2020 TOCICO Virtual Conference

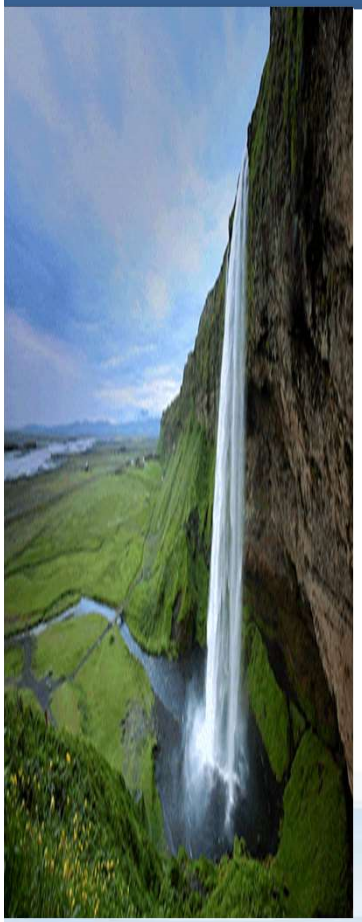
Reaching the Goal

Smash the Bottleneck

Fixing Patient Flow:

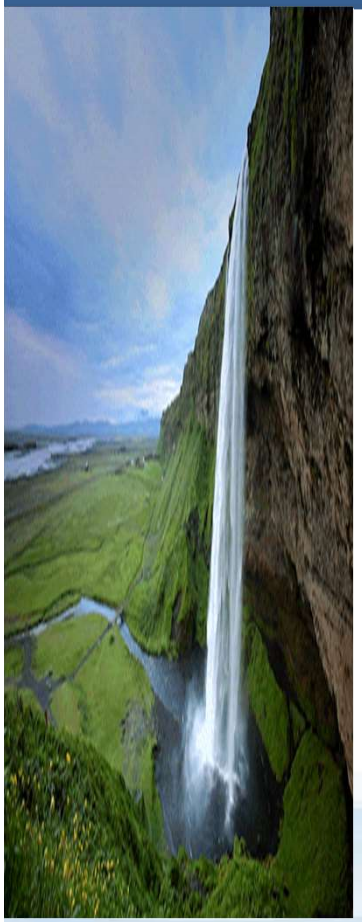
A Provider's Guide to TOC in Health Care

Presented by:
Christopher Strear, MD, FACEP
Danilo Sirias, Ph.D.



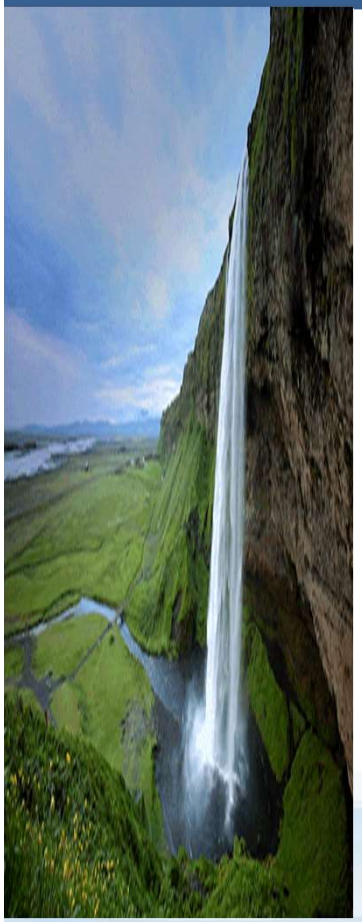
Throughput

Rate at which the system generates money through sales



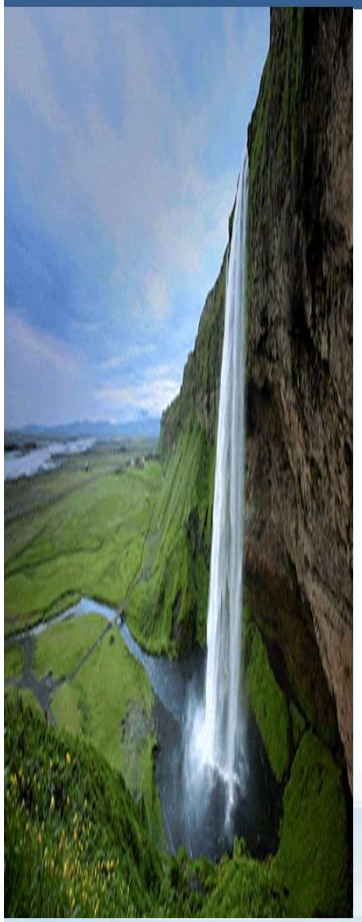
Inventory

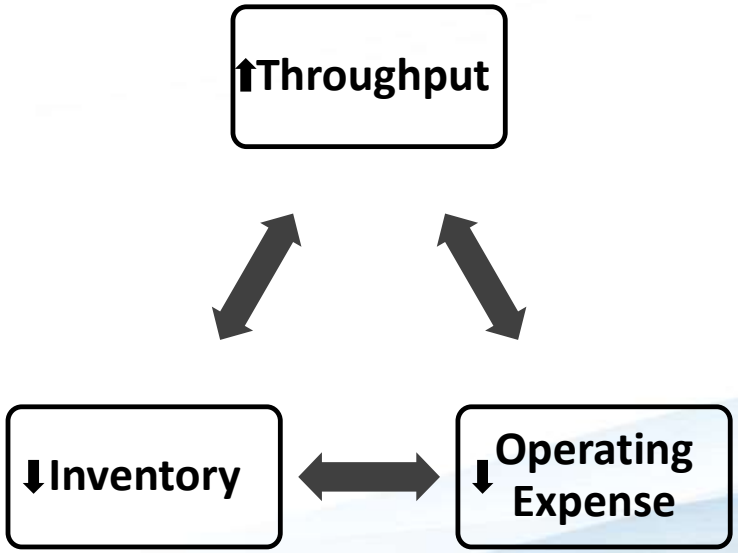
All the money that the system invests in purchasing things which it intends to sell

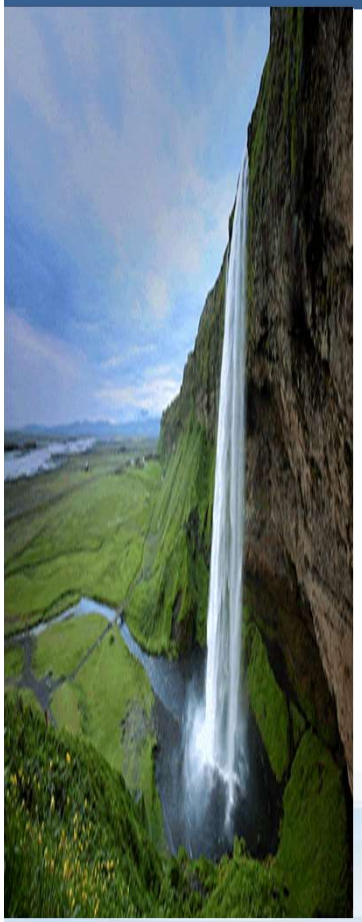


Operating Expense

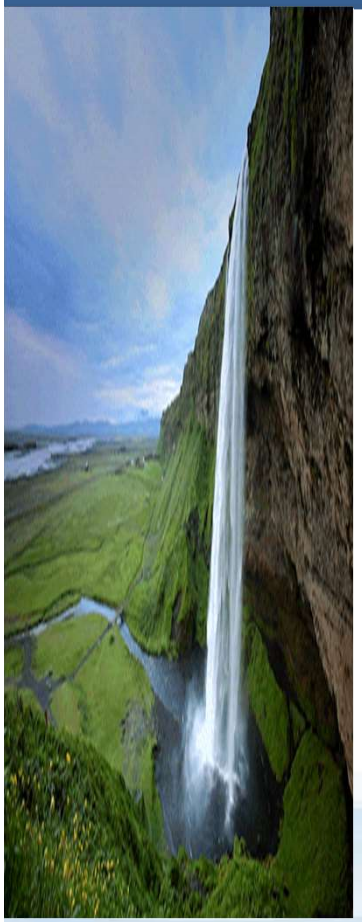
All the money that the system spends to turn inventory into throughput





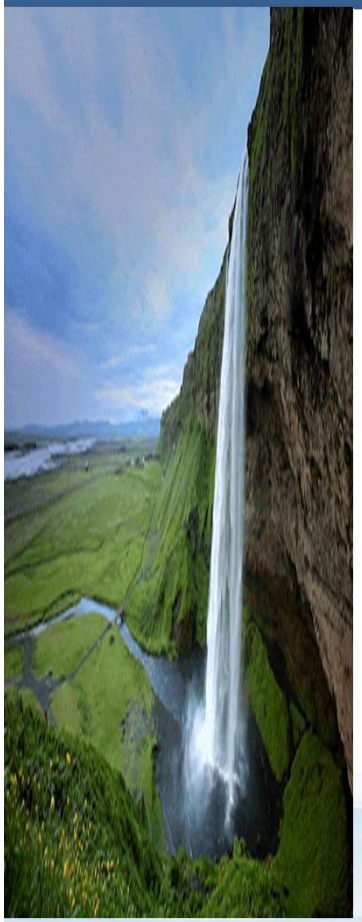


TOC Measurements in Health Care



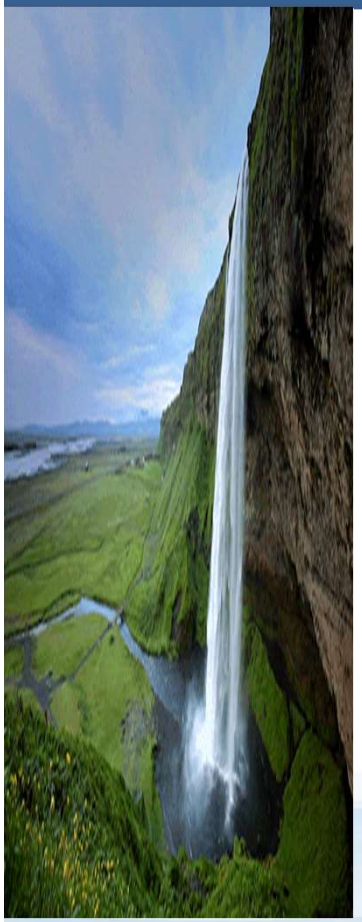
Throughput

Rate at which a patient moves through a location (clinic, ED, ward, hospital)



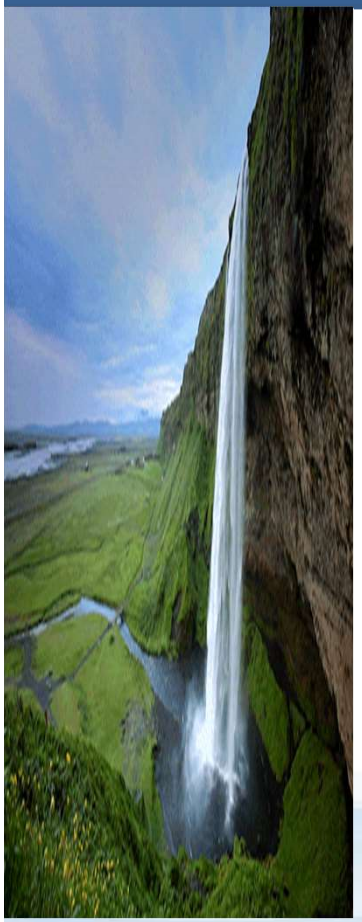
Inventory

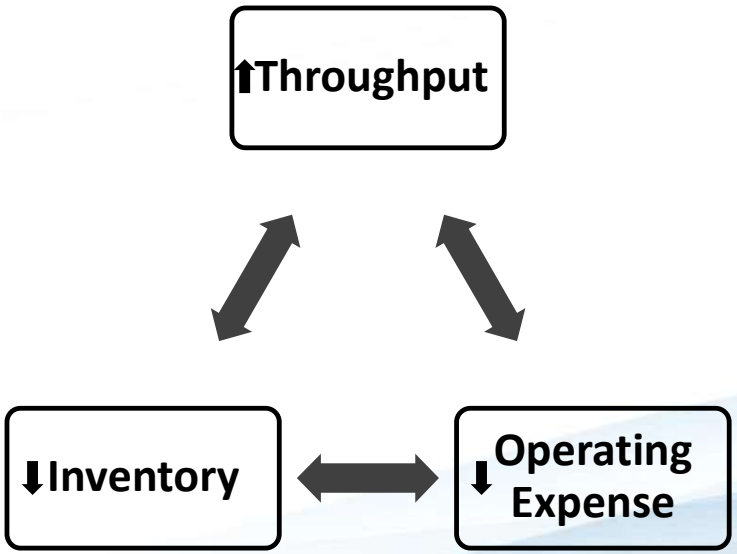
All the patients in a location

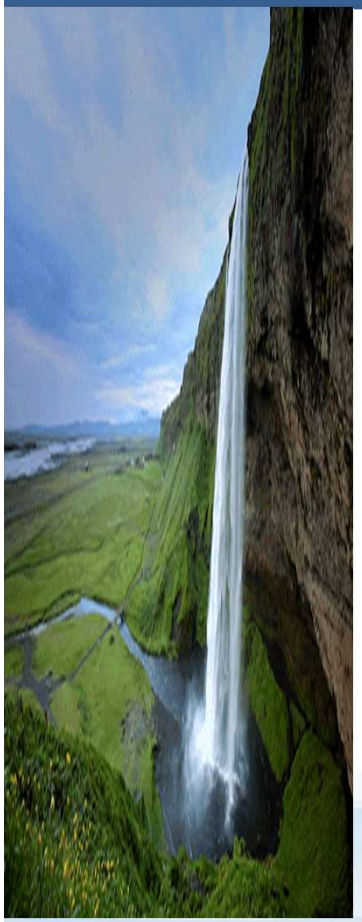


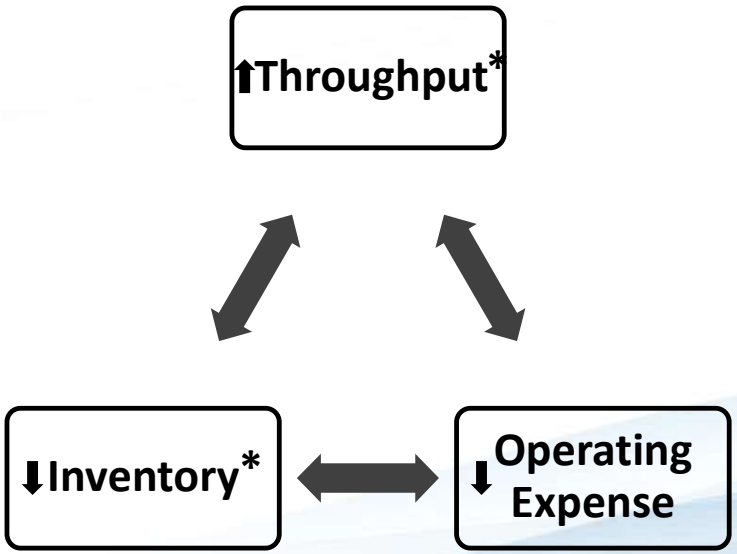
Operating Expense

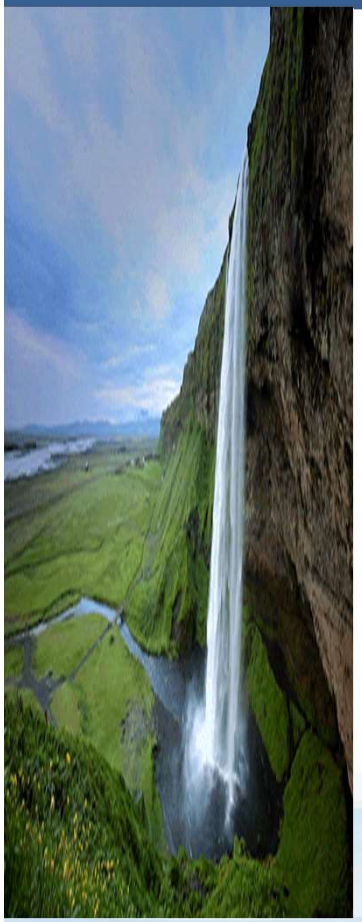
All the resources used in evaluating, diagnosing, treating, and discharging

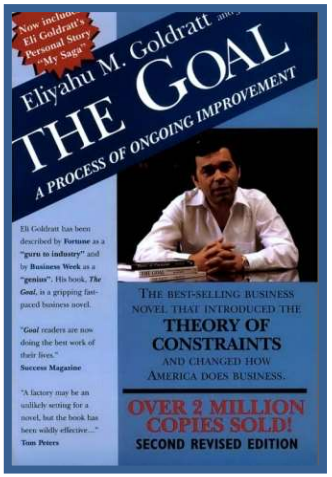






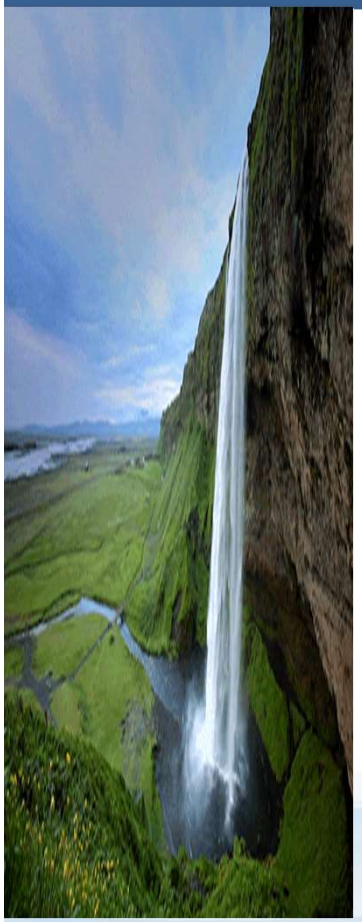






FASTER dispositions, SHORTER lengths of stay, REDUCED costs

While maintaining clinical excellence



The Effect of Emergency Department Expansion on Emergency Department Overcrowding

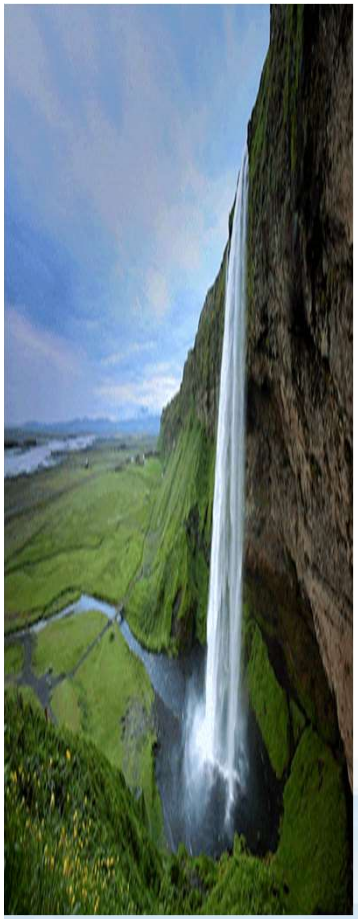
Jin H. Han, MD, MSc, Chuan Zhou, PhD, Daniel J. France, PhD, Sheng Zhong, MS, Ian Jones, MD, Alan B. Storrow, MD, Dominik Aronsky, MD, PhD

Abstract

Objectives: To examine the effects of emergency department (ED) expansion on ambulance diversion at an urban, academic Level 1 trauma center.

Methods: This was a pre-post study performed using administrative data from the ED and hospital electronic information systems. On April 19, 2005, the adult ED expanded from 28 to 53 licensed beds. Data from a five-month pre-expansion period (November 1, 2004, to March 1, 2005) and a five-month postexpansion period (June 1, 2005, to October 31, 2005) were included for this analysis. ED and waiting room statis-

Han, Jin H., et al. "The effect of emergency department expansion on emergency department overcrowding." *Academic Emergency Medicine* 14.4 (2007): 338-343.



In the accelerated failure time model, ED expansion did not affect the time to the next ambulance diversion episode.

Conclusions: An increase in ED bed capacity did not affect ambulance diversion. Instead, total and admission hold LOS increased. As a result, ED expansion appears to be an insufficient solution to improve diversion without addressing other bottlenecks in the hospital.

ACADEMIC EMERGENCY MEDICINE 2007; 14:338–343 © 2007 by the Society for Academic Emergency Medicine

Keywords: ambulance diversion, emergency department overcrowding, expansion, length of stay

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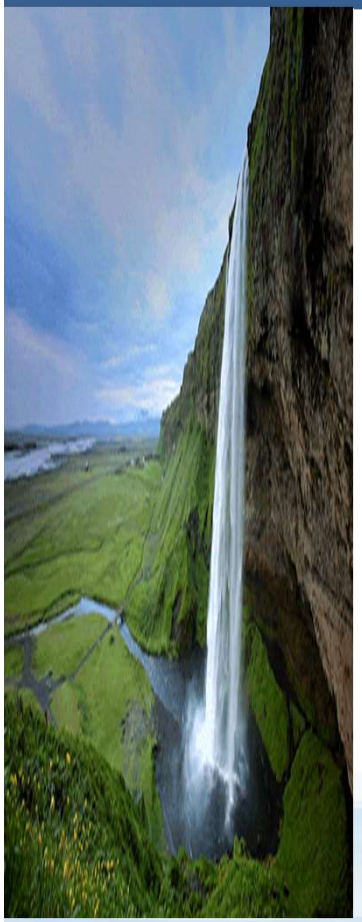
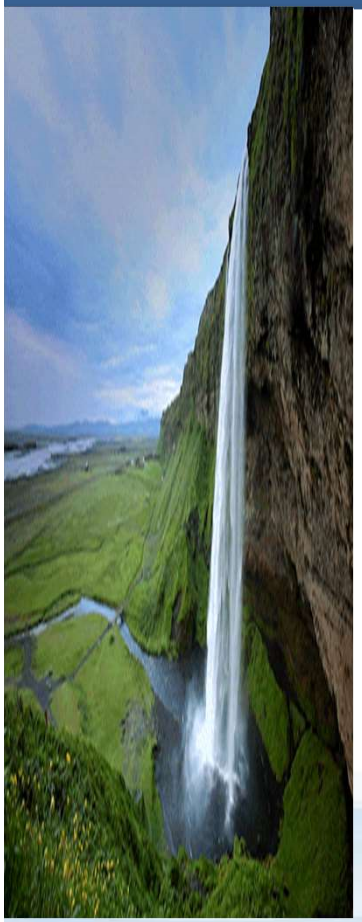


Look for Bottlenecks



Bottleneck Productivity

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System Productivity

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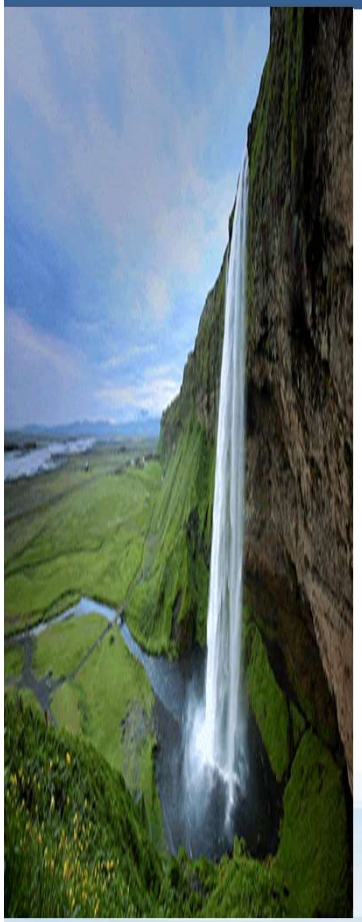

