6a</u>	<u>6a-7a</u>
L <mark>ow Volume Days</mark> Average ED Volume		<u>12mn-1a</u> 5.40	<u>1a-2a</u> 4.85	<u>2a-3a</u> 4.51	<u>3a-4a</u> <u>3.87</u>	<u>4a-5a</u> 3.40	<u>5a-6a</u> 3.05	<u>6a-7a</u> 3.38
Low Volume Days Average ED Volume Average Triage Volu	ne	<u>12mn-1a</u> 5.40 3.78	<u>1a-2a</u> <u>4.85</u> 3.40	<u>2a-3a</u> 4.51 3.16	<u>3a-4a</u> <u>3.87</u> 2.71	<u>4a-5a</u> <u>3.40</u> 2.38	<u>5a-6a</u> <u>3.05</u> 2.13	<u>6a-7a</u> <u>3.38</u> 2.36
Low Volume Days Average ED Volume Average Triage Volu Friage Nurses	ne	<u>12mn-1a</u> 5.40 3.78 1	<u>1a-2a</u> 4.85 3.40 1	2a-3a 4.51 3.16 1	3a-4a 3.87 2.71 1	<u>4a-5a</u> <u>3.40</u> 2.38 1	5a-6a 3.05 2.13 1	<u>6a-7a</u> 3.38 2.36 1
Low Volume Days Average ED Volume Average Triage Volu Iriage Nurses Nurse Utilization	ne	<u>12mn-1a</u> 5.40 3.78 1 44%	<u>1a-2a</u> 4.85 3.40 1 40%	2a-3a 4.51 3.16 1 37%	3.87 2.71 1 32%	<u>4a-5a</u> 3.40 2.38 1 28%	5a-6a 3.05 2.13 1 25%	<u>6a-7a</u> 3.38 2.36 1 28%
Low Volume Days Average ED Volume Average Triage Volu Triage Nurses Nurse Utilization Triage Beds/Bays	ne	12mn-1a 5.40 3.78 1 44% 1	<u>1a-2a</u> 4.85 3.40 1 40% 1	2a-3a 4.51 3.16 1 37% 1	<u>3a-4a</u> <u>3.87</u> 2.71 1 32% 1	<u>4a-5a</u> 3.40 2.38 1 28% 1	5a-6a 3.05 2.13 1 25% 1	<u>6a-7a</u> 3.38 2.36 1 28% 1
Low Volume Days Average ED Volume Average Triage Volu Triage Nurses Nurse Utilization Triage Beds/Bays Bed Utilization	ne	12mn-1a     5.40     3.78     1     44%     1     76%	1a-2a     4.85     3.40     1     40%     1     68%	2a-3a 4.51 3.16 1 37% 1 63%	3.87 2.71 1 32% 1 54%	4a-5a     3.40     2.38     1     28%     1     48%	5a-6a 3.05 2.13 1 25% 1 43%	<u>6a-7a</u> 3.38 2.36 1 28% 1 47%
Low Volume Days Average ED Volume Average Triage Volu Triage Nurses Nurse Utilization Triage Beds/Bays Bed Utilization Goal Staffing Calcula	ne ted based on 80% Utilization	12mn-1a     5.40     3.78     1     44%     1     76%     1	1a-2a     4.85     3.40     1     40%     1     68%     1	2a-3a 4.51 3.16 1 37% 1 63% 1	<u>3a-4a</u> 3.87 2.71 1 32% 1 54% 1	4a-5a     3.40     2.38     1     28%     1     48%     1	5a-6a 3.05 2.13 1 25% 1 43% 1	<u>6a-7a</u> 3.38 2.36 1 28% 1 47% 1
Low Volume Days Average ED Volume Average Triage Volu Triage Nurses Nurse Utilization Triage Beds/Bays Bed Utilization Goal Staffing Calcula Goal bed/bays Calcul	ne ted based on 80% Utilization ated based on 80% Utilization	12mn-1a     5.40     3.78     1     44%     1     76%     1     1     1     1     1     1     3.78	1a-2a     4.85     3.40     1     40%     1     68%     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1	2a-3a 4.51 3.16 1 37% 1 63% 1 1 1	<u>3a-4a</u> 3.87 2.71 1 32% 1 54% 1 1 1	4a-5a     3.40     2.38     1     28%     1     48%     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1	<u>5a-6a</u> 3.05 2.13 1 25% 1 43% 1 1	<u>6a-7a</u> 3.38 2.36 1 28% 1 47% 1 1 1

<u>/a-0a</u>	<u>0a-7</u> a	<u>Ja-10a</u>	104-114	11 <b>a-</b> 1211	12n-1p	<u>1p-2p</u>	<u>2p-3p</u>
4.82	6.22	7.55	9.08	9.38	9.50	9.07	9.21
3.38	4.35	5.28	6.36	6.57	6.65	6.35	6.44
1	1	1	1	1	1	1	1
39%	51%	62%	74%	77%	78%	74%	75%
1	1	1	1	1	1	1	1
68%	87%	106%	127%	131%	133%	127%	129%
1	1	1	1	1	1	1	1
1	2	2	2	2	2	2	2

#### Standardize best practice

- Streamline process: remove waste + redundancy
- Standardize: algorithm/protocols, standard operating procedures
- Monitor (data) + control
- Decreasing process variation improves flow

#### Surge Plan: Triage contingencies

<u>Green</u> : ≤3 pts	Triage RN protocols in operation
@ triage	
	60-90 second triage
<u>Yellow</u> : >3	Defer Triage RN protocols
pts @ triage	ER Tech /LPN to triage
	Volunteers hand out intake form
<u>Red</u> 8+ pts	Float nurse or CNL to triage
@ triage	WR SWAT
	EMS triage