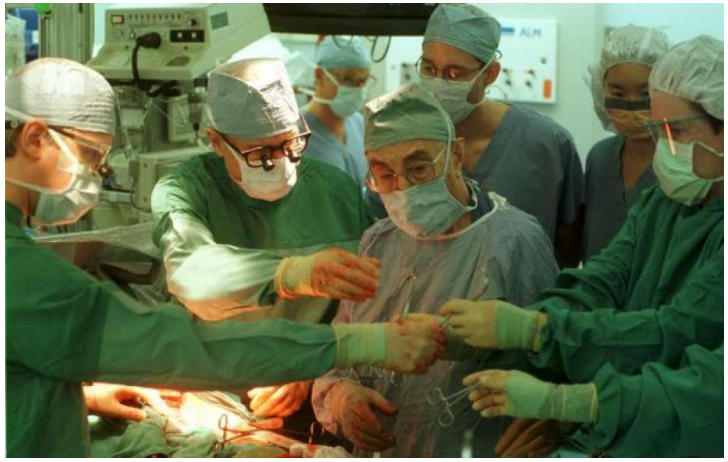

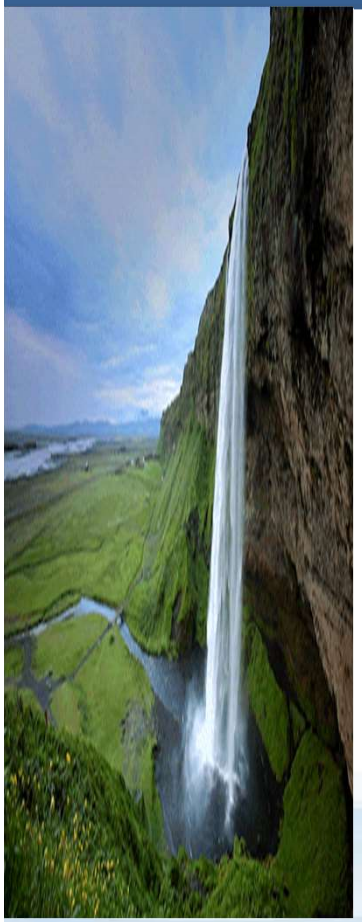

Cost Lost Hour on Bottleneck

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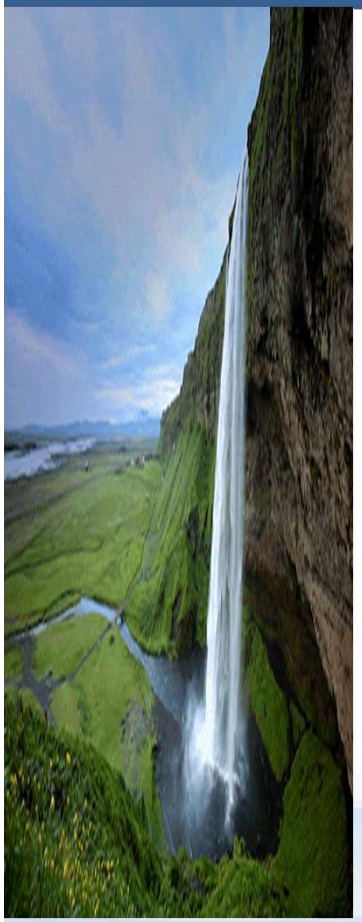
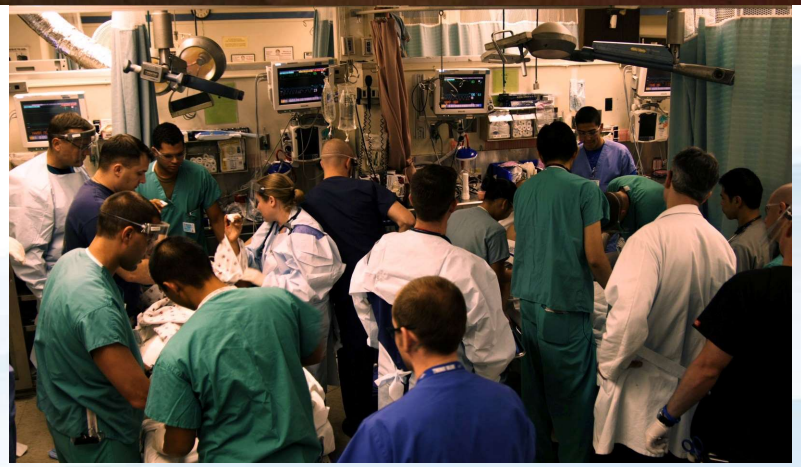
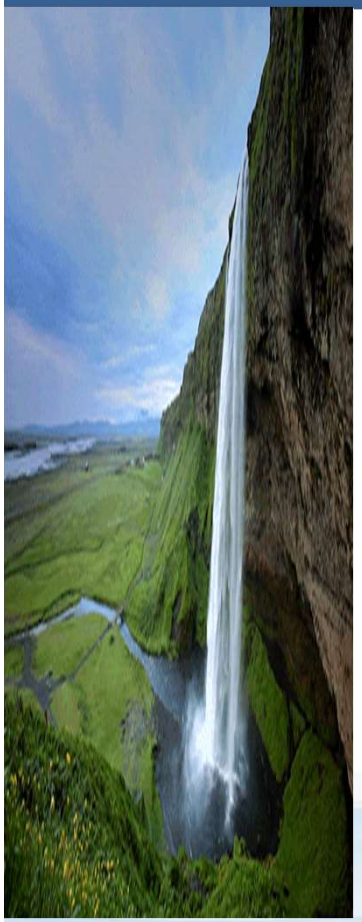
Cost Lost Hour for Entire System

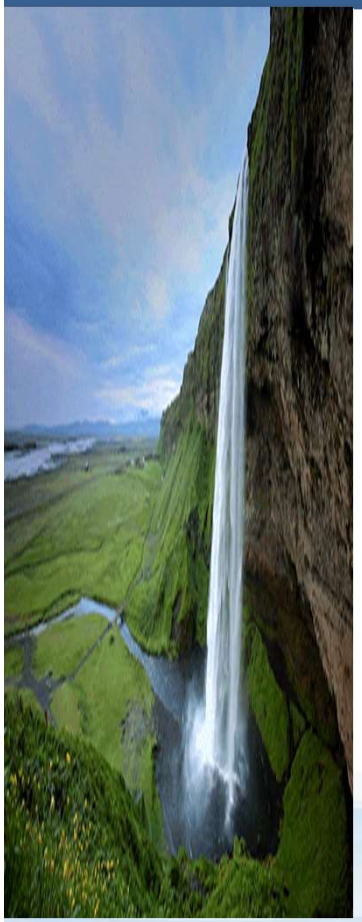






Smashing the Bottleneck

Fixing Patient Flow for Better Care



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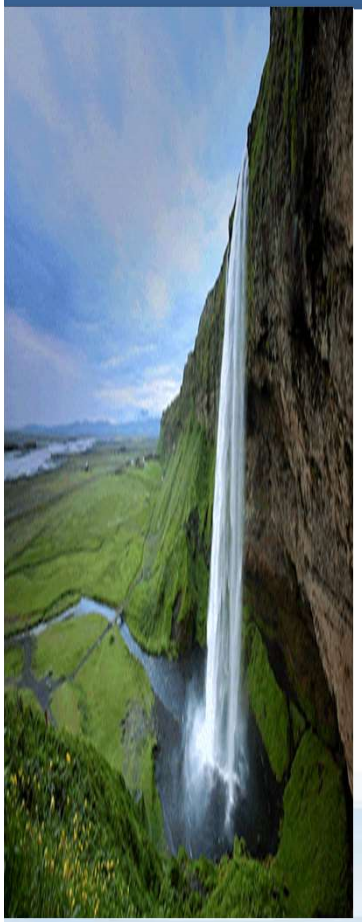
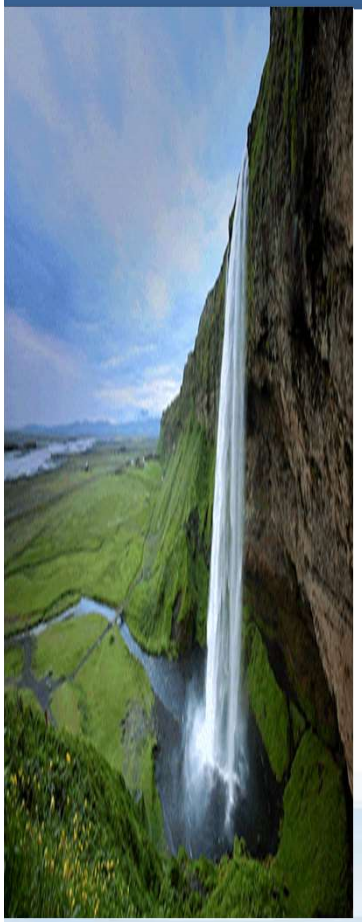


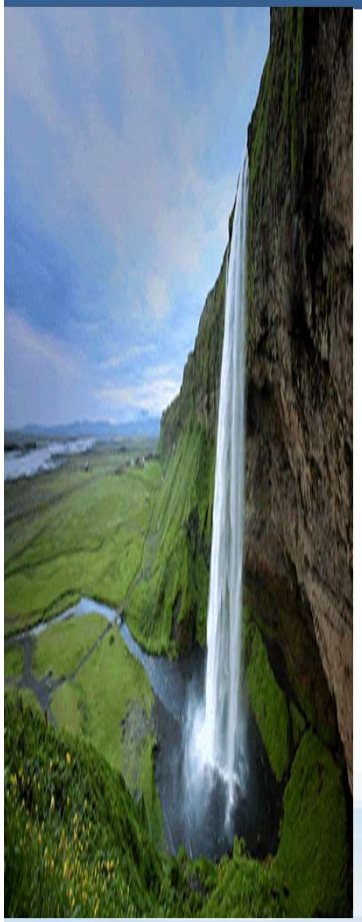
The 5 Focusing Steps

Identify the Bottleneck



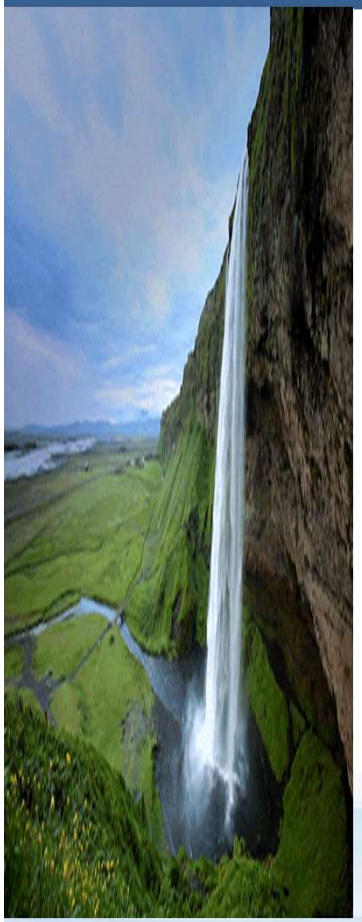
The 5 Focusing Steps

Decide how to exploit the Bottleneck



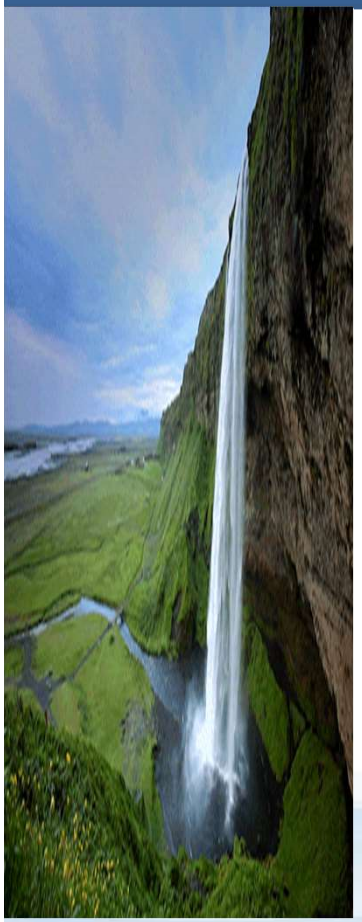
The 5 Focusing Steps

Subordinate to the Bottleneck



The 5 Focusing Steps

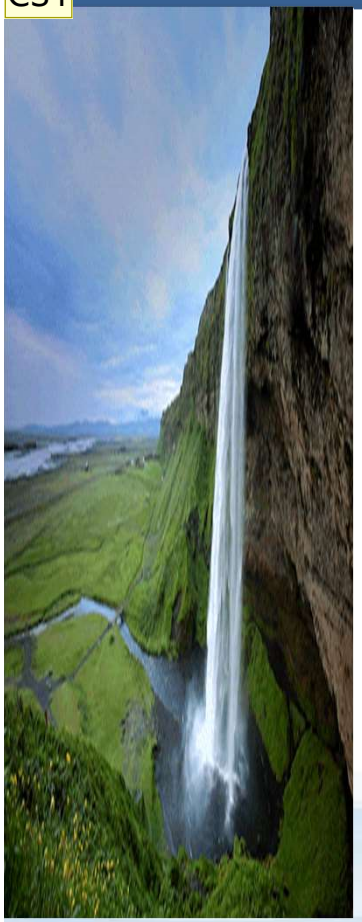
Elevate the Bottleneck



The 5 Focusing Steps

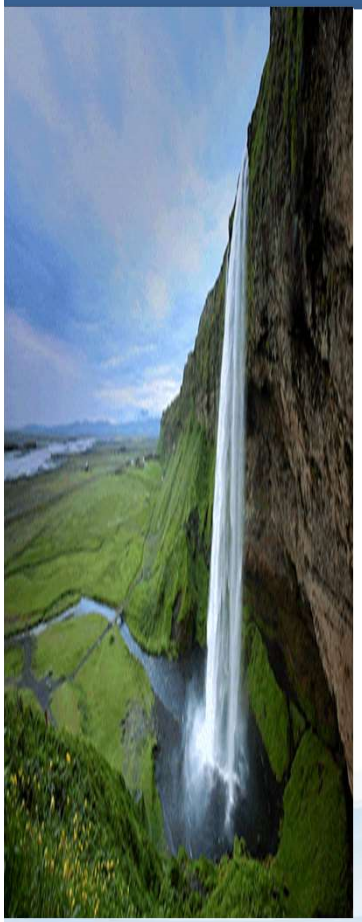
If the Bottleneck is Broken

Return to Step 1



Identify the Bottleneck

Where's our pileup?



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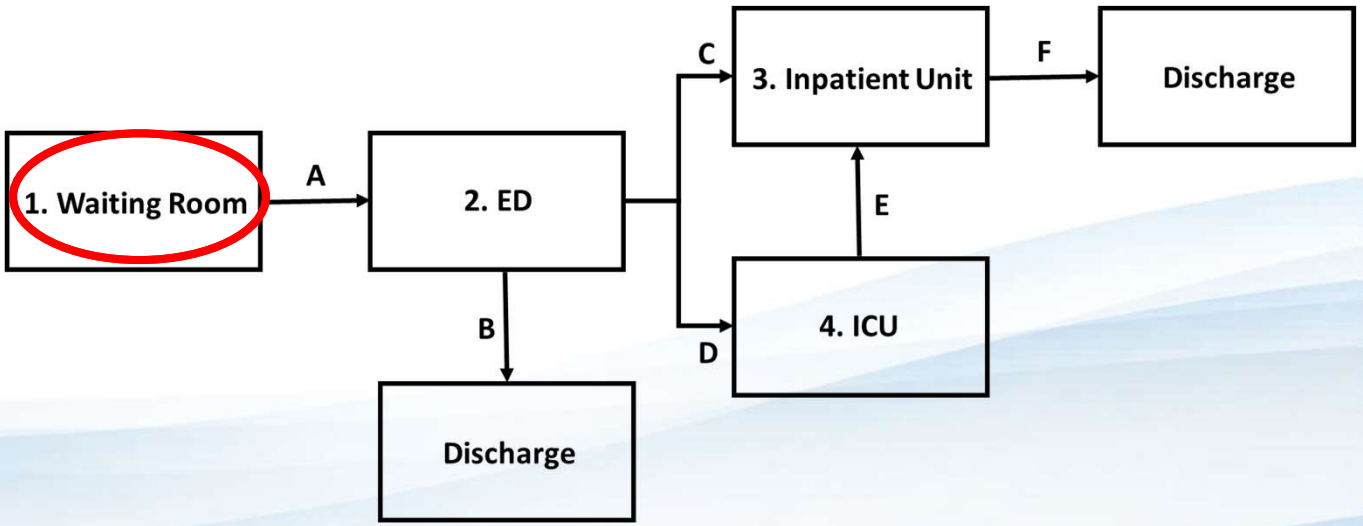

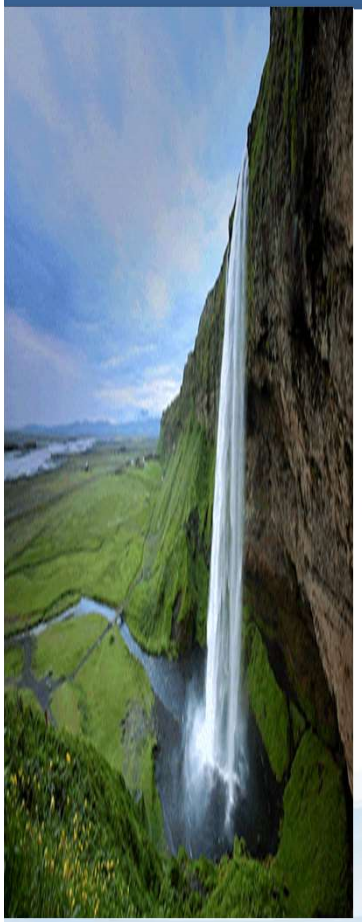

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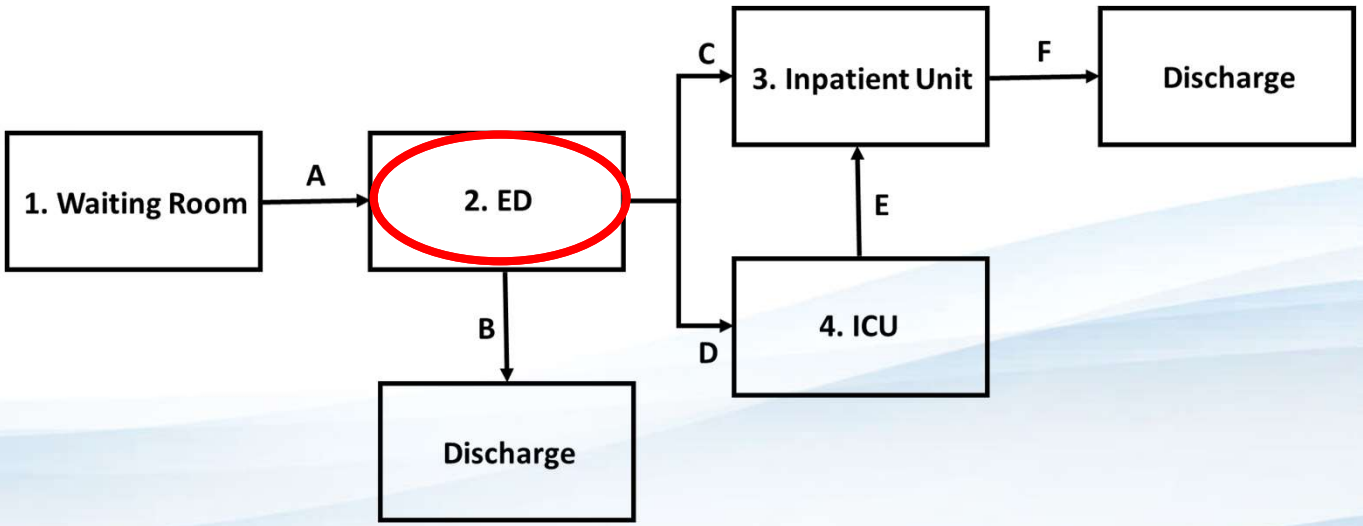

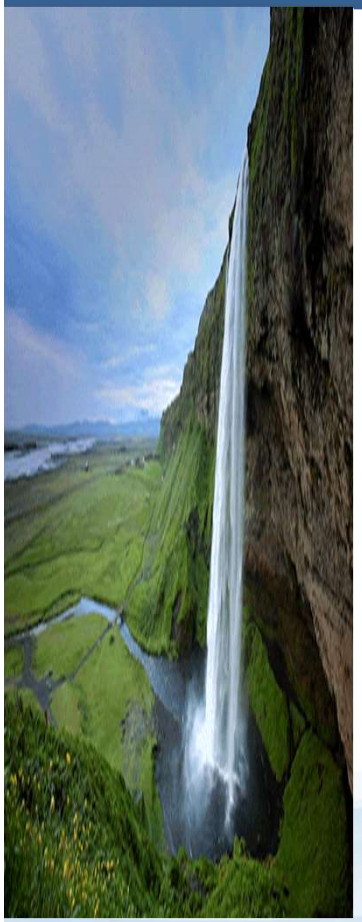

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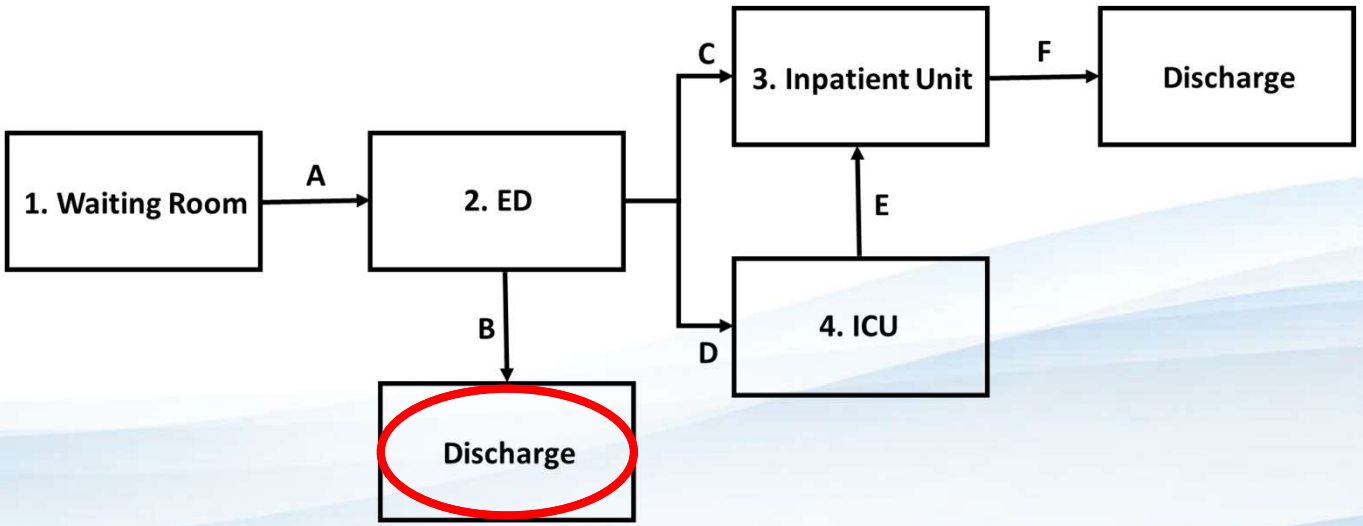

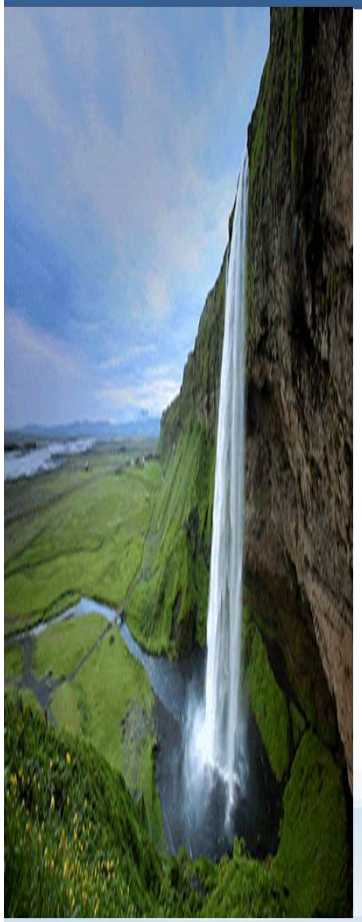

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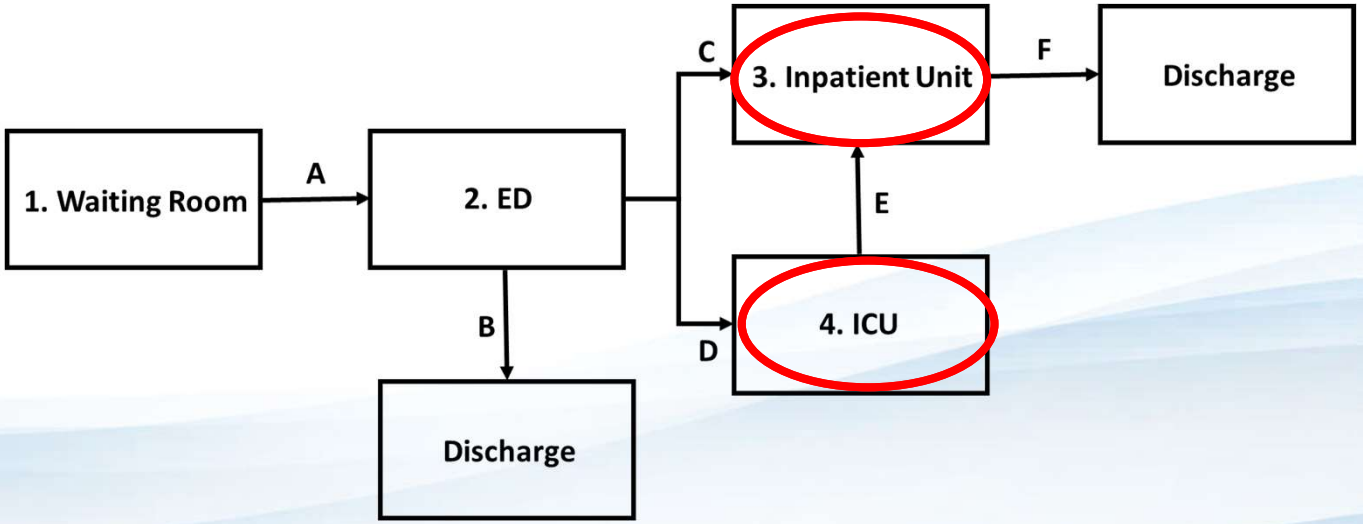

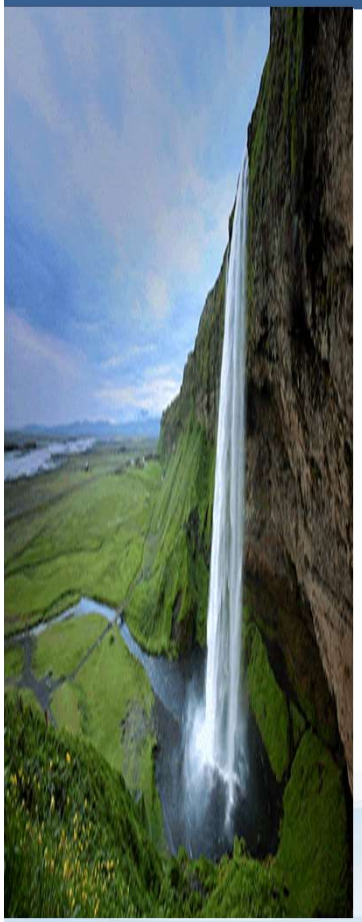

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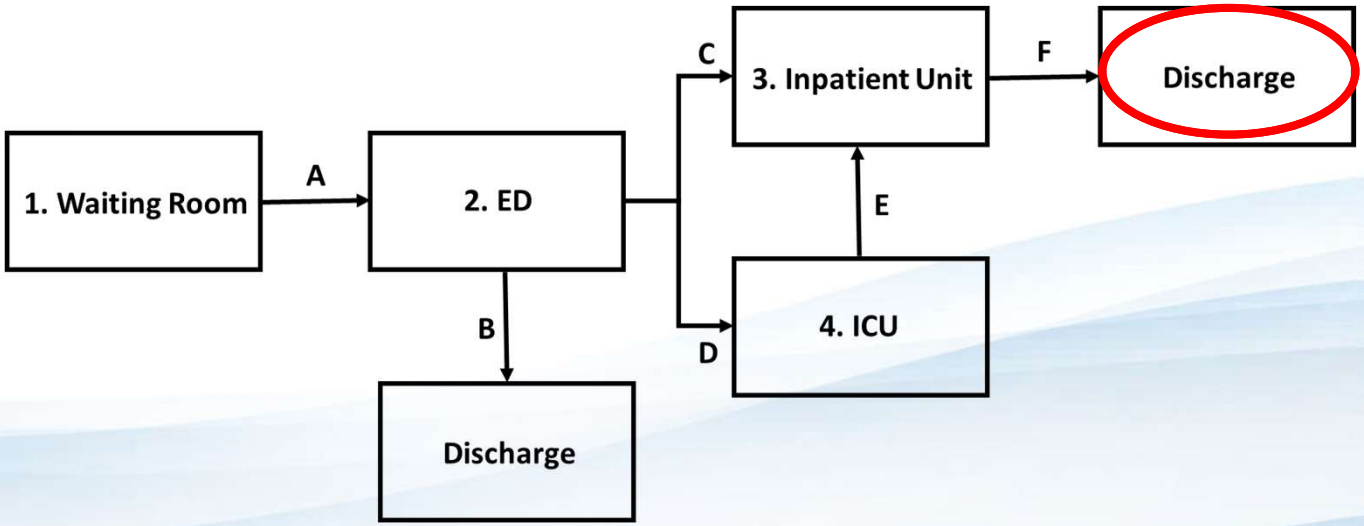
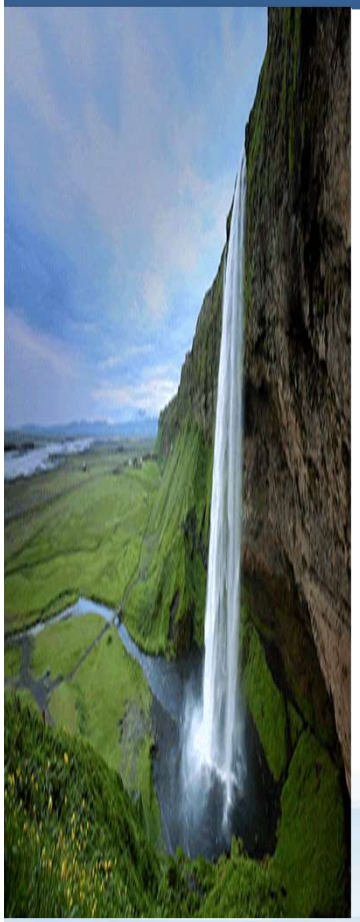
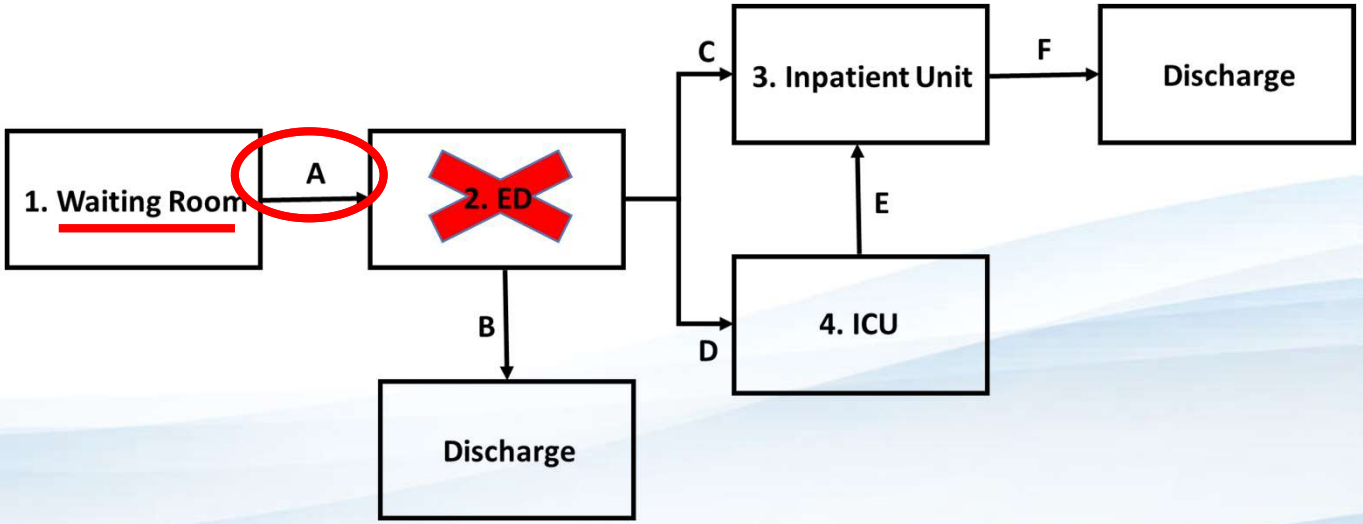
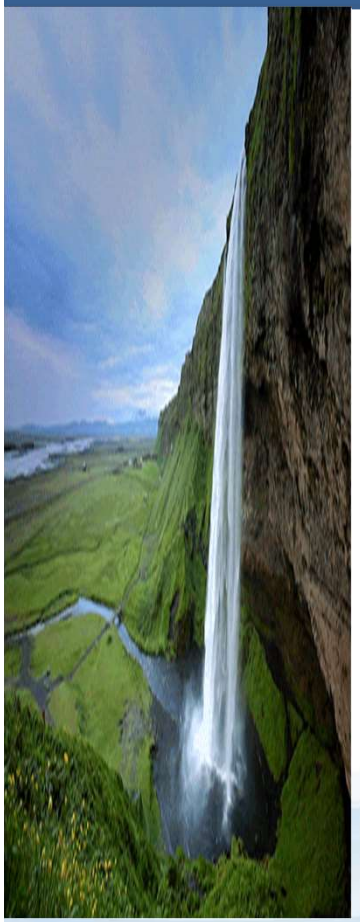




What are Patients Waiting For?





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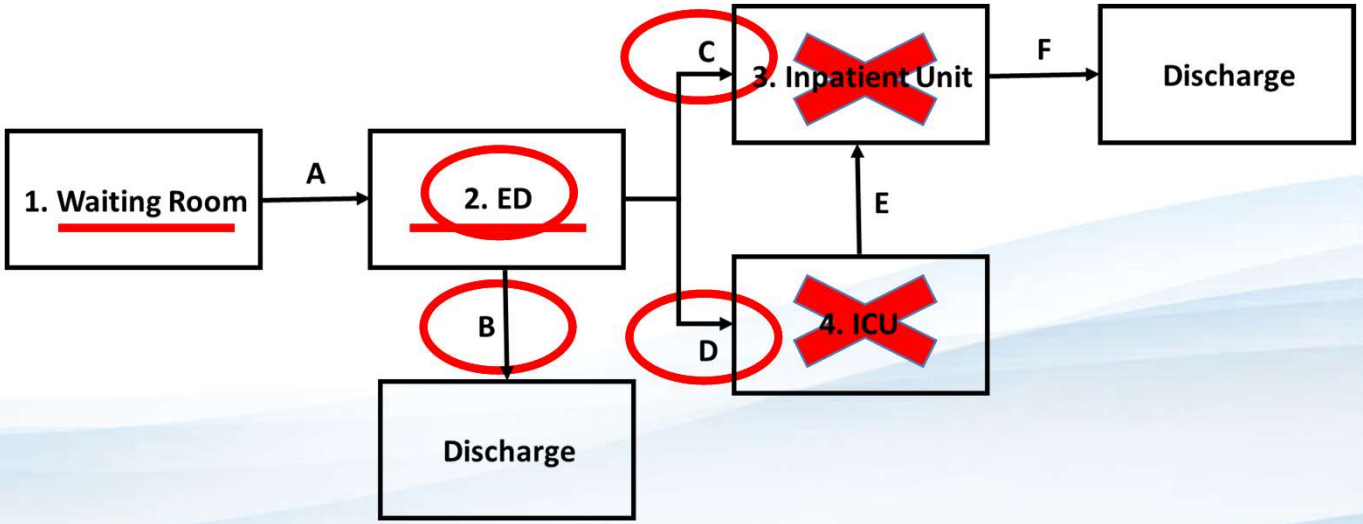

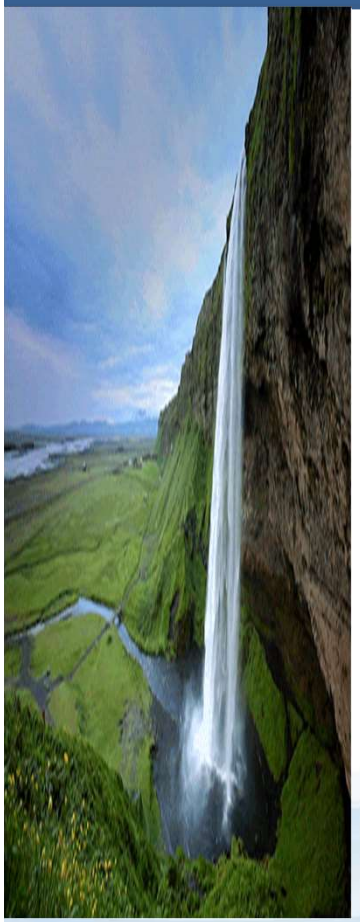

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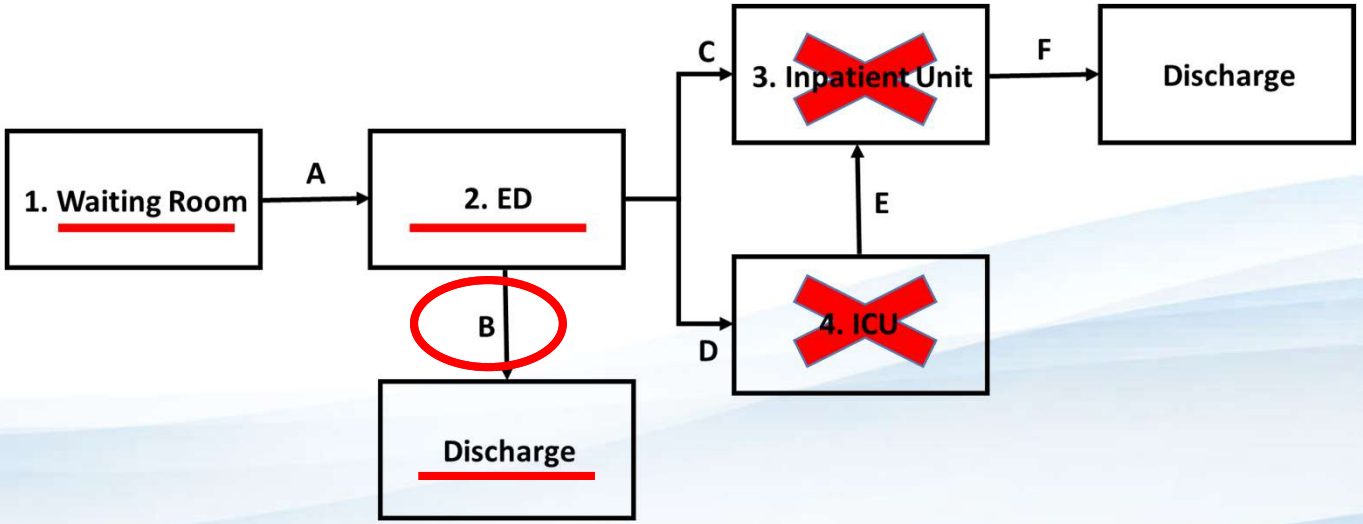

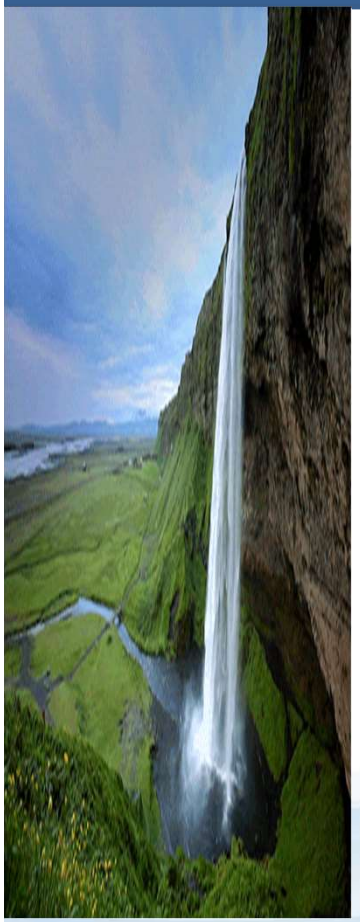

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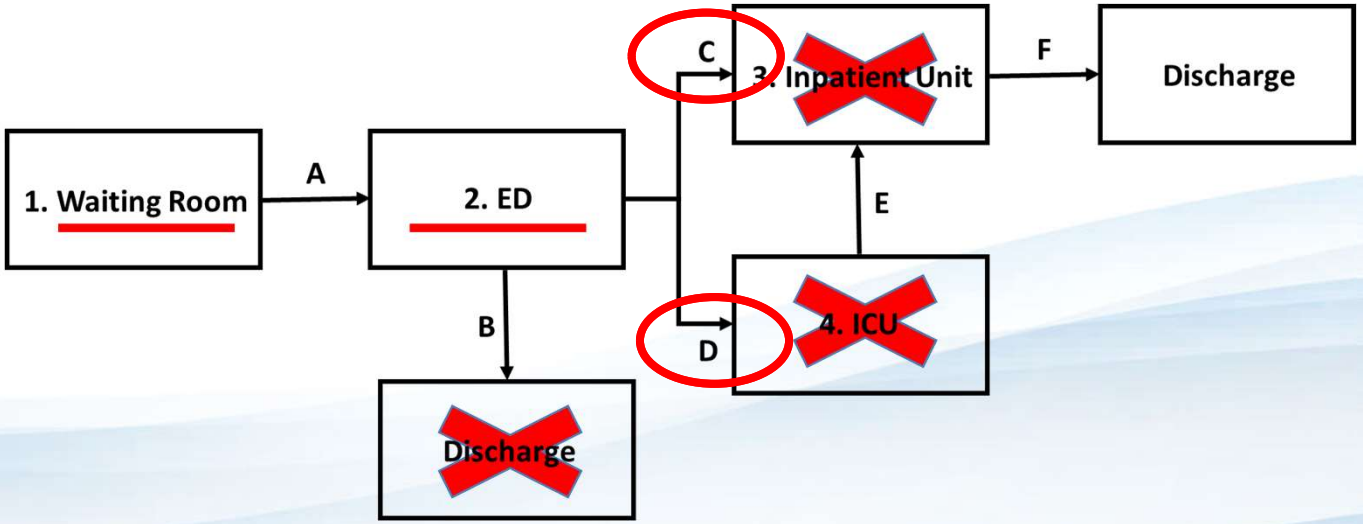

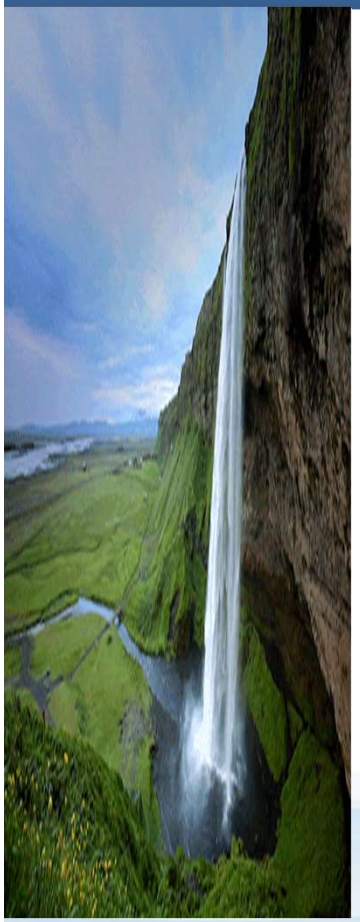

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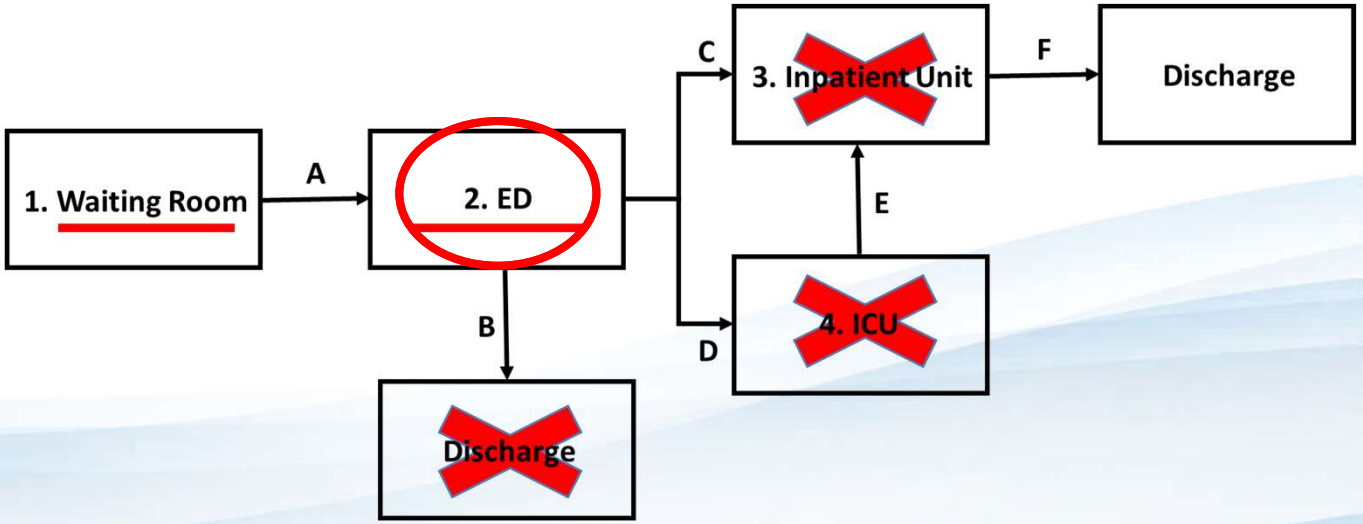

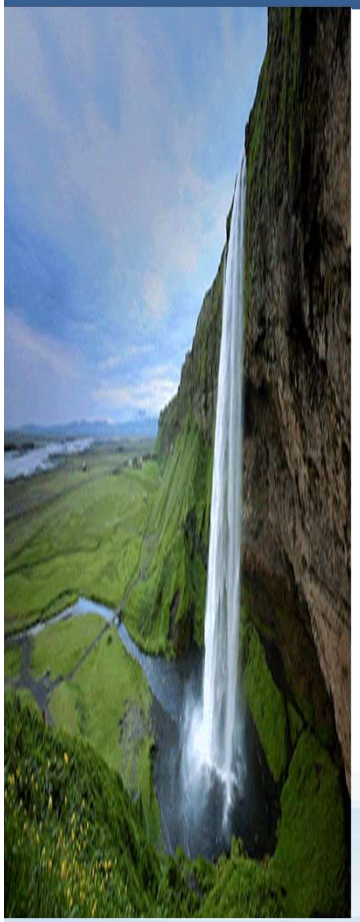

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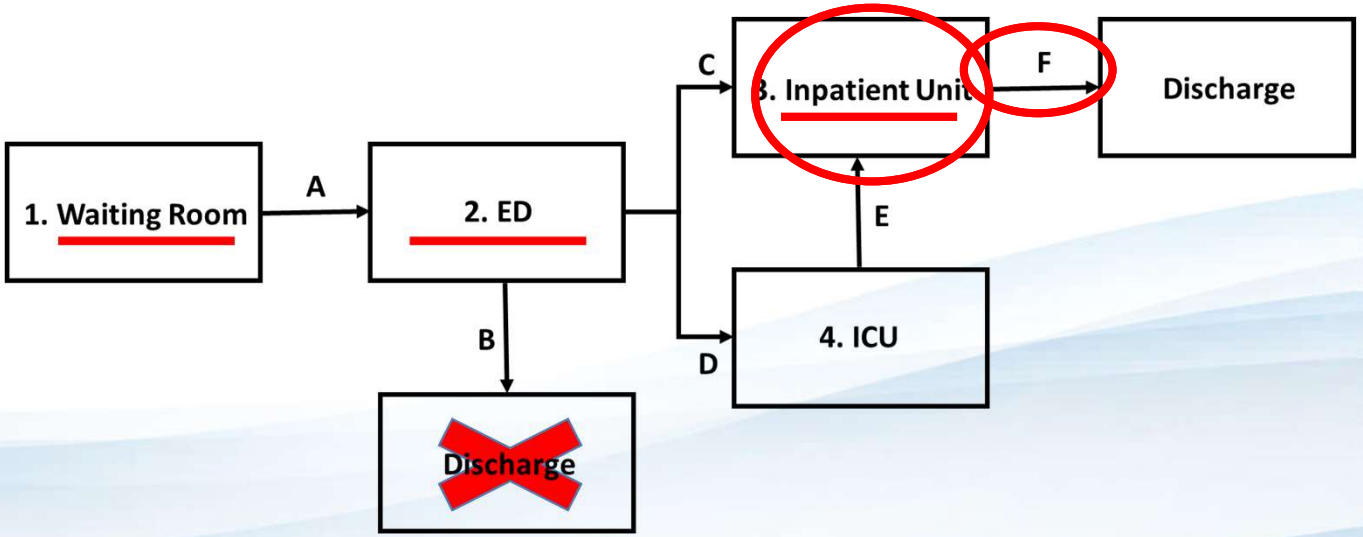
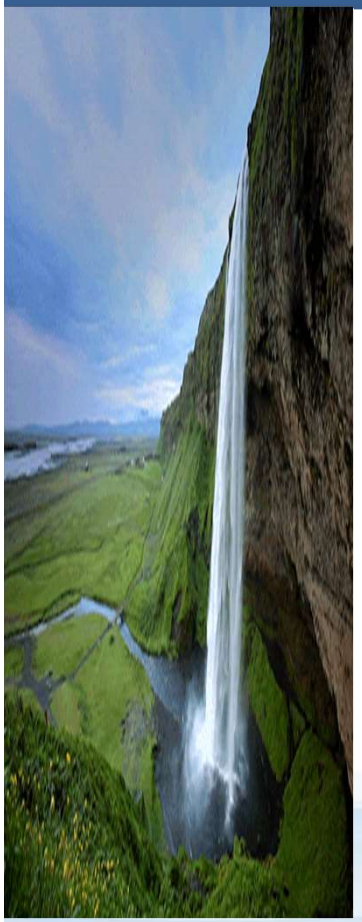
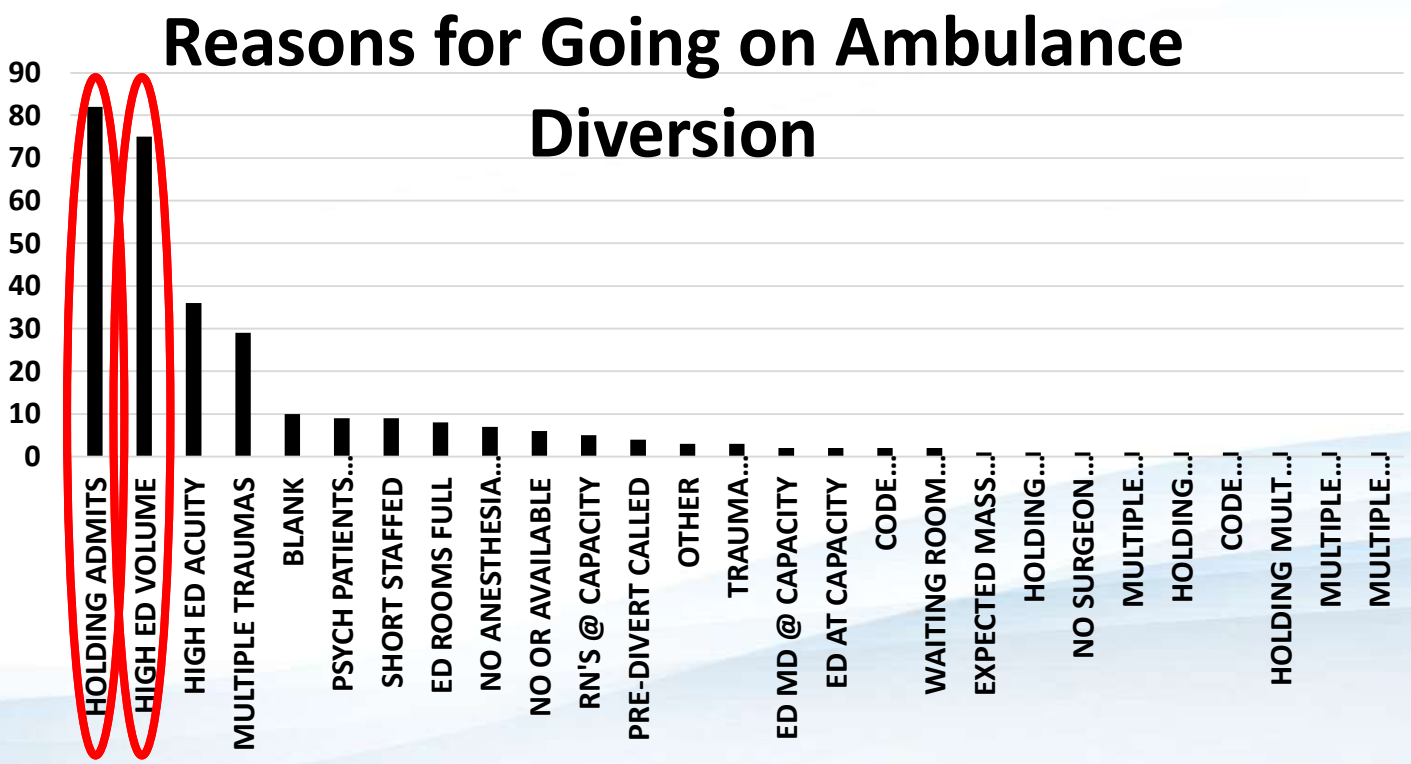
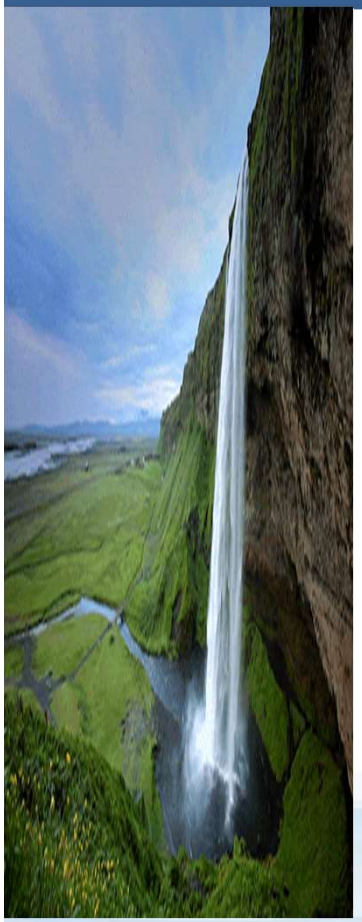


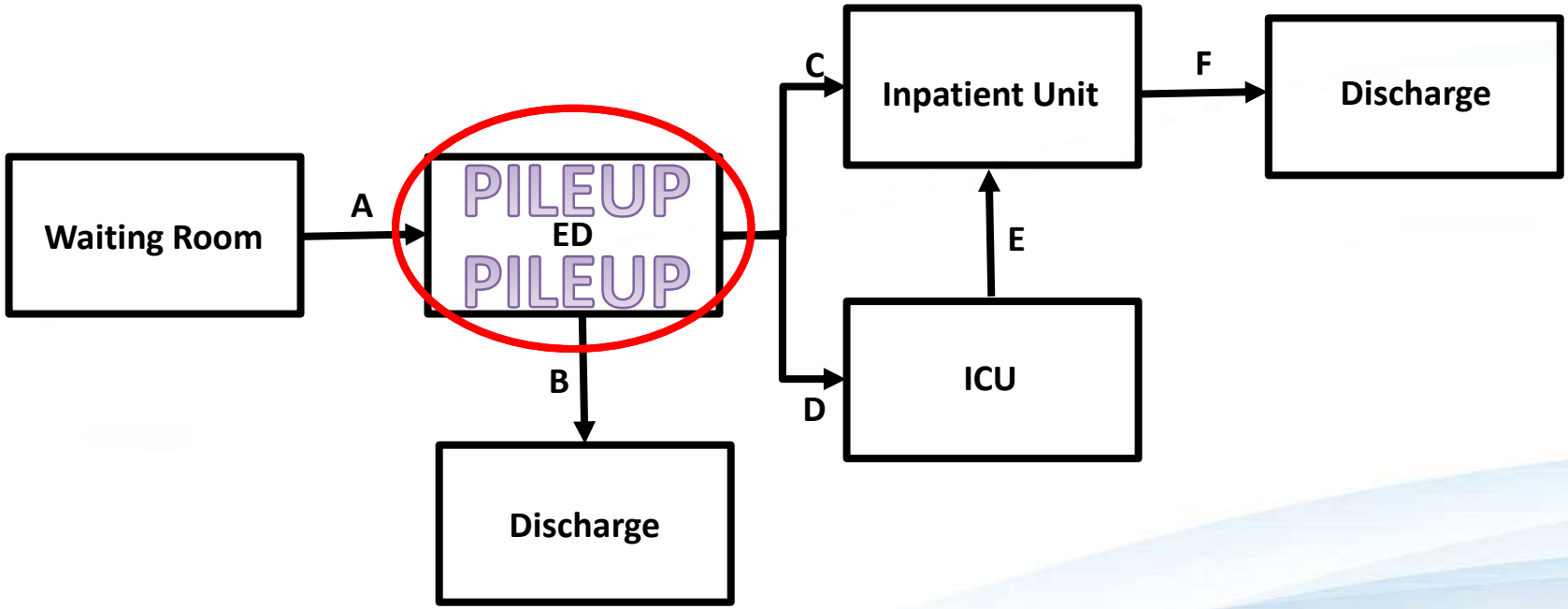




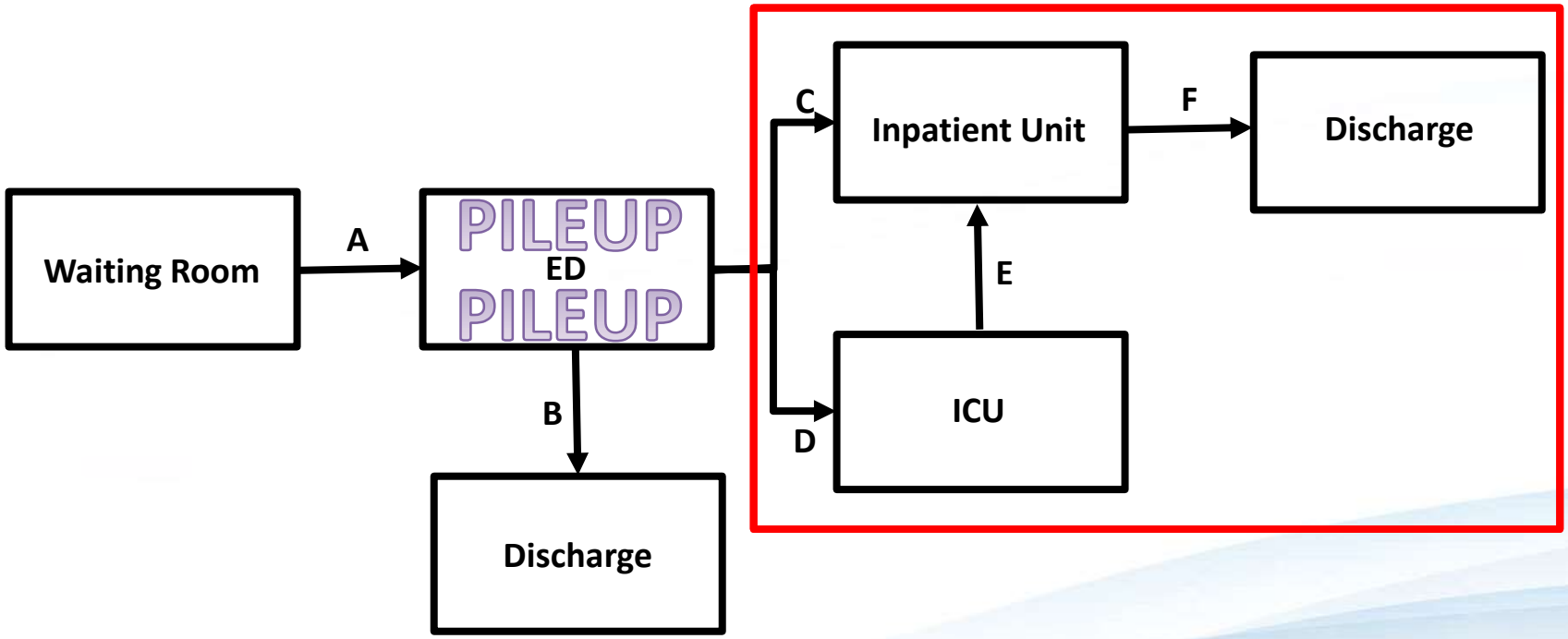


Go More Granular

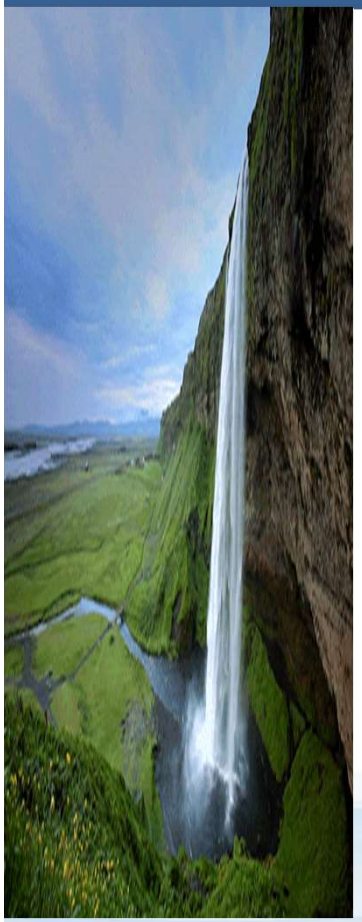
Pileup of ED patients



Emergency Department Bottleneck

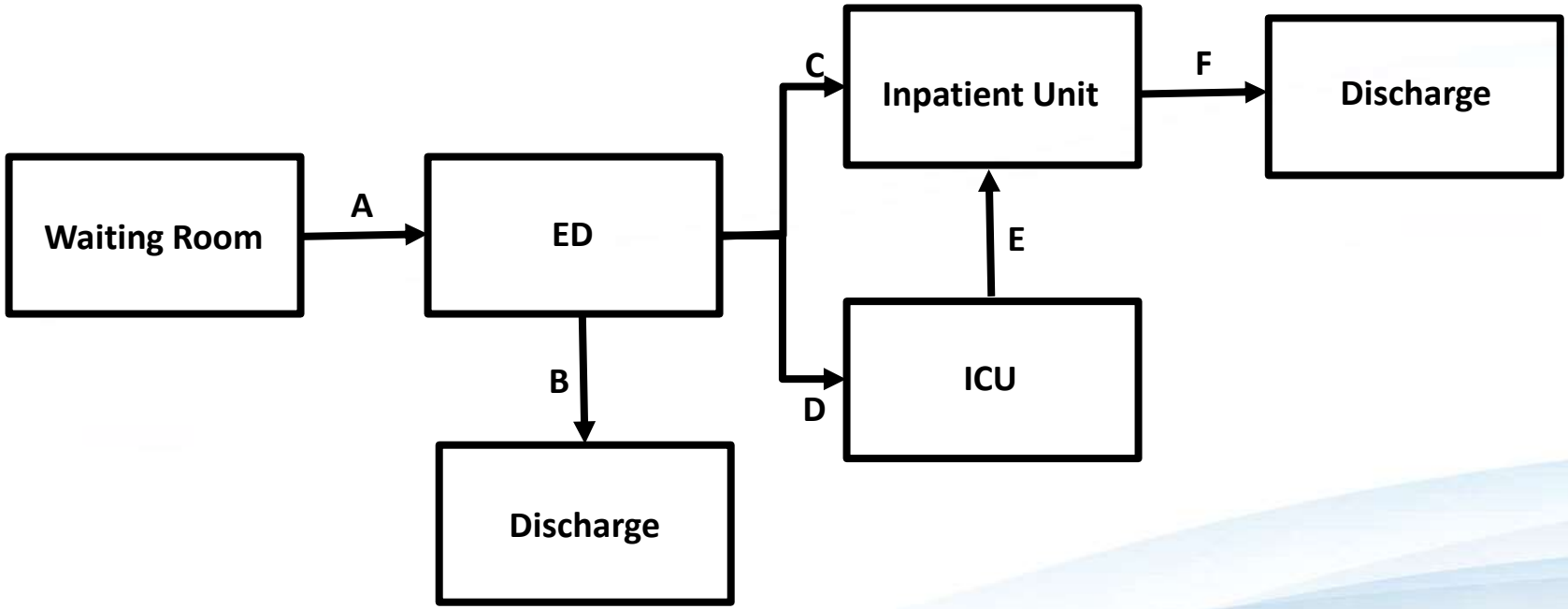


Bottleneck *outside* of the ED

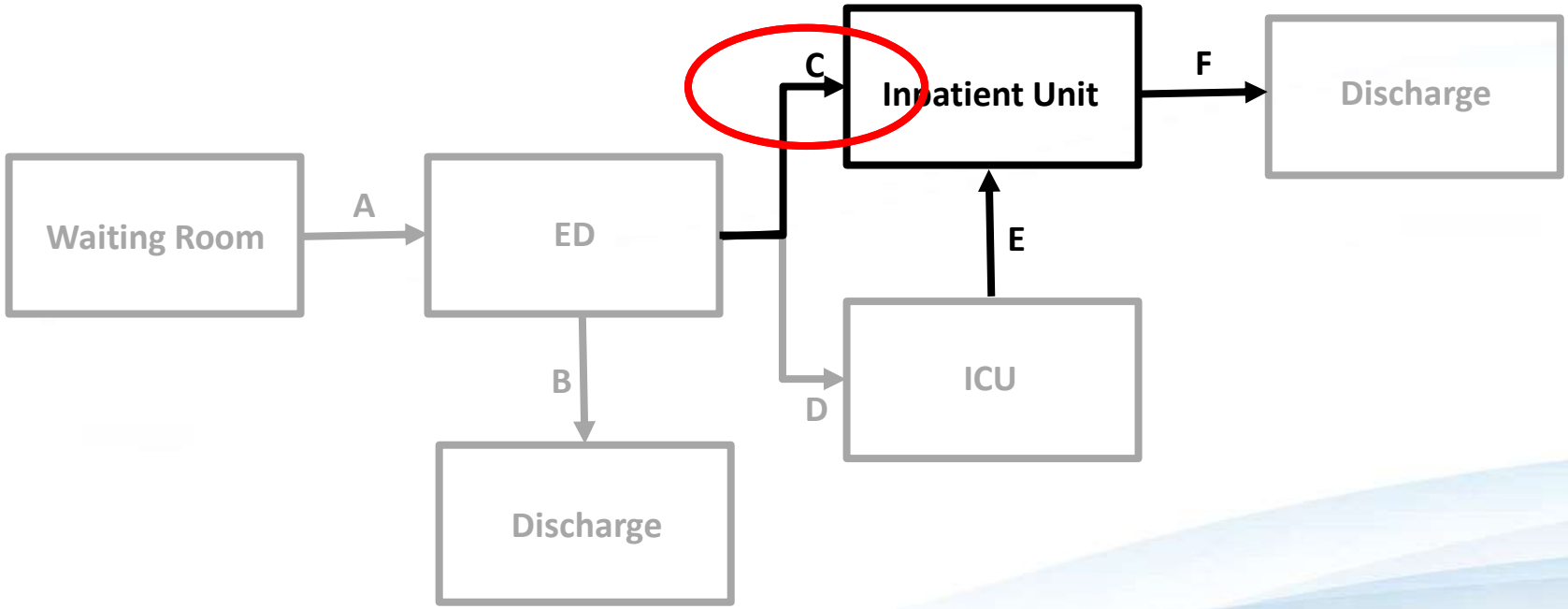


Go More Granular

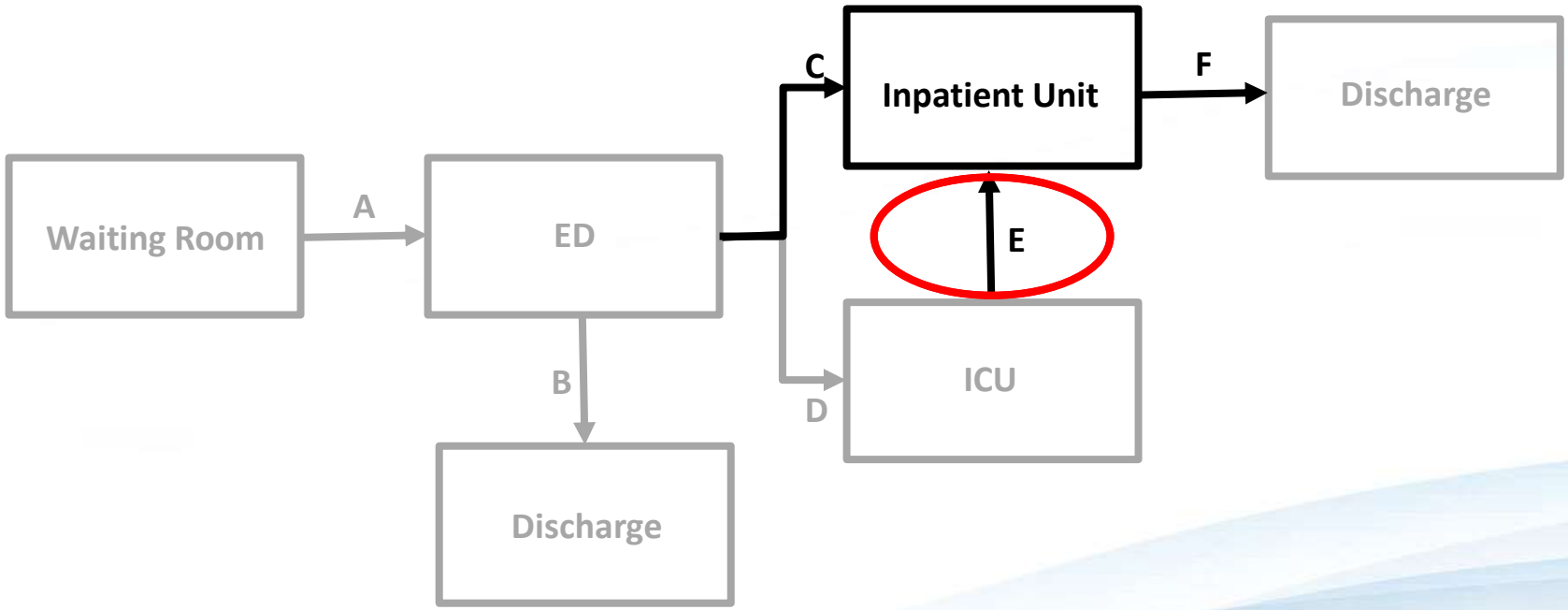
Inpatient Bottleneck



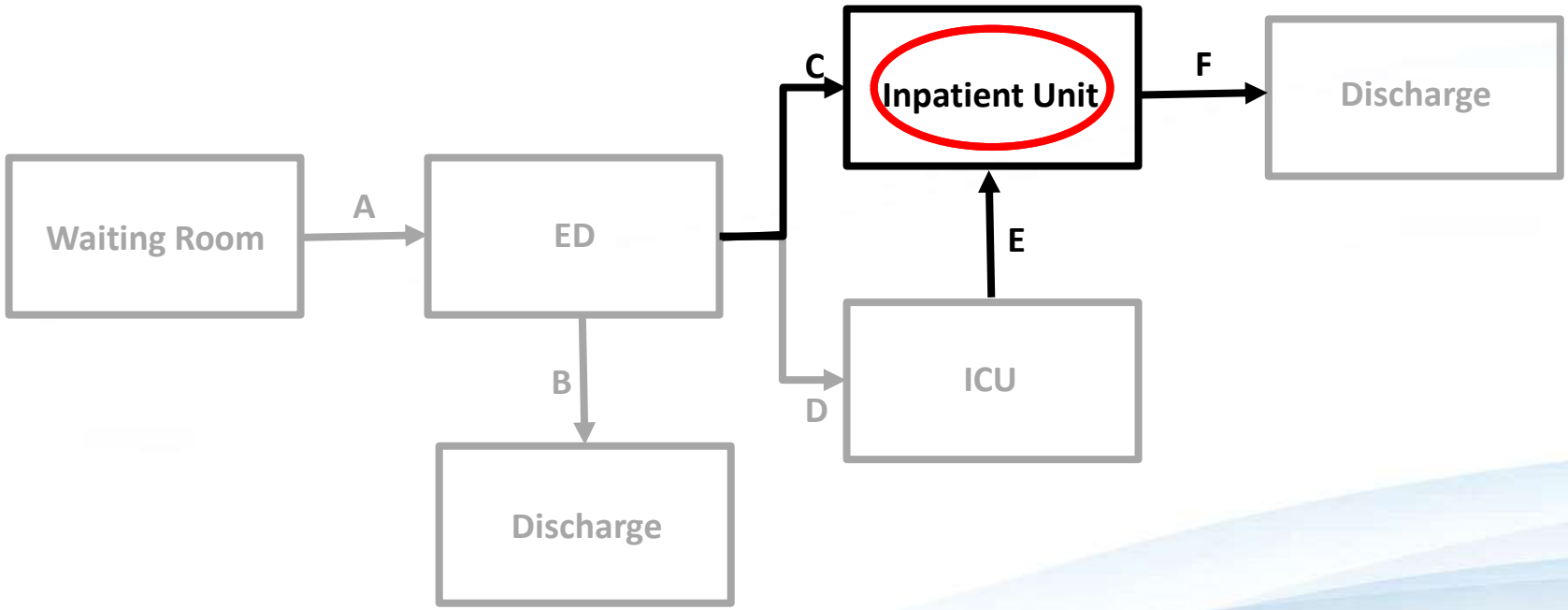
Inpatient Bottleneck



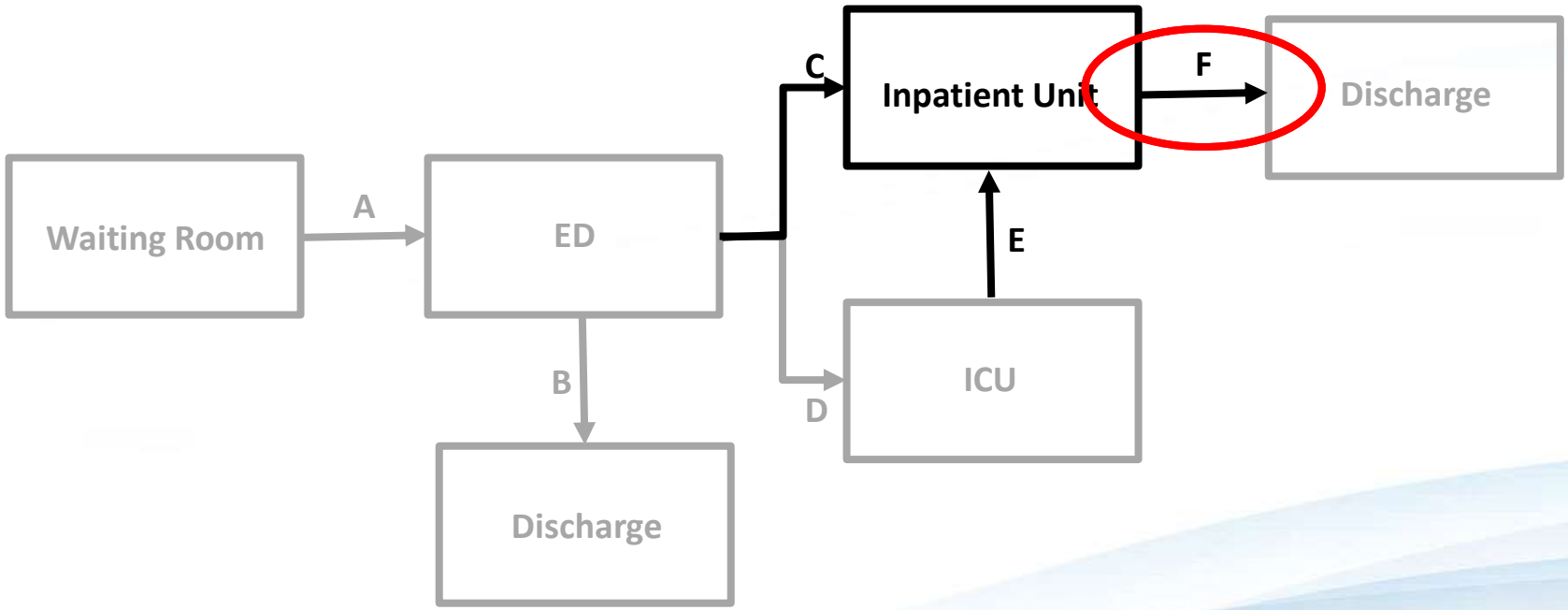
Inpatient Bottleneck



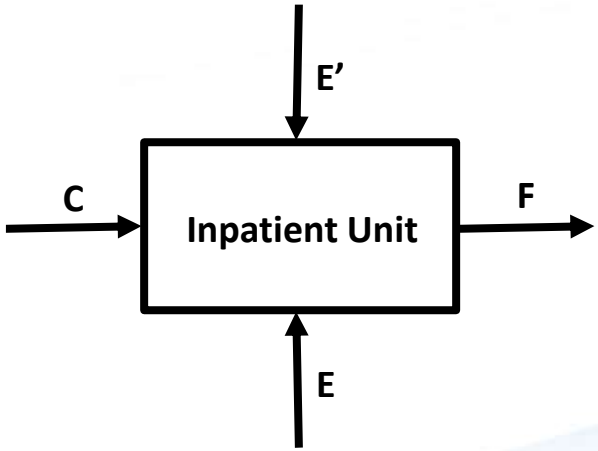
Inpatient Bottleneck



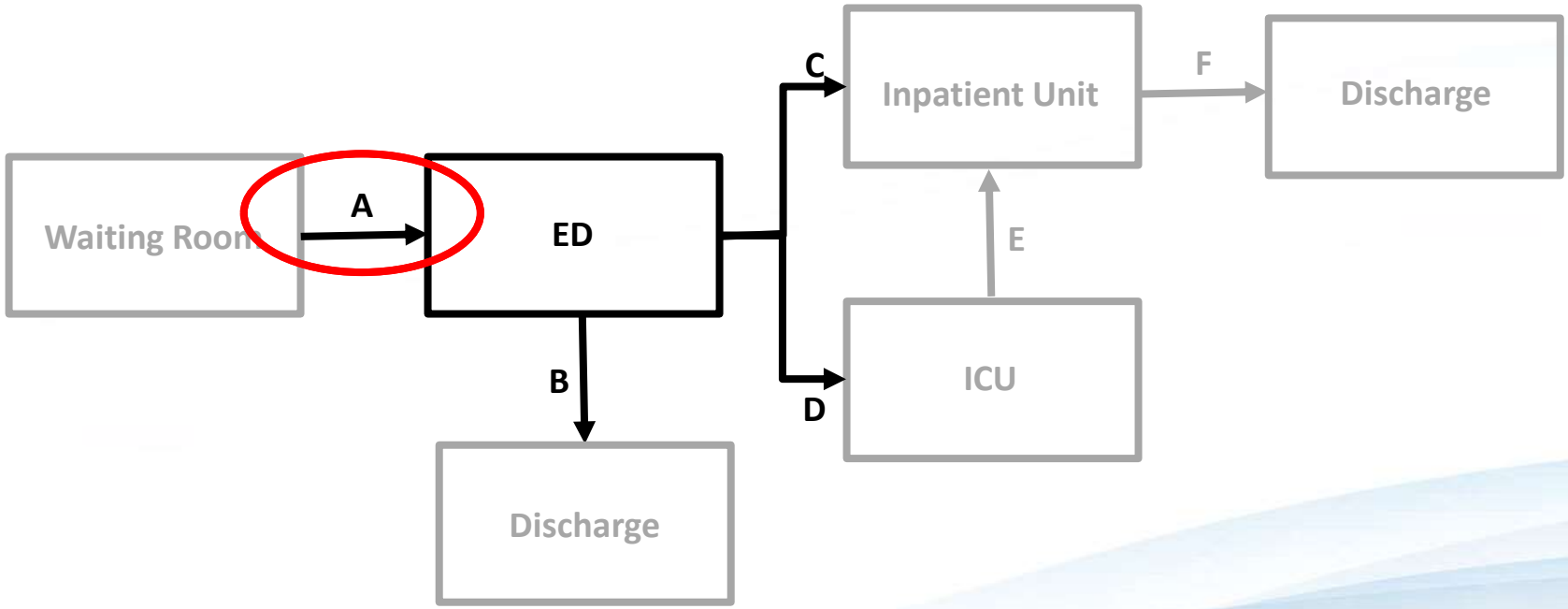
Inpatient Bottleneck



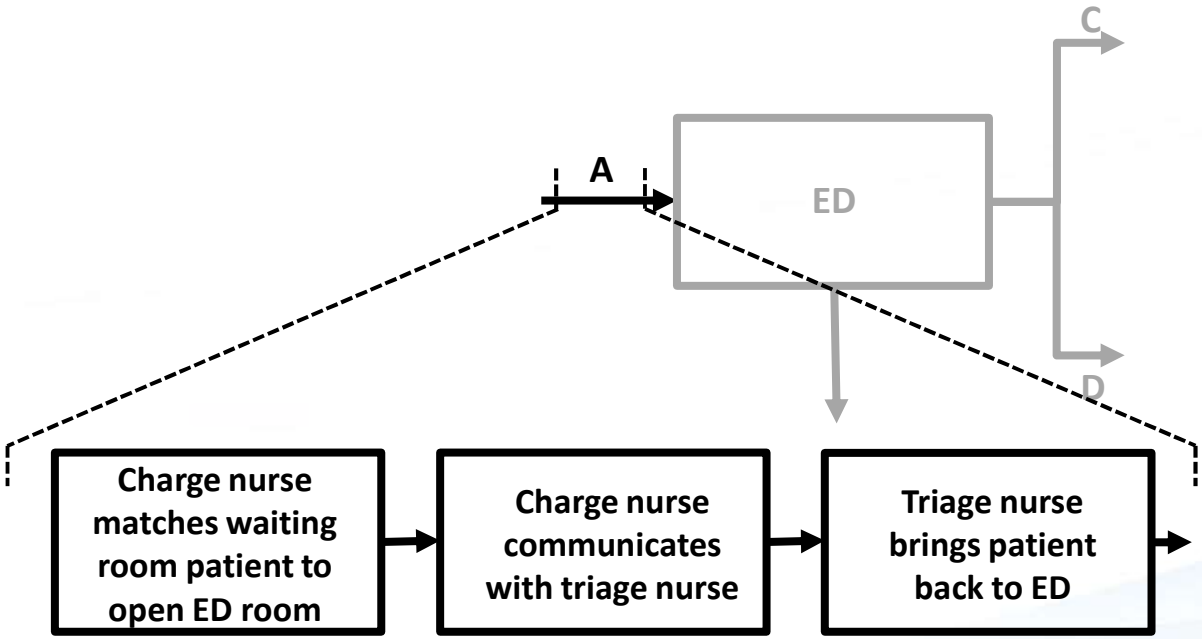
Inpatient Bottleneck



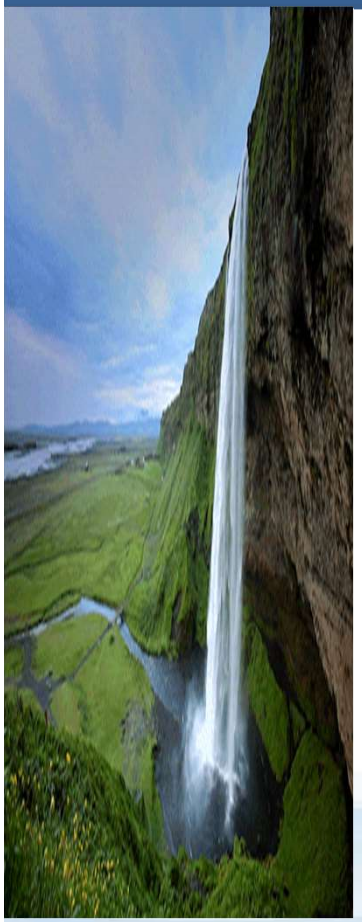
Inpatient Bottleneck



Emergency Department Bottleneck

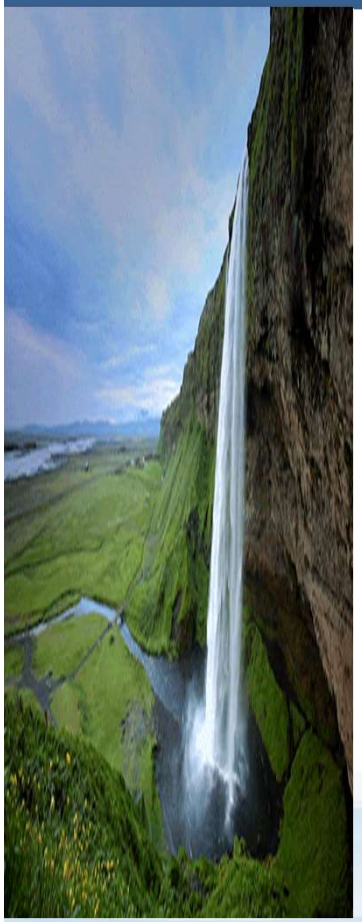


Emergency Department Bottleneck

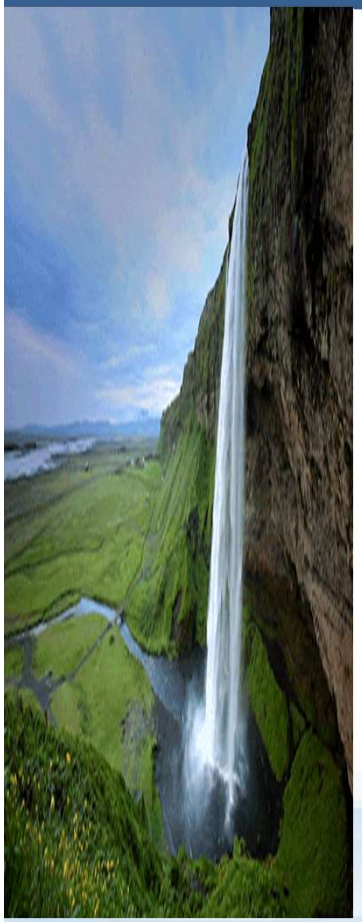


Exploit the Bottleneck

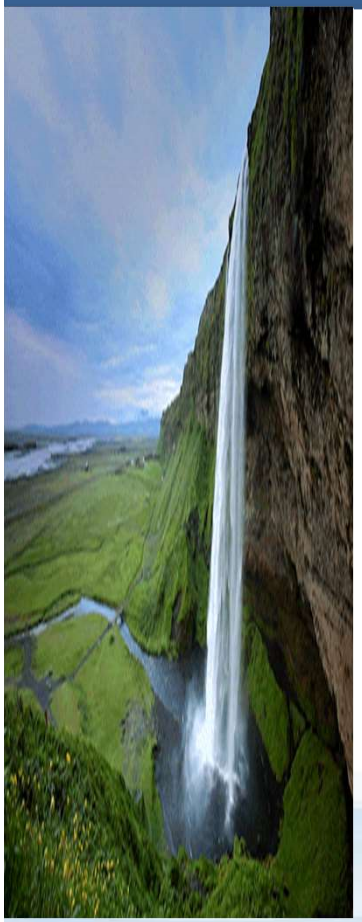
Bottleneck should never sit idle



Exploit the Bottleneck

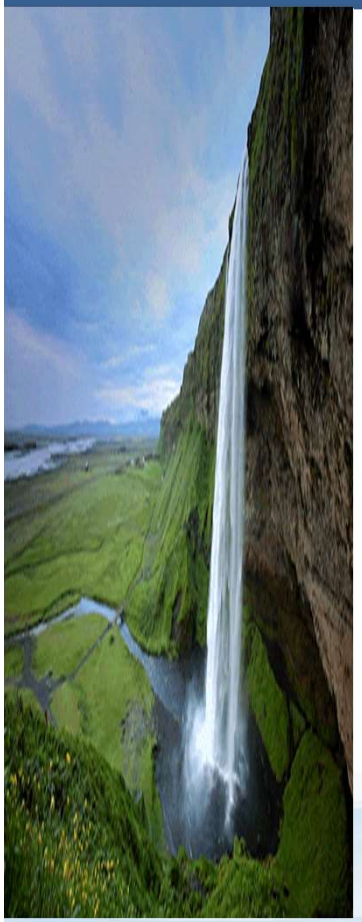


Exploit the Bottleneck



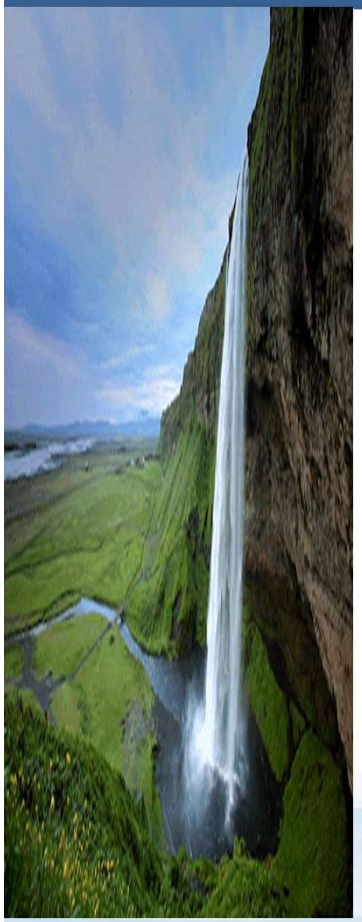
Exploit the Bottleneck

~~Occupying a Bed but Ready for Lower Acuity~~



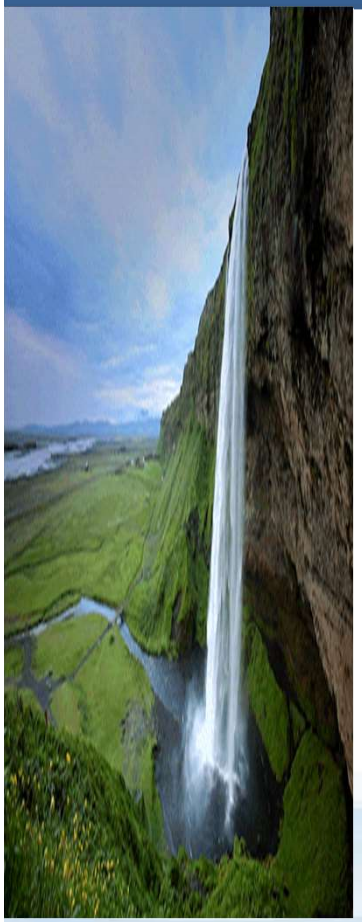
Subordinate to the Bottleneck

Eliminate Steps



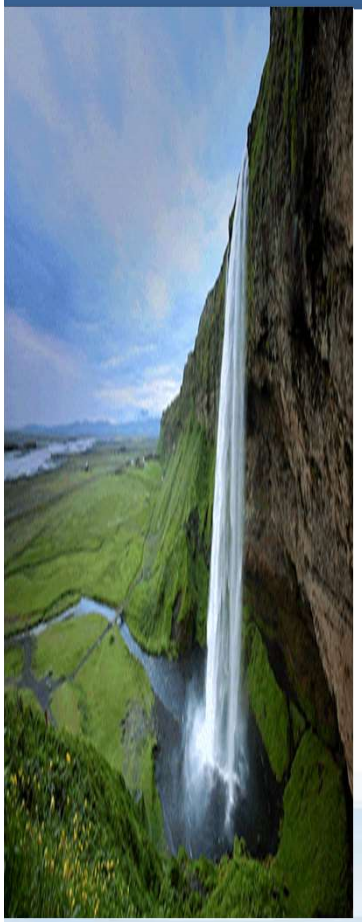
Subordinate to the Bottleneck

Shorten Steps

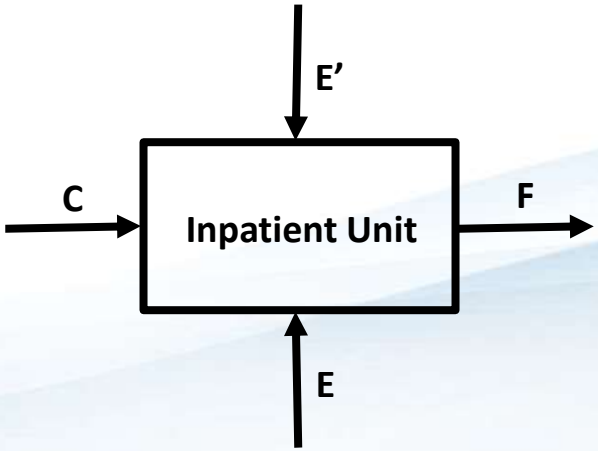


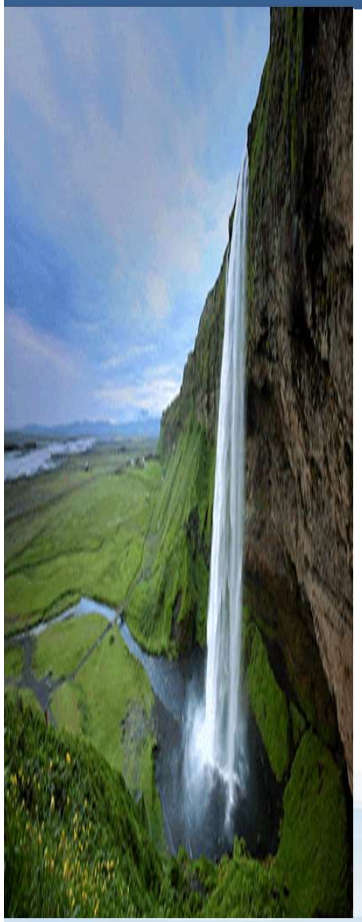
Subordinate to the Bottleneck

Rearrange Steps

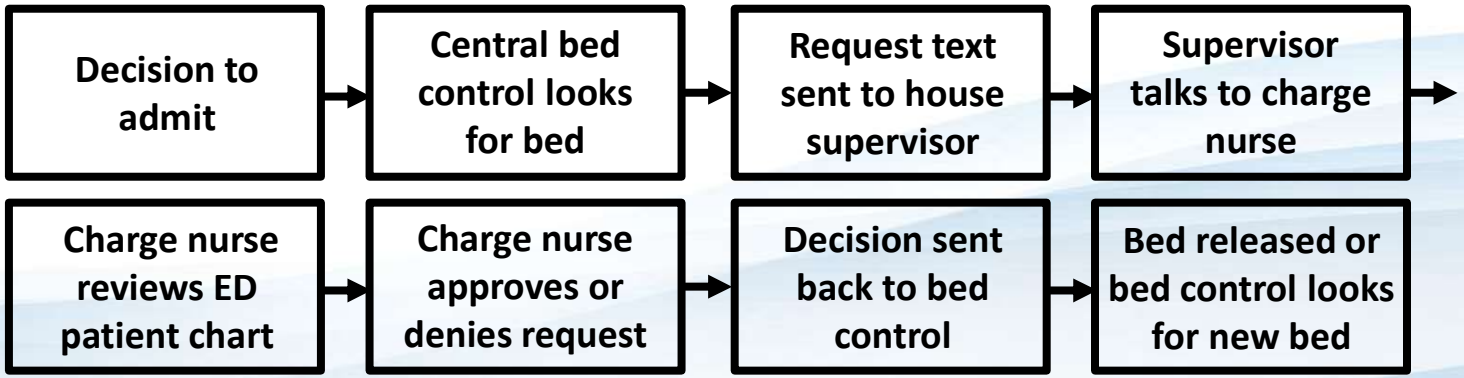


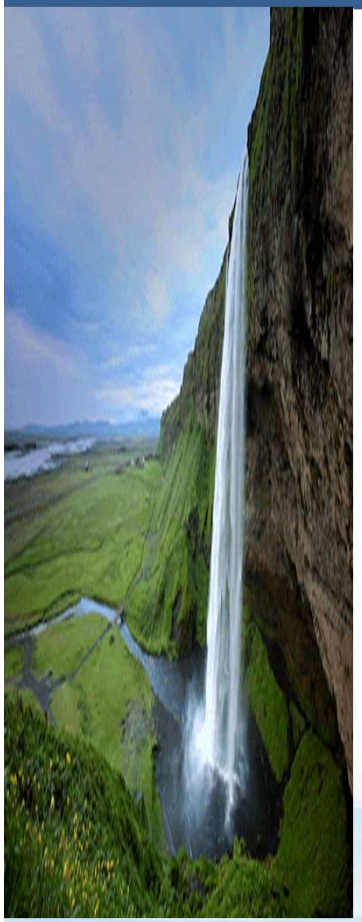
Eliminate Steps



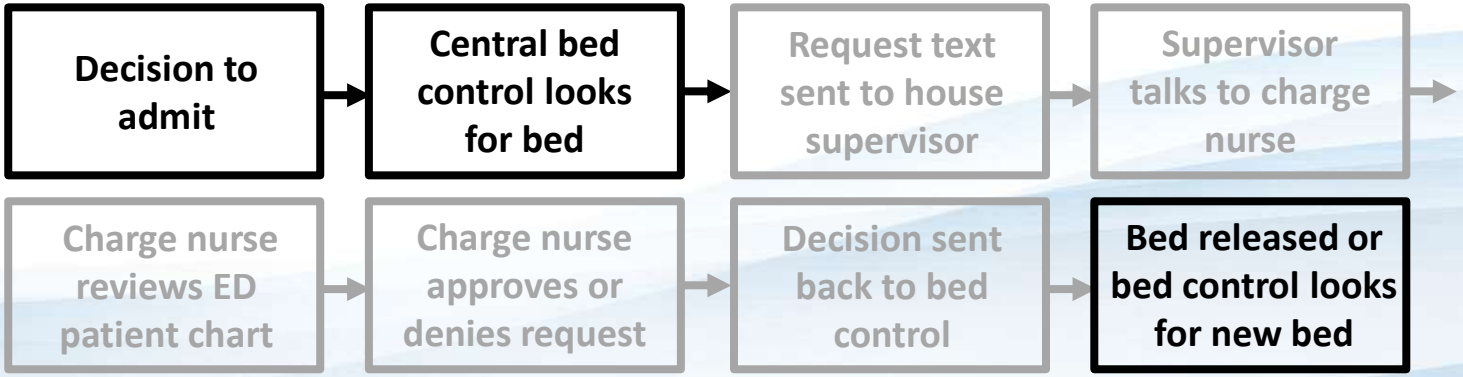


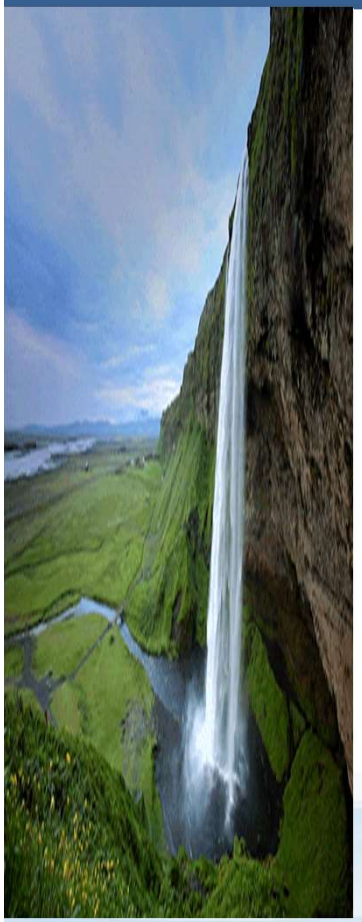
Eliminate Steps



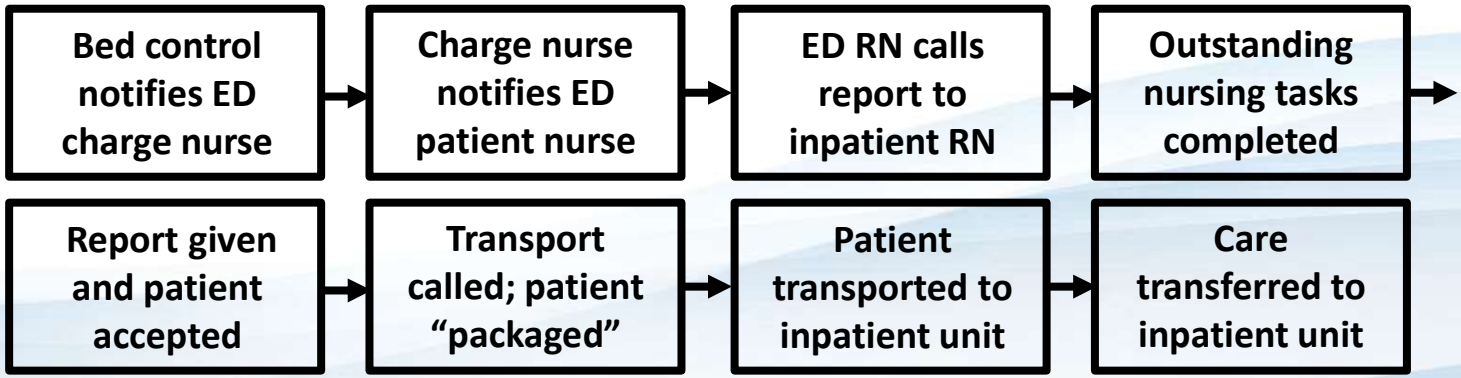


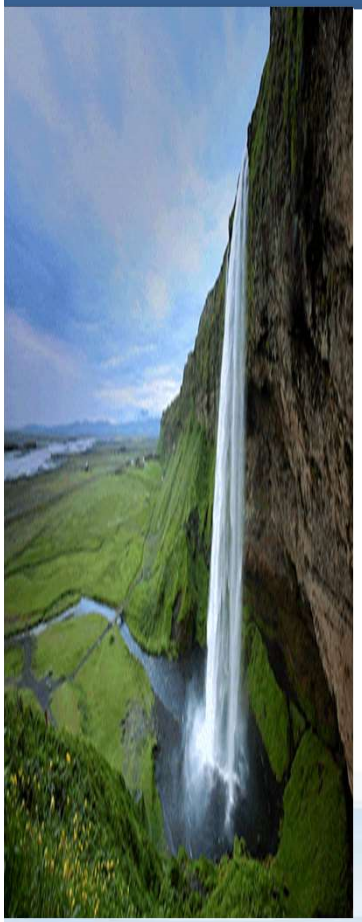
Eliminate Steps



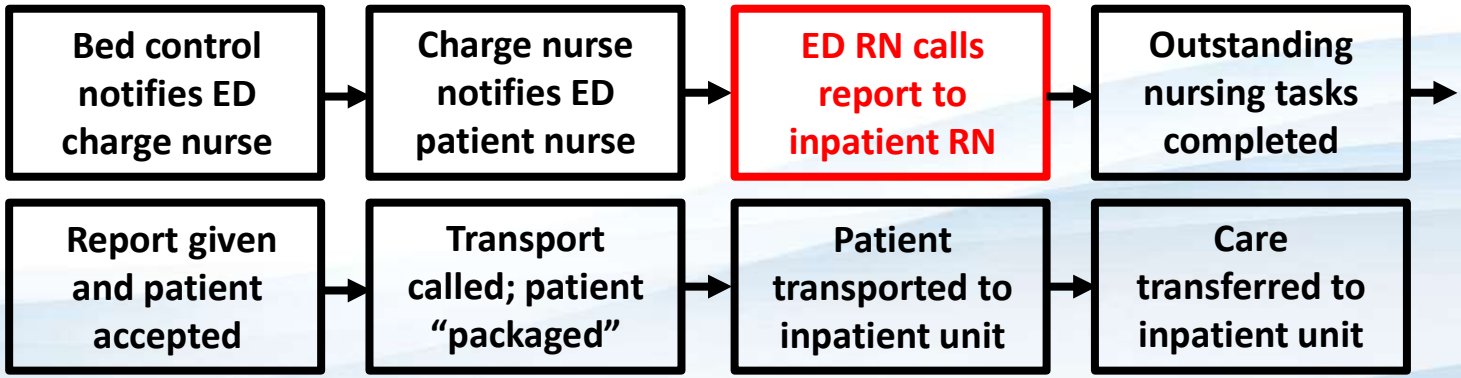


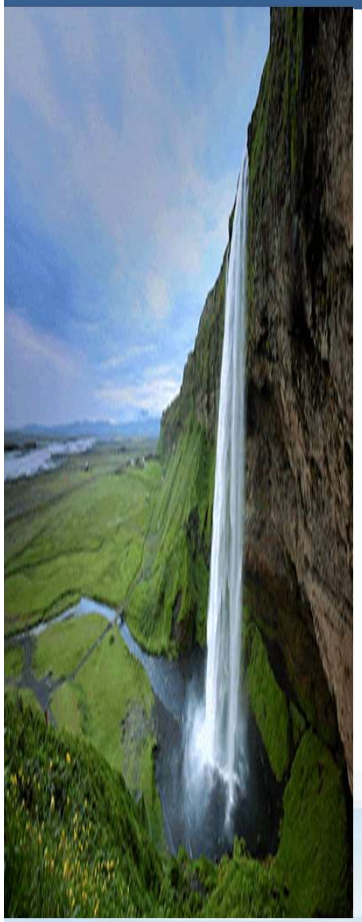
Shorten Steps



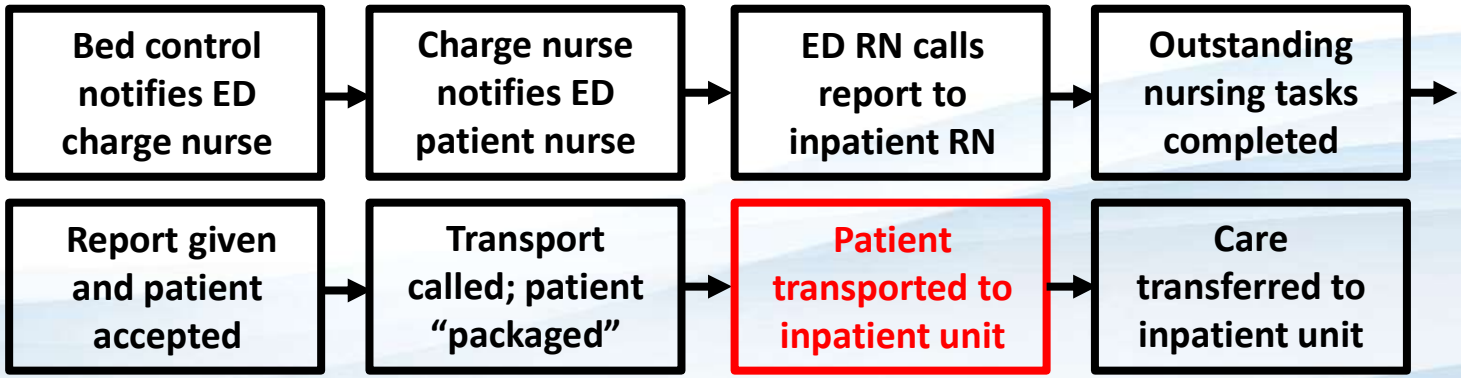


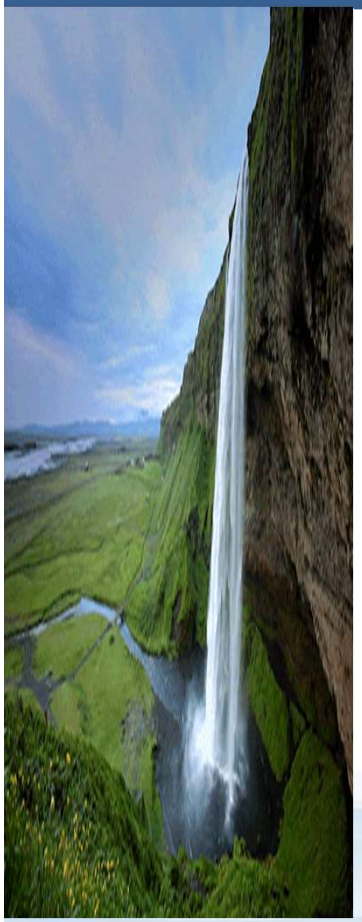
Shorten Steps





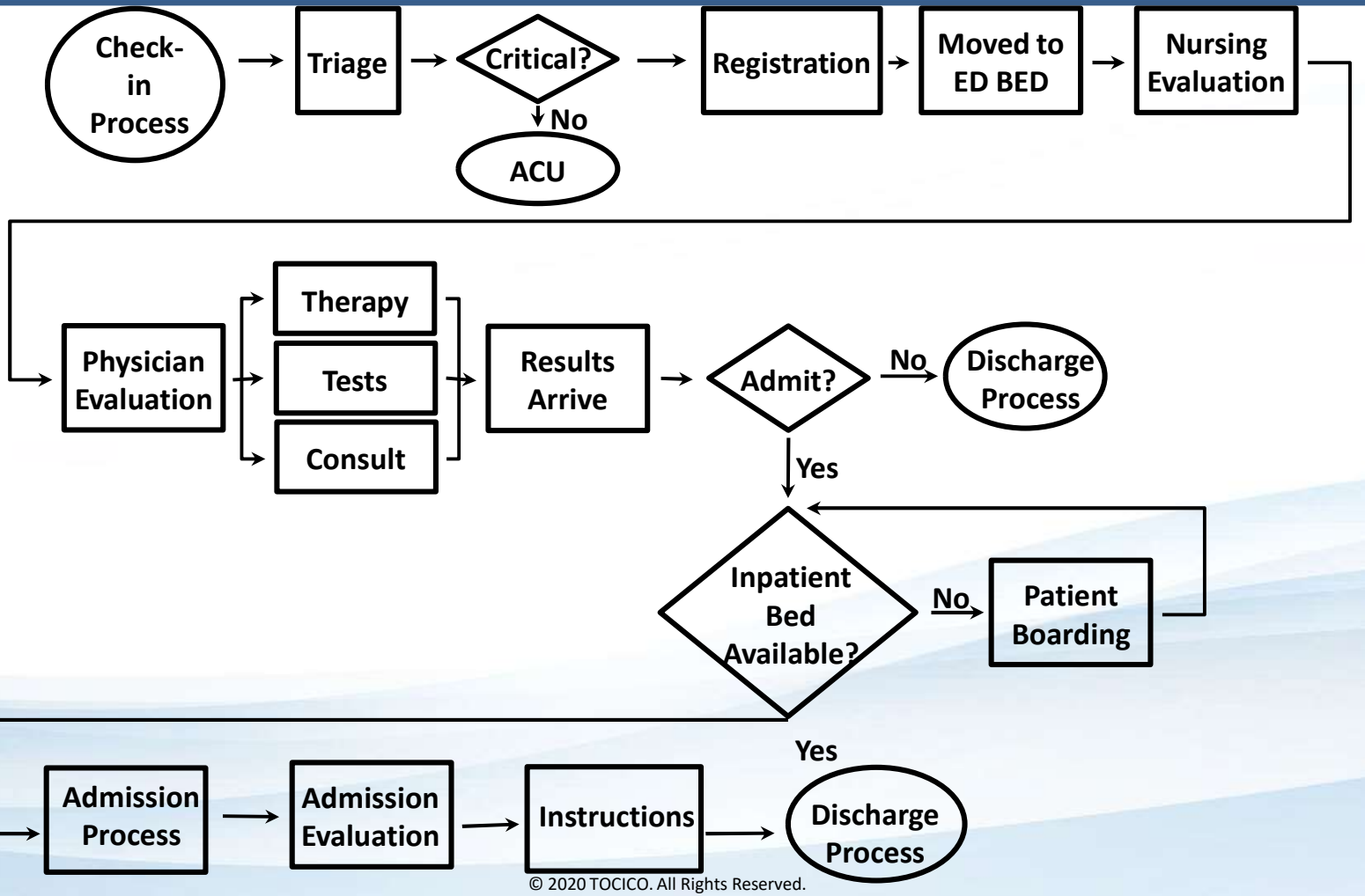
Shorten Steps

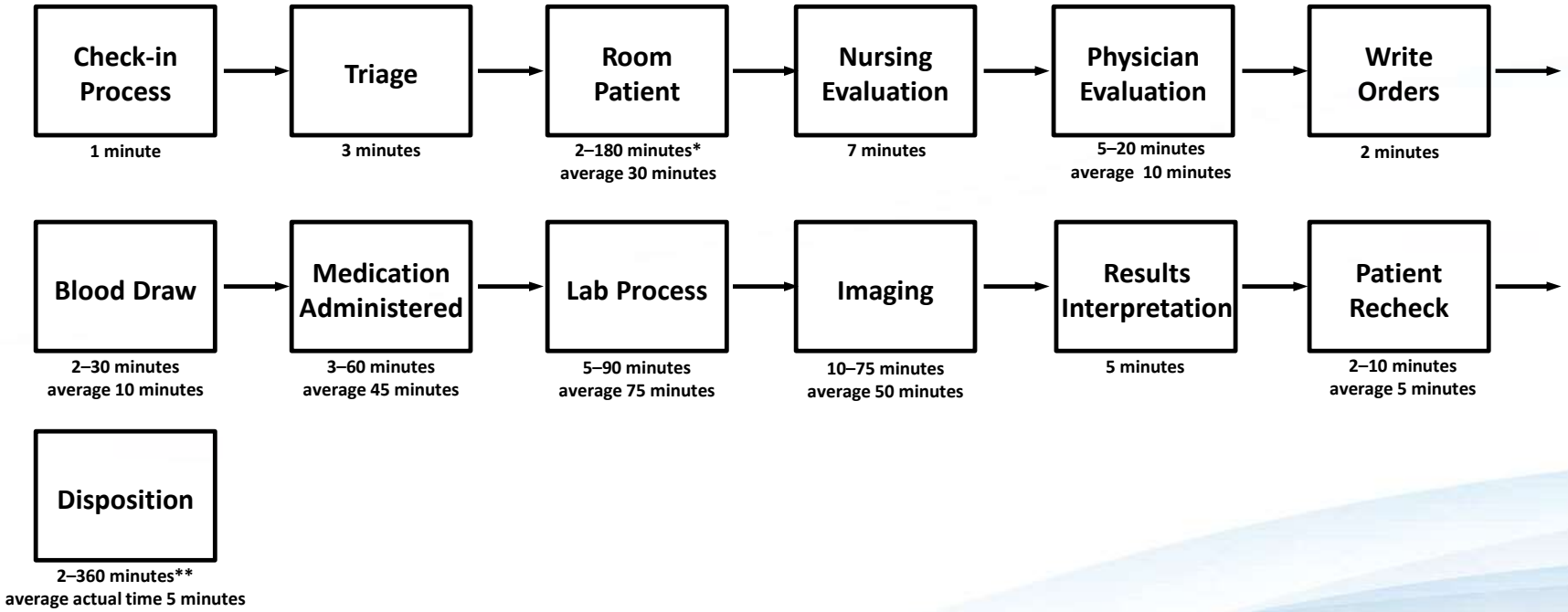




Rearrange Steps

Important to break dependencies

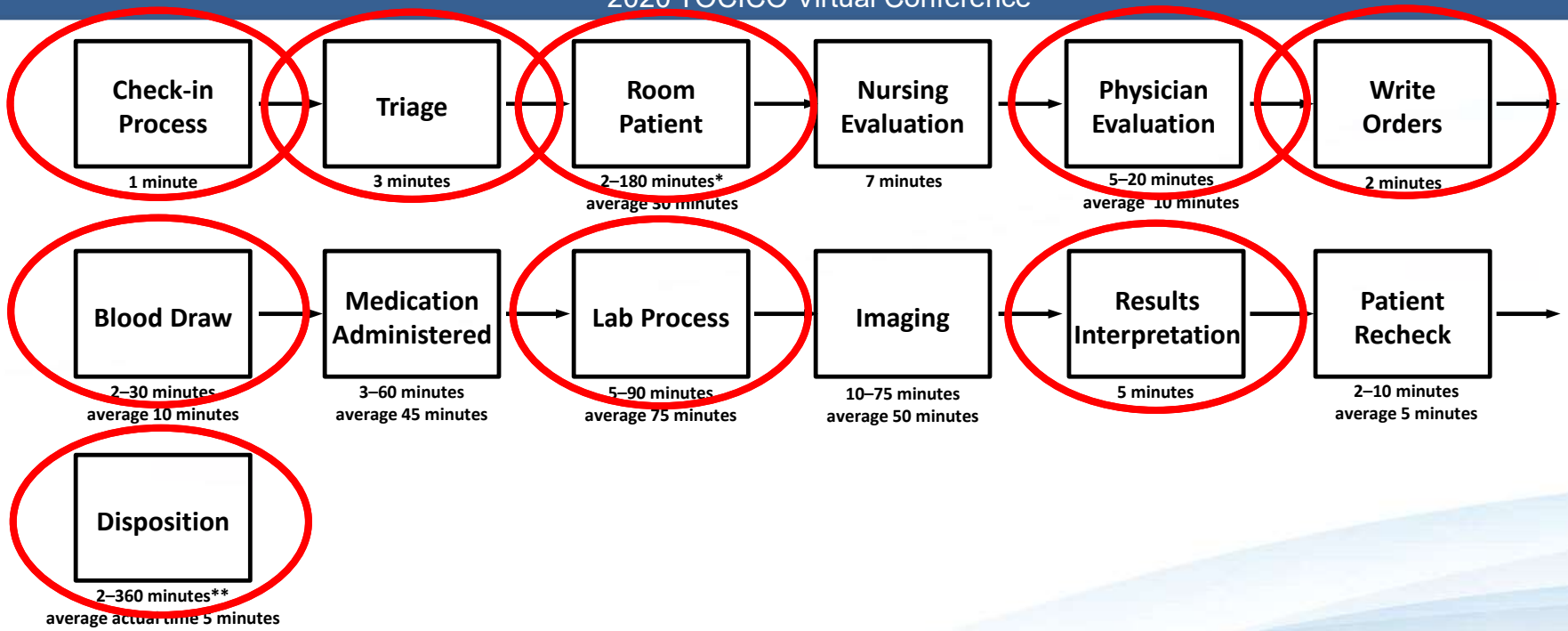




*ED bed availability accounts for most of the variability in this step.

**Although a patient may have technically completed this step, disposition does not officially occur until the patient has left the ED bed.

Average 248 minutes (49 minutes – 838 minutes)



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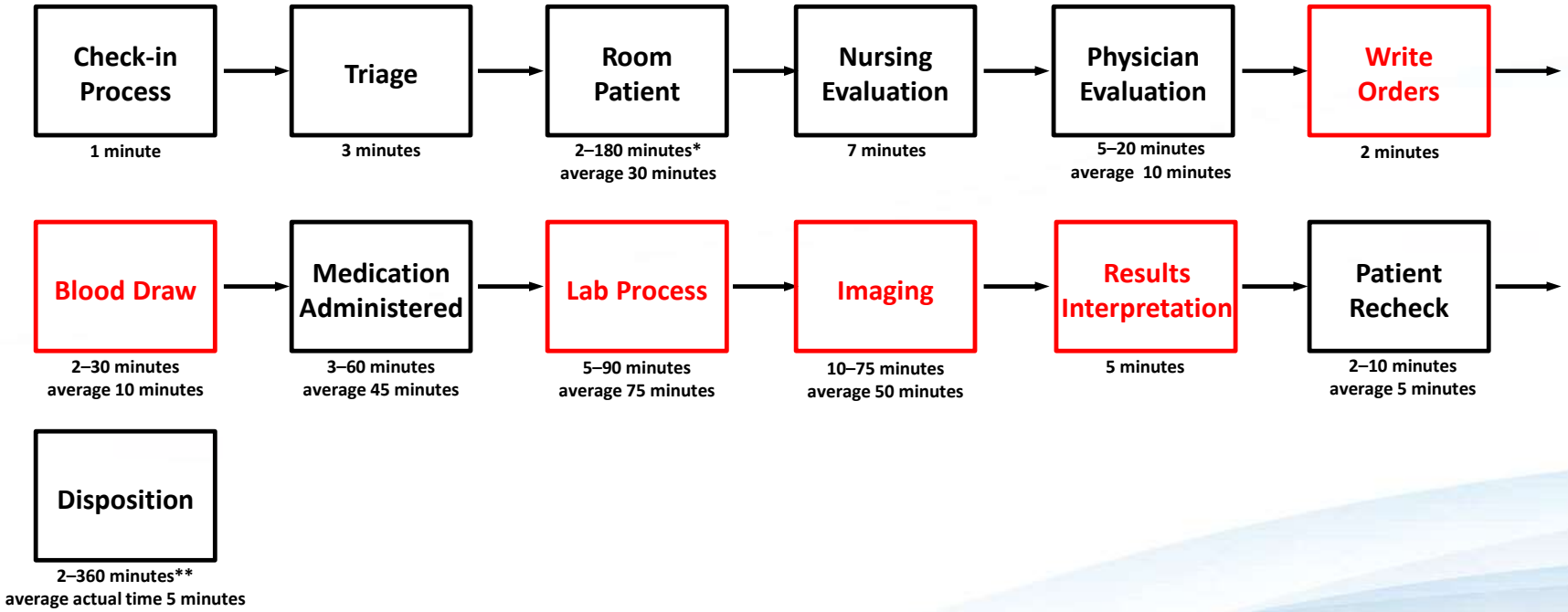

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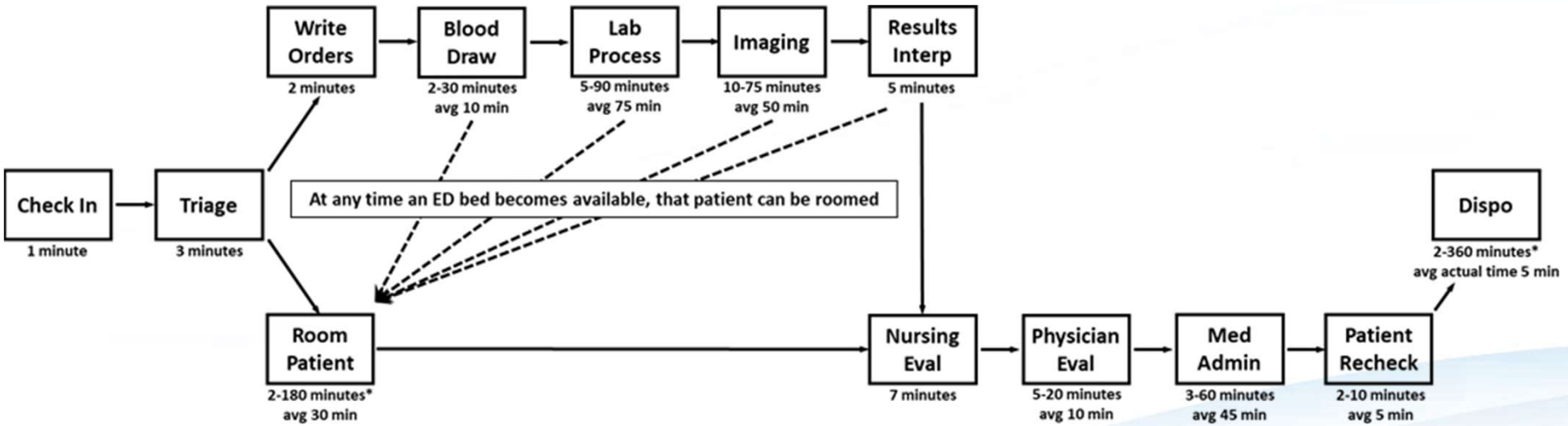
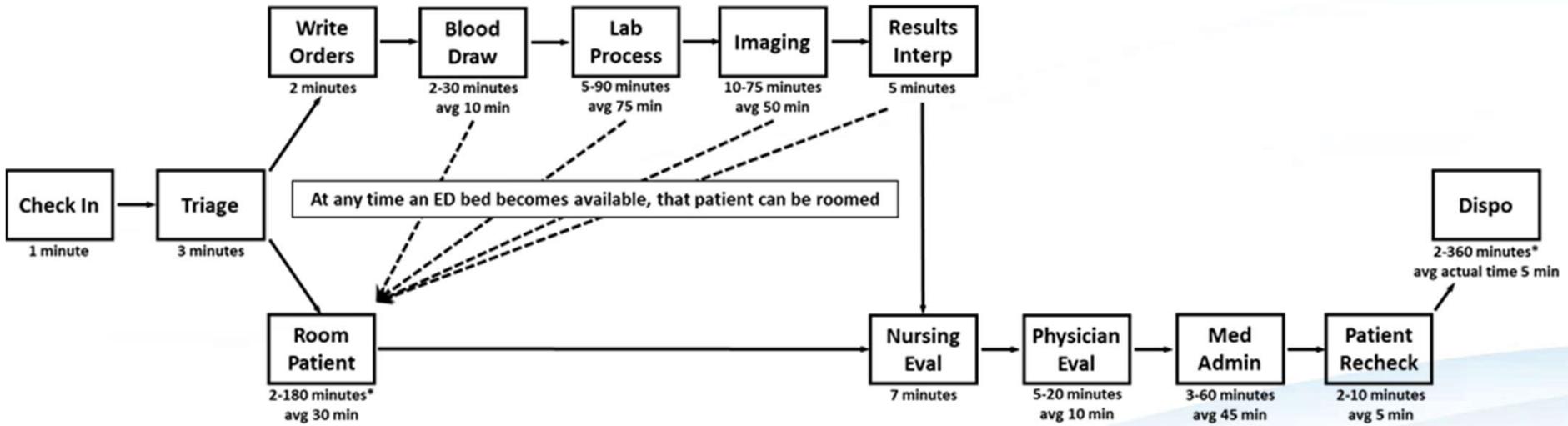
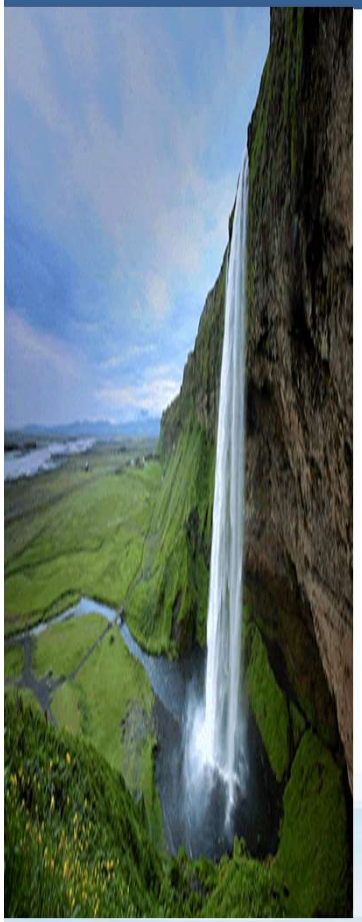


*Varies by ED bed availability. Although patient may have completed this step and the majority of time is queuing, that resource is still responsible for the patient until the patient moves to the next step.



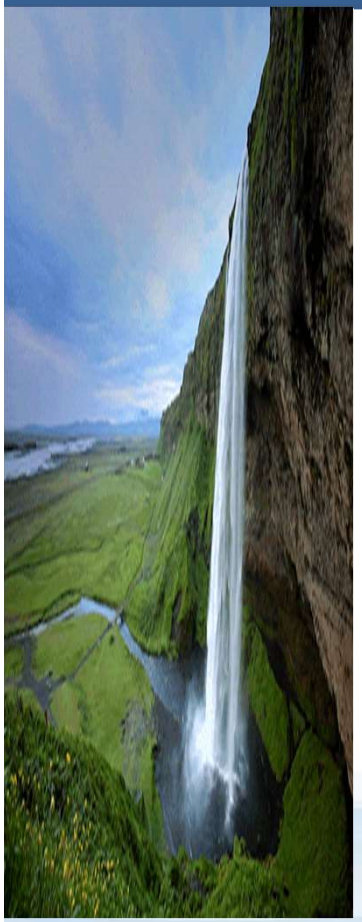
*Varies by ED bed availability. Although patient may have completed this step and the majority of time is queuing, that resource is still responsible for the patient until the patient moves to the next step.

142 minutes saved



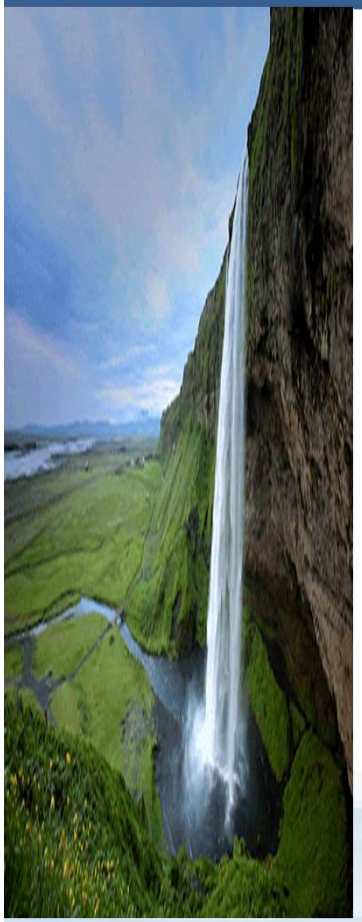
Subordinate to the Bottleneck

Inpatient Bed Bottleneck



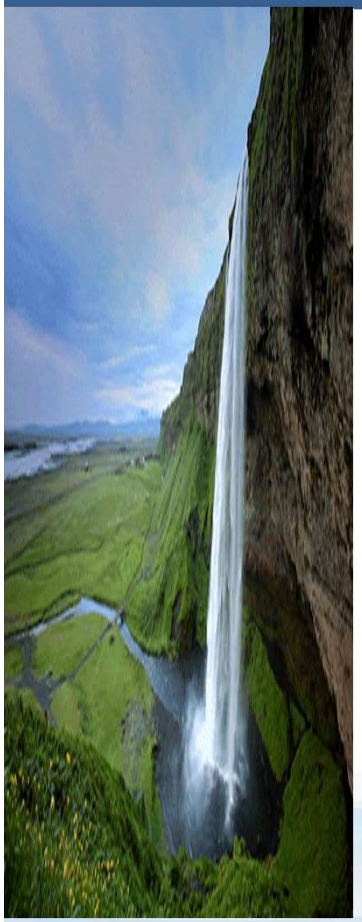
Subordinate to the Bottleneck

Do *not* hold open inpatient beds



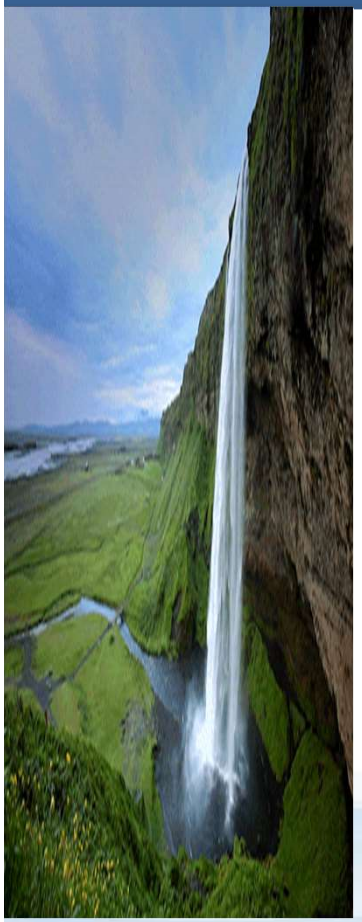
Subordinate to the Bottleneck

Prioritize the beds that need cleaning



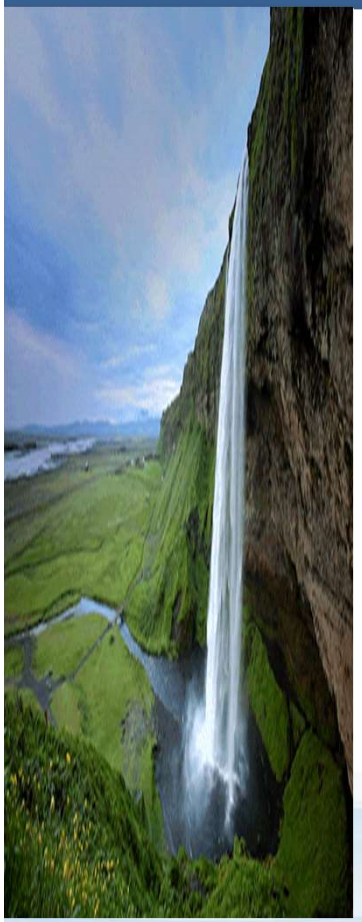
Subordinate to the Bottleneck

Discharge lounge



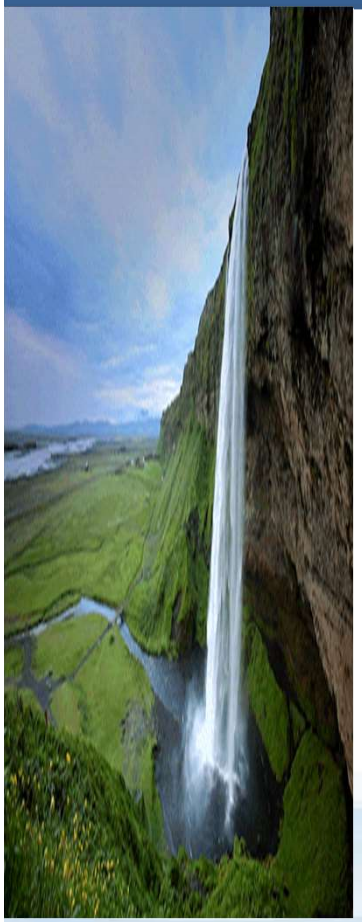
Subordinate to the Bottleneck

Holding orders



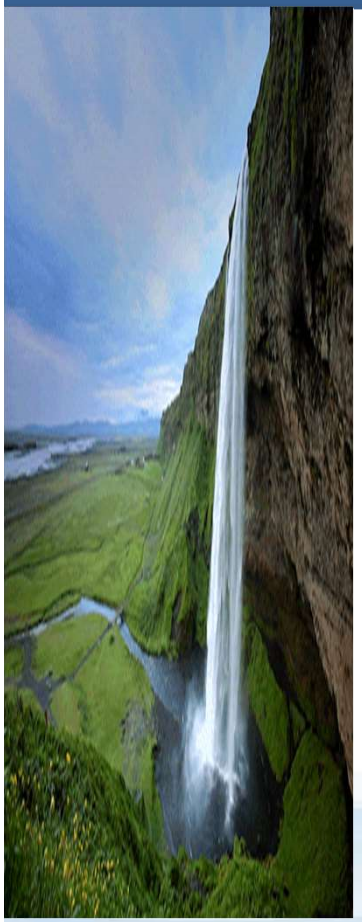
Elevate the Bottleneck

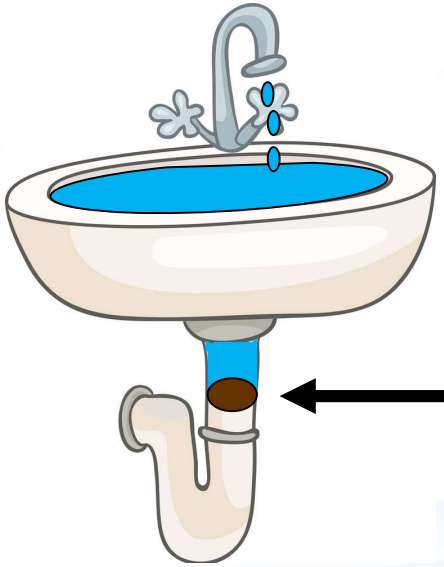
Invest in more capacity

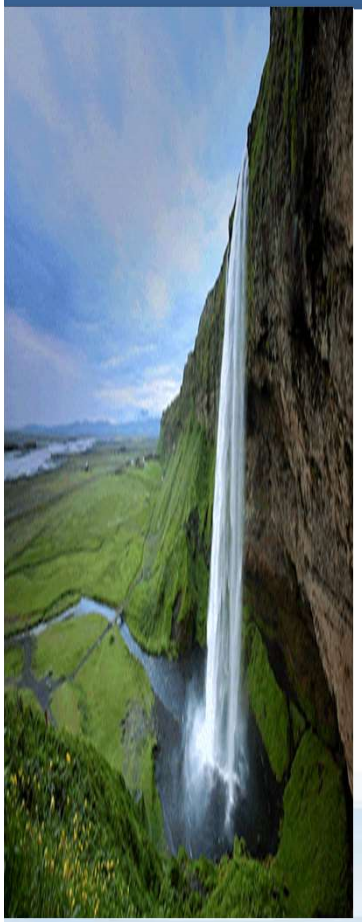


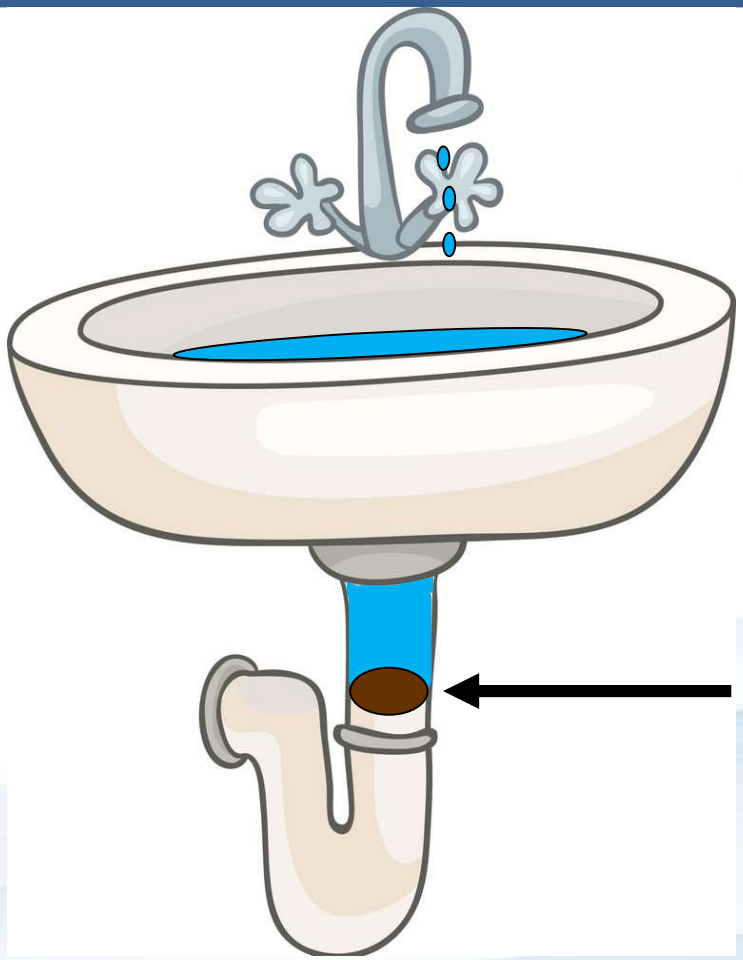
Elevate the Bottleneck

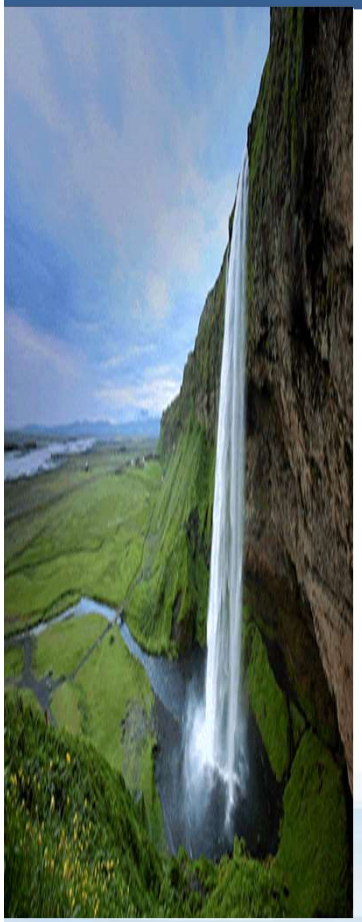
Is building more beds the answer?

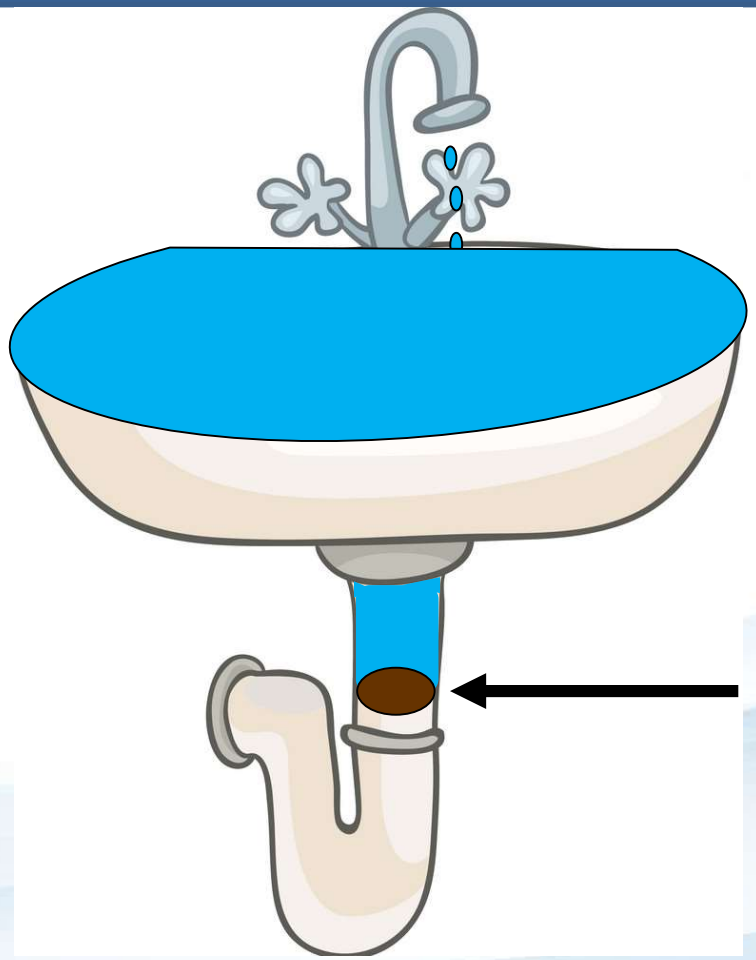


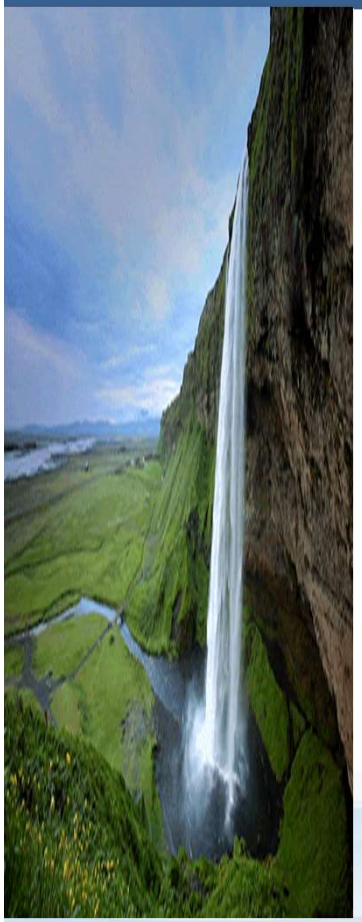












The Effect of Emergency Department Expansion on Emergency Department Overcrowding

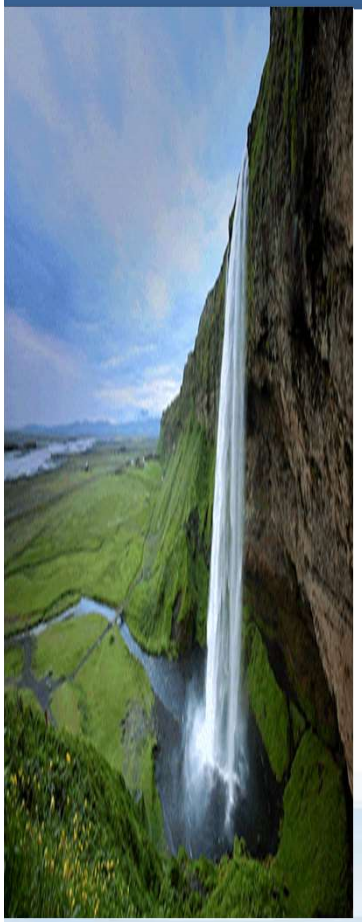
Jin H. Han, MD, MSc, Chuan Zhou, PhD, Daniel J. France, PhD, Sheng Zhong, MS, Ian Jones, MD, Alan B. Storrow, MD, Dominik Aronsky, MD, PhD

Abstract

Objectives: To examine the effects of emergency department (ED) expansion on ambulance diversion at an urban, academic Level 1 trauma center.

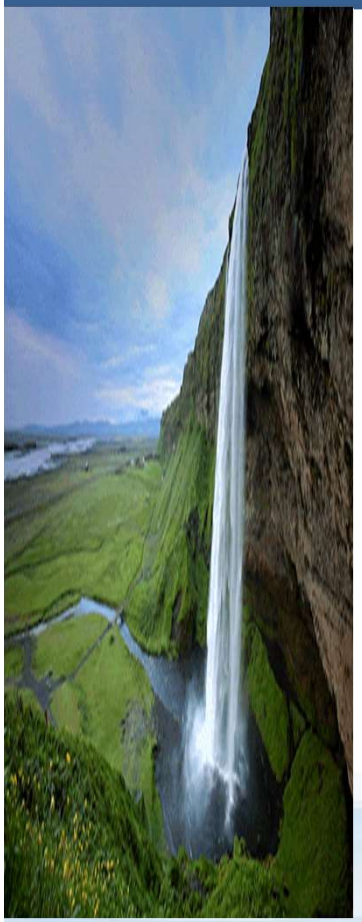
Methods: This was a pre-post study performed using administrative data from the ED and hospital electronic information systems. On April 19, 2005, the adult ED expanded from 28 to 53 licensed beds. Data from a five-month pre-expansion period (November 1, 2004, to March 1, 2005) and a five-month postexpansion period (June 1, 2005, to October 31, 2005) were included for this analysis. ED and waiting room statis-

Han, Jin H., et al. "The effect of emergency department expansion on emergency department overcrowding." *Academic Emergency Medicine* 14.4 (2007): 338-343.



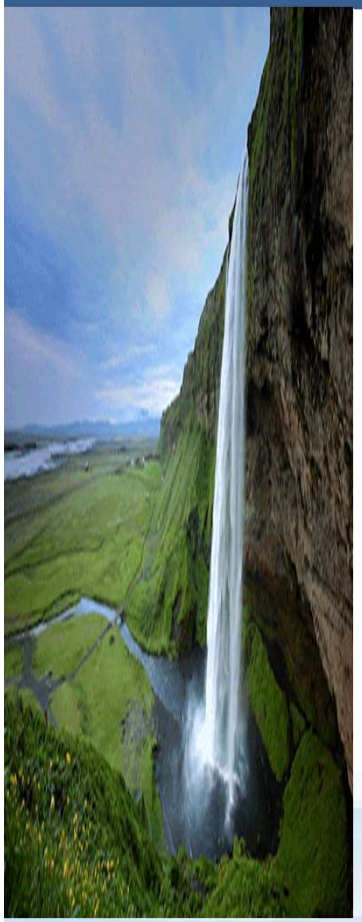
Elevate the Bottleneck

Are Inpatient Beds the bottleneck?



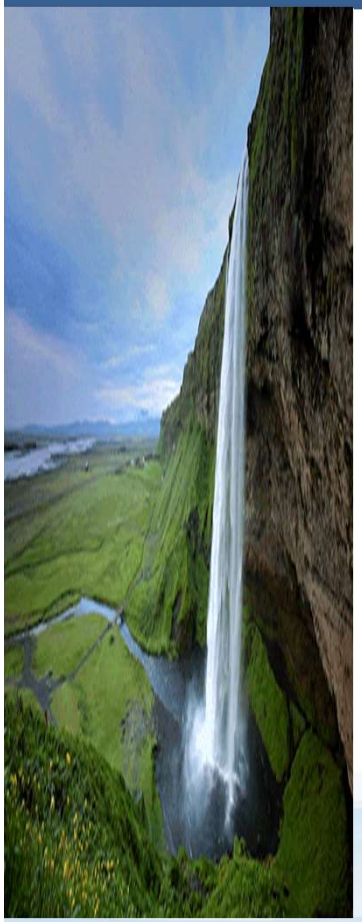
Elevate the Bottleneck

Board inpatients on the hallways



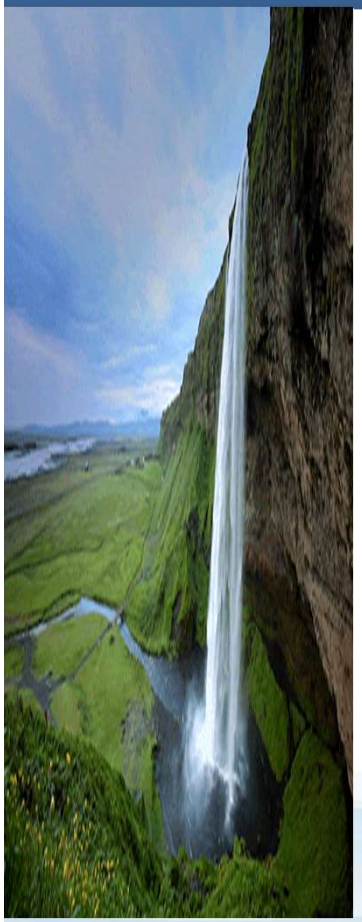
Elevate the Bottleneck

Flex Units



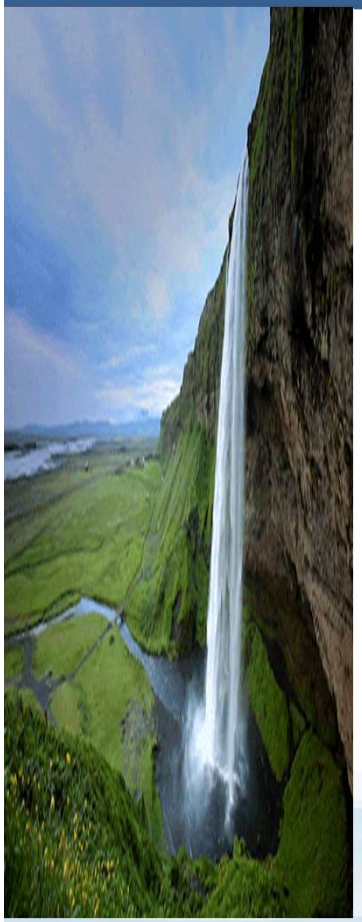
Elevate the Bottleneck

Transfer Centers



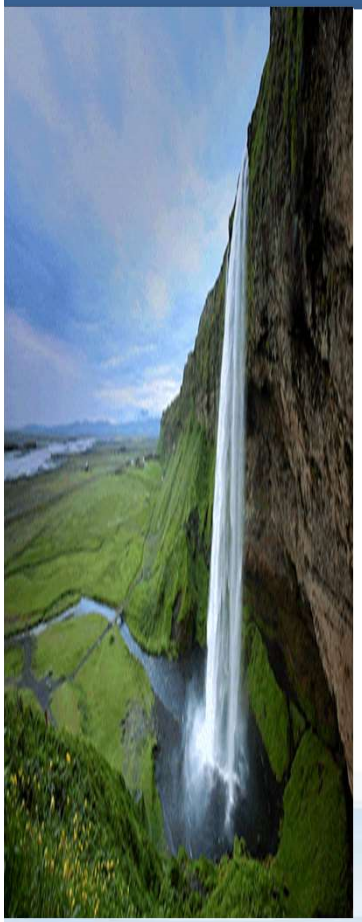
Elevate the Bottleneck

Inpatient Nursing Capacity?



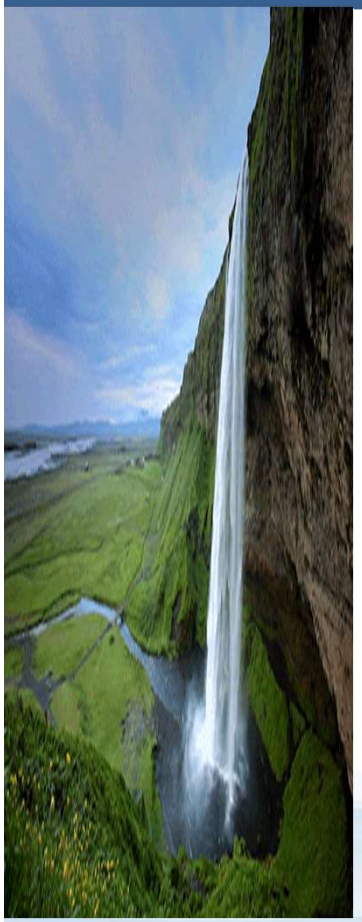
Elevate the Bottleneck

Cohort inpatients with lower acuity



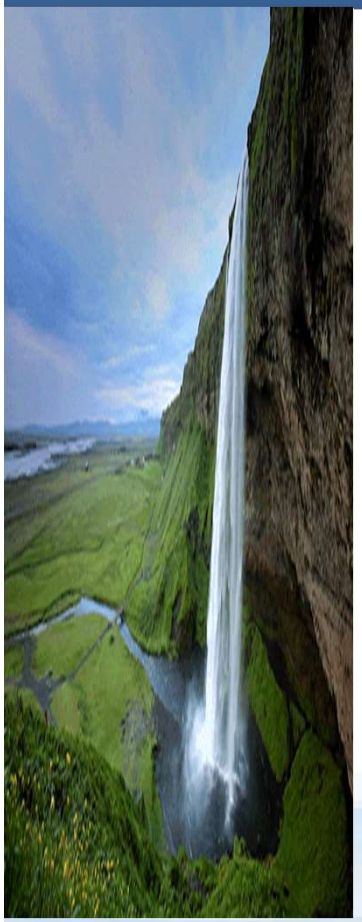
Elevate the Bottleneck

Resource Pools



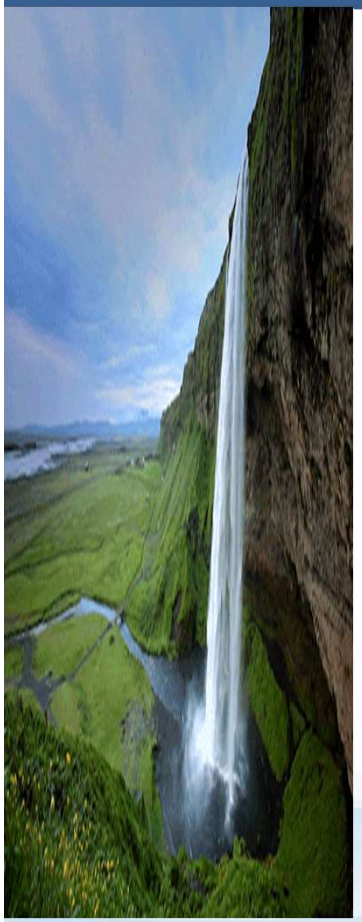
Elevate the Bottleneck

What if the ED beds are the bottleneck?



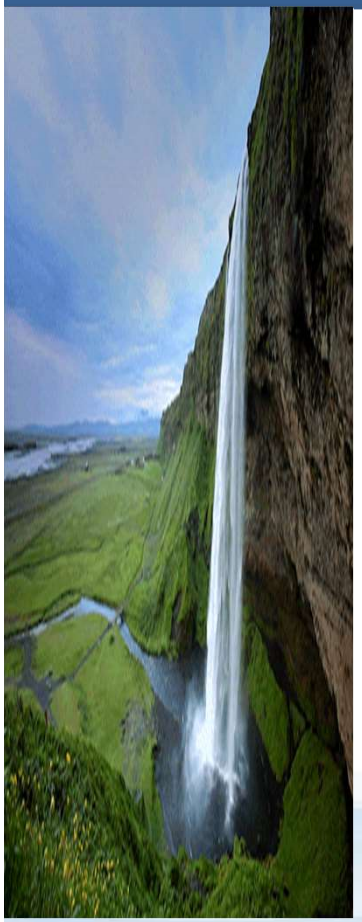
Elevate the Bottleneck

Ambulatory Care Units/Fast Tracks



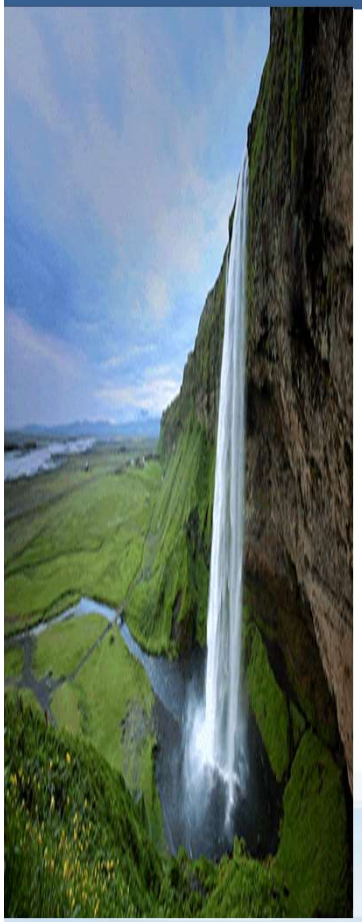
Elevate the Bottleneck

Providers in Triage



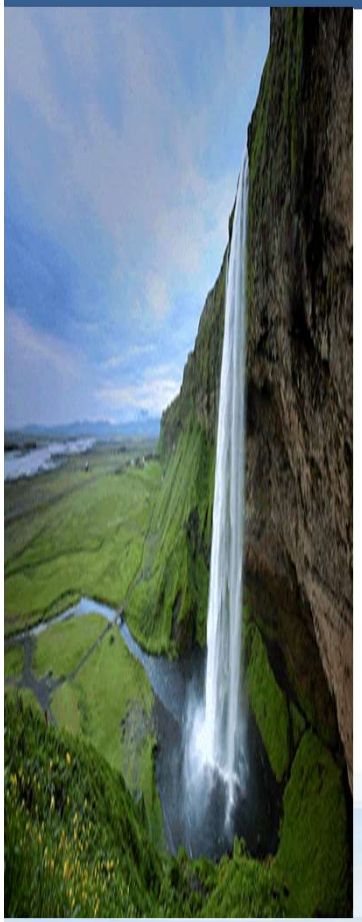
Elevate the Bottleneck

Clinical Decision Units



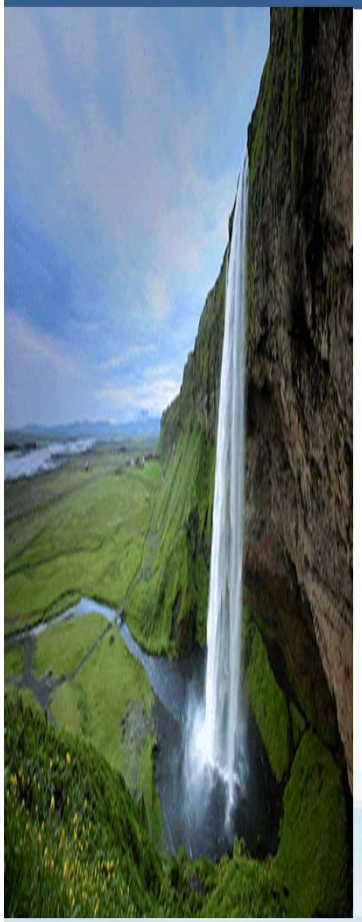
Elevate the Bottleneck

How about ED Physicians as bottlenecks?



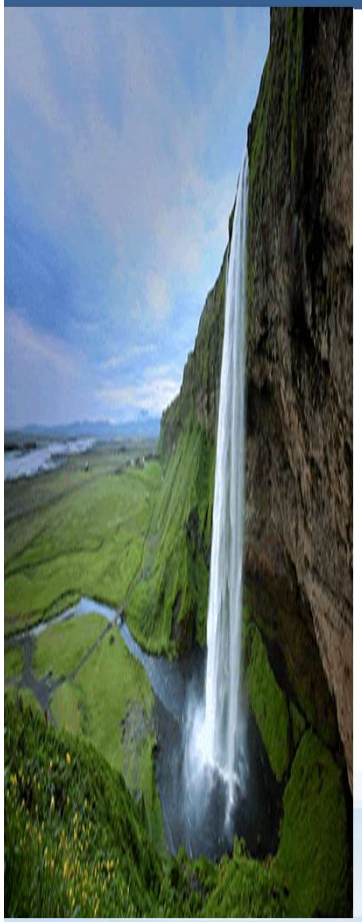
Elevate the Bottleneck

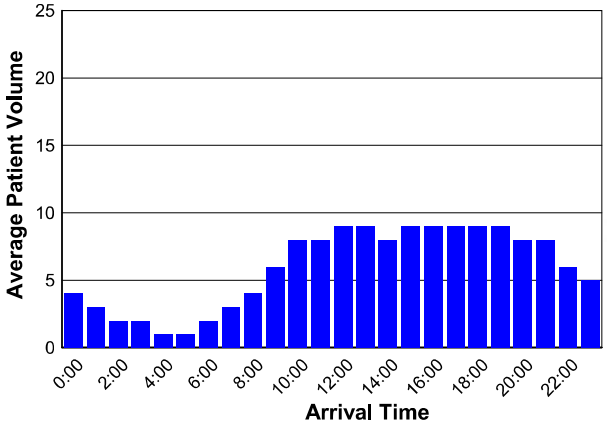
Advanced Practice Practitioners



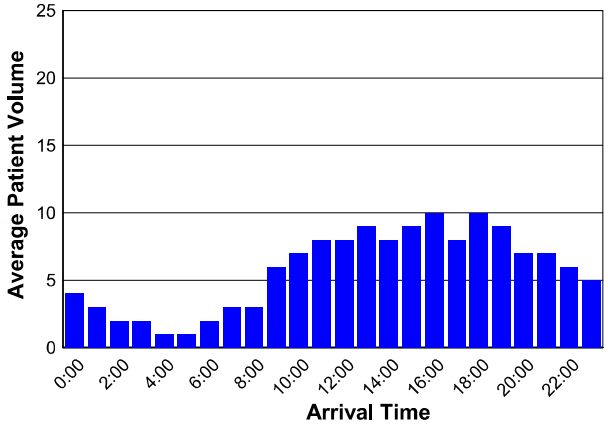
Elevate the Bottleneck

Increase physician hours

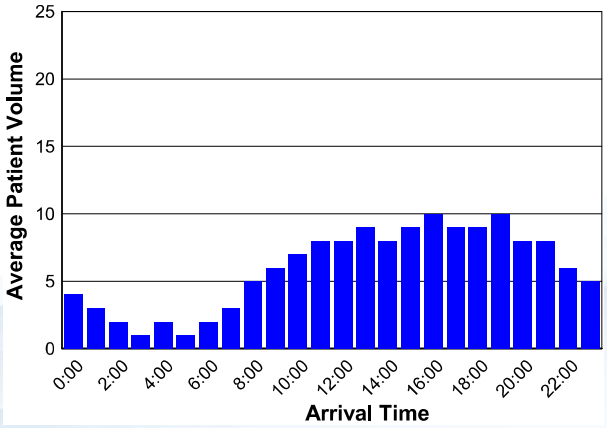




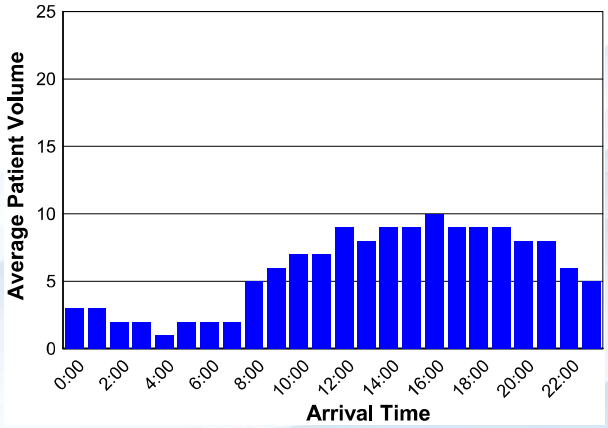
January – October, 2008



January, 2008



May, 2008



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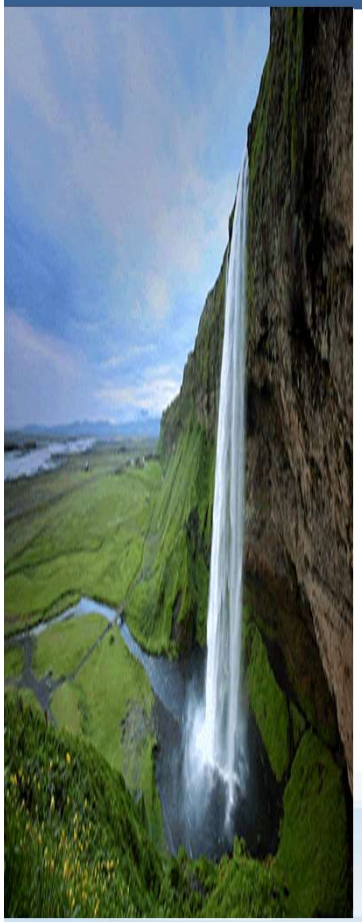
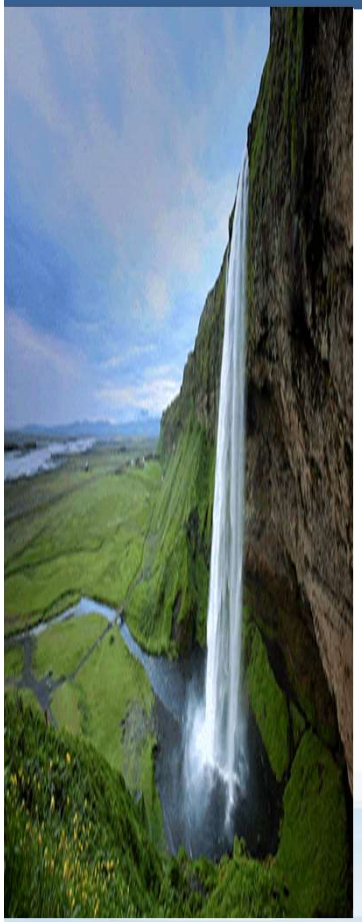


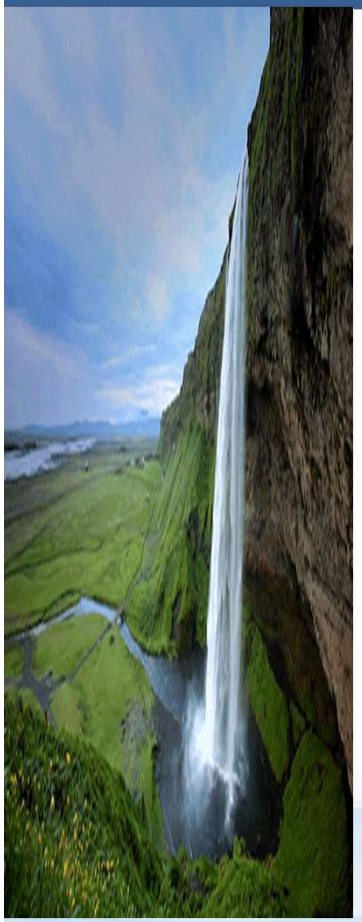
Does It Work?



Bottleneck – Smashed!

	4/09-3/10	4/08-3/09	Change
Average monthly ambulance diversion (hours)	0.27 h	60 h	99.6% decrease
Total ED visits (excluding trauma, pediatrics, ACU visits)	26,698	22,366	19.5 % increase
Total ED ambulance visits	9530	9228	3.3% increase
Total ED admissions	7035	6707	4.9% increase
LWBS	2.5%	3.9%	38% decrease
Actual Inpatient LOS	5.40 days	5.68 days	6.7 hour decrease
CMS expected LOS (adjusted for acuity)	5.44 days	5.46 days	No change in acuity
ED inpatient boarding time			60 minute decrease

Strear, C., et al. ” Applying the Theory of Constraints to Emergency Department Workflow: Reducing Ambulance Diversion Through Basic Business Practice." *Annals of Emergency Medicine* 56.3 (2010): S11.



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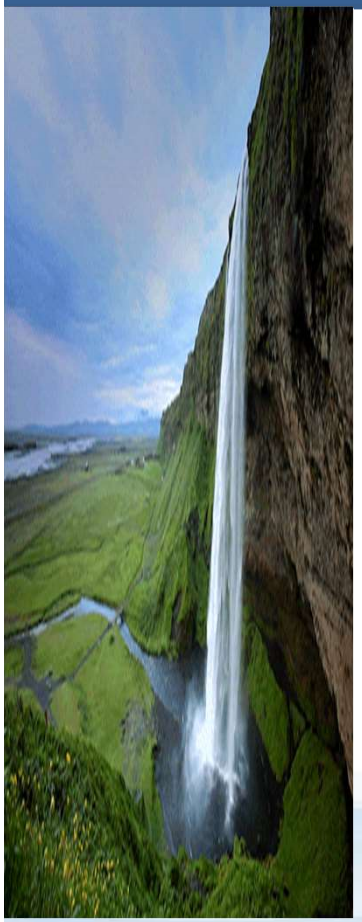

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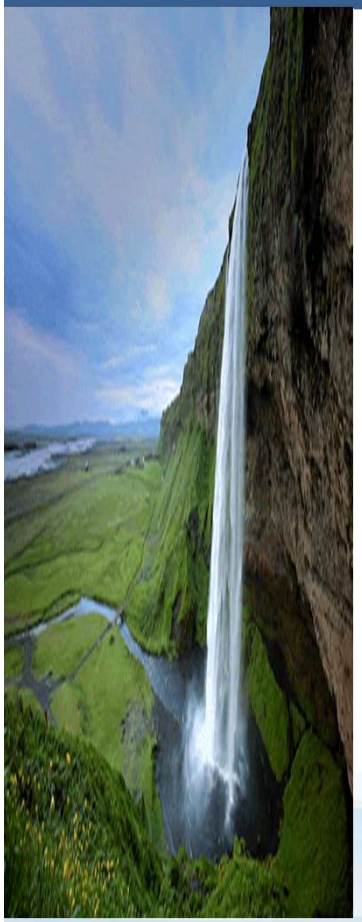

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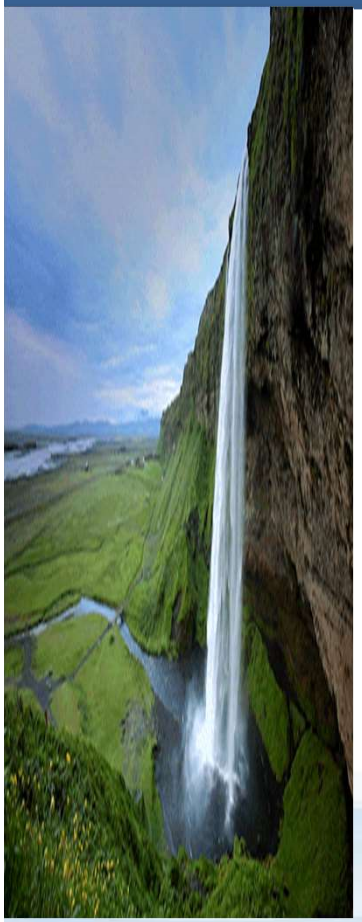

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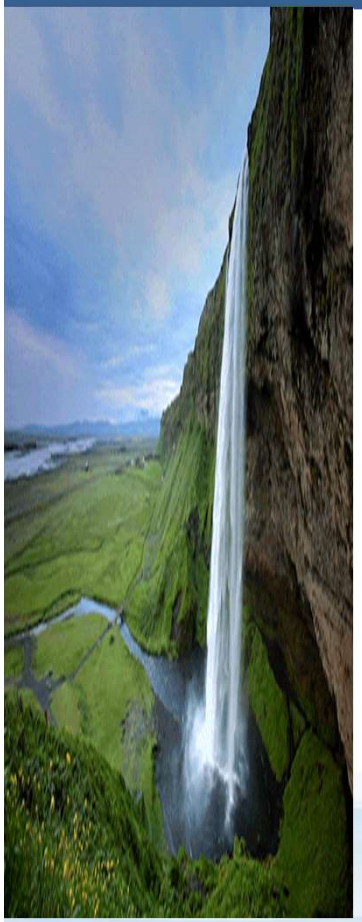

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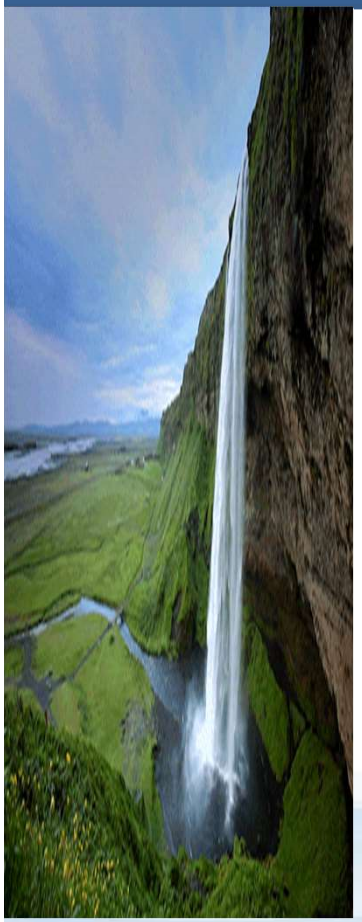
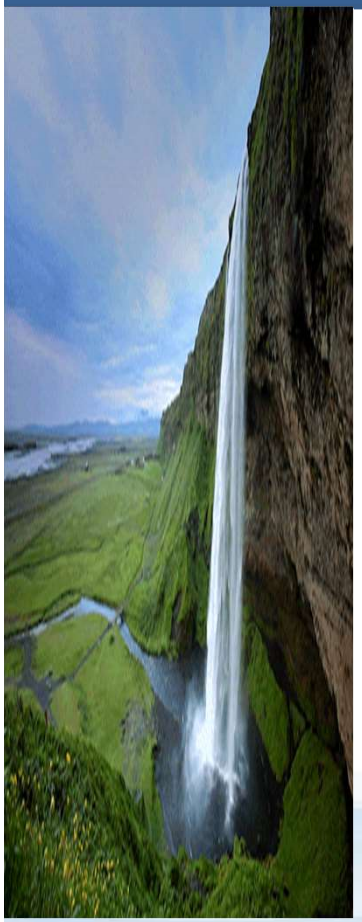


If the Bottleneck Is Broken

Return to Step 1



	4/08-3/09
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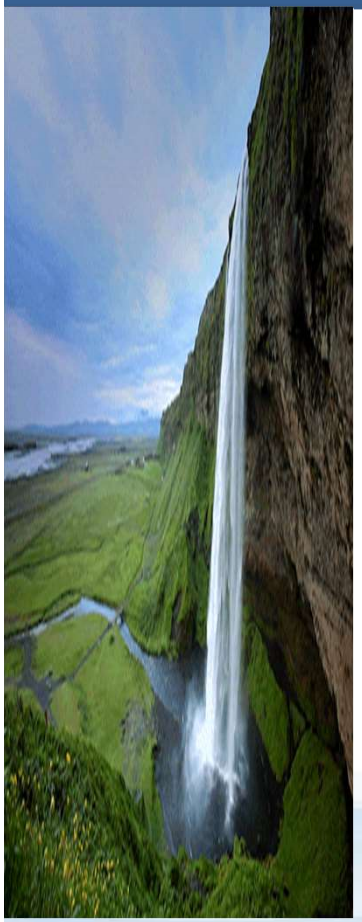
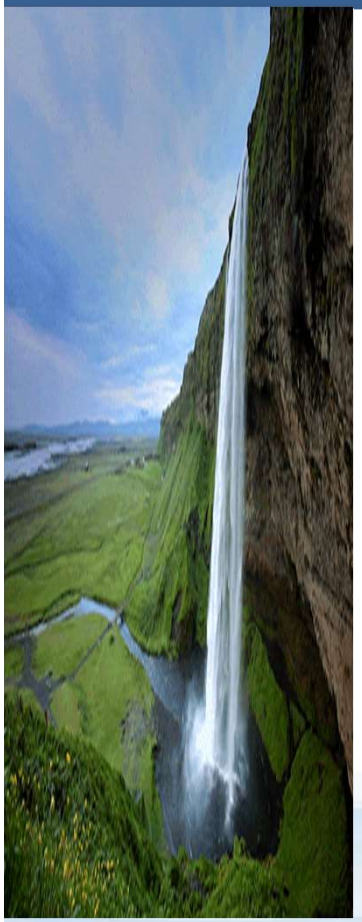
ED visits (exclu pedi isits)	22,366
	%
Actual ent LOS	5.68 days
CMS expected LOS (adjusted for acuity)	5.46 days

Average monthly ambulance diversion (hours) 60.52 h

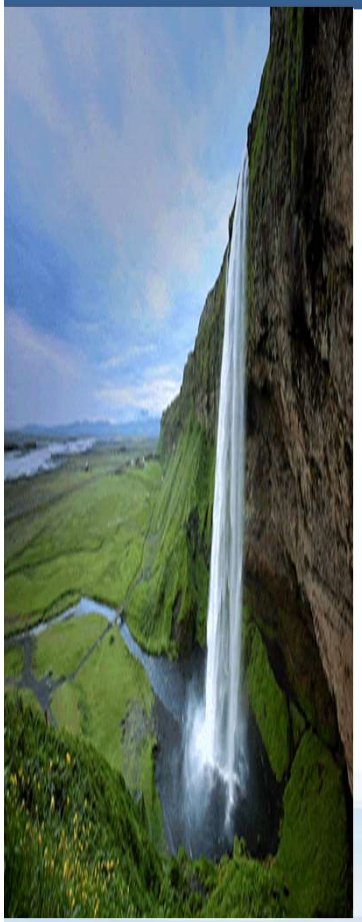
2016

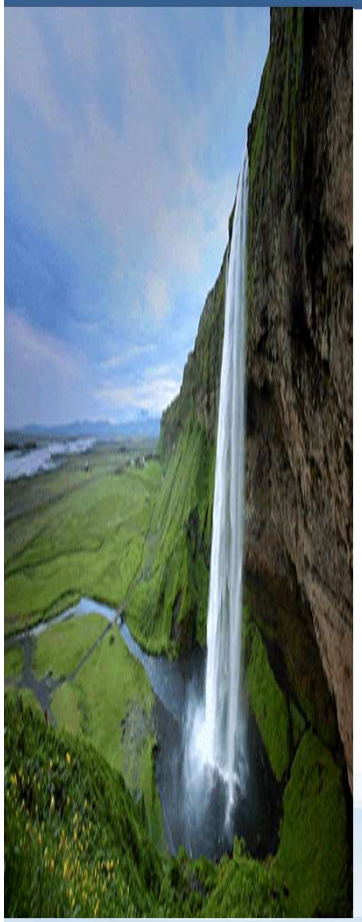


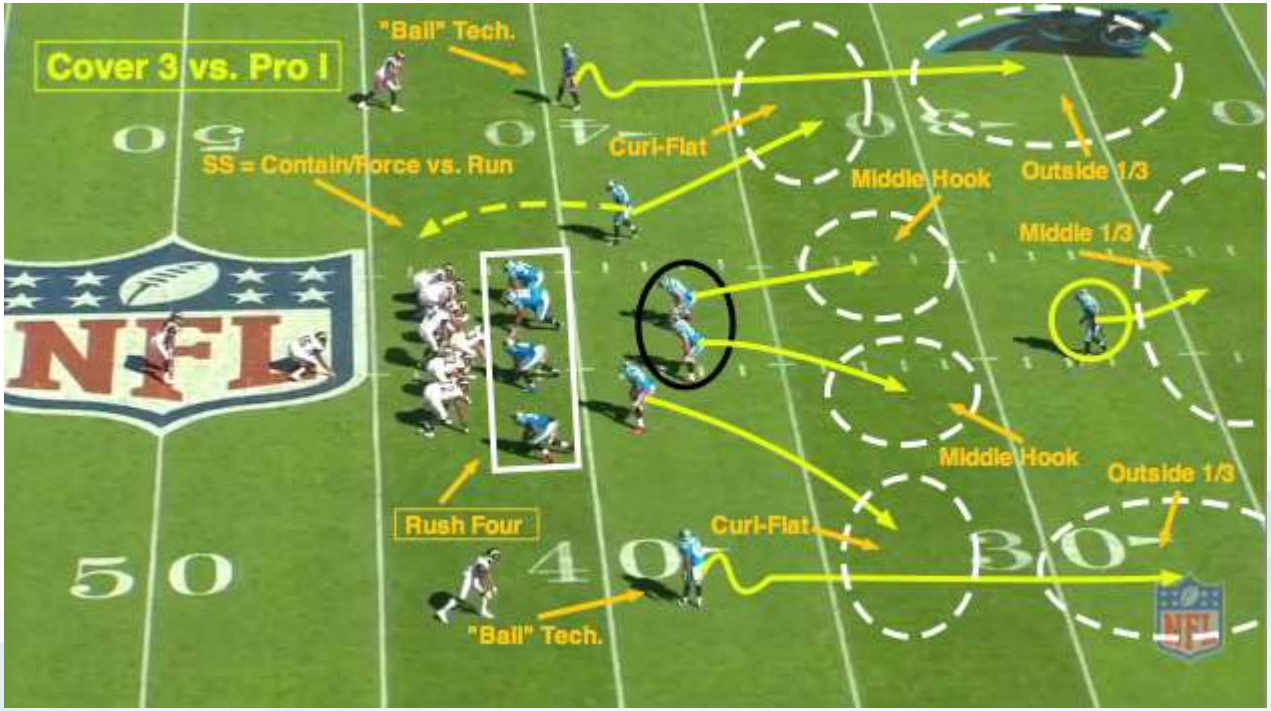
Bottleneck
vs
Constraint

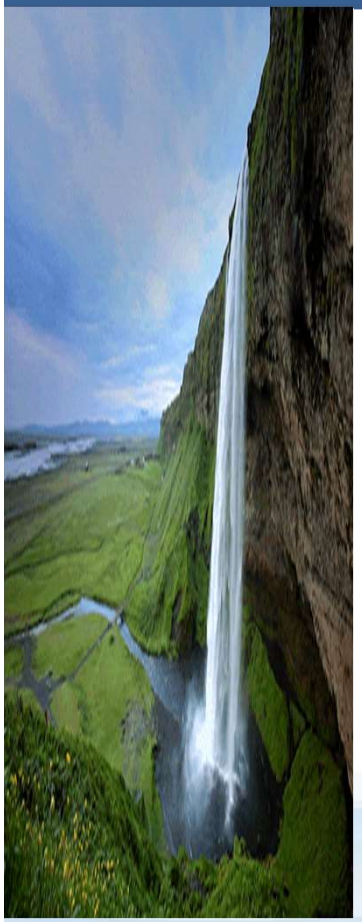


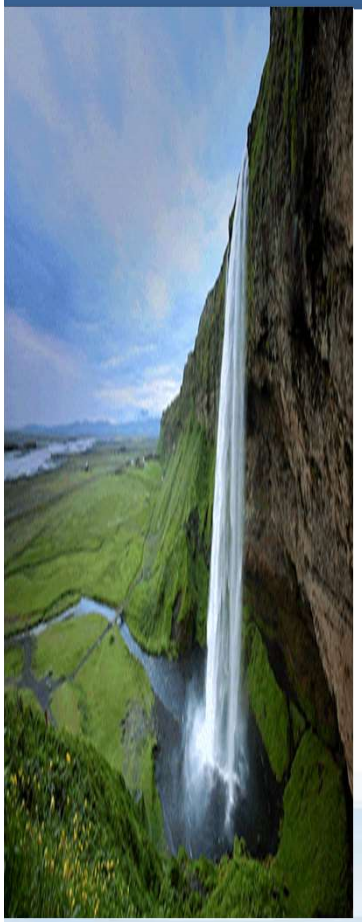
Defense vs Offense

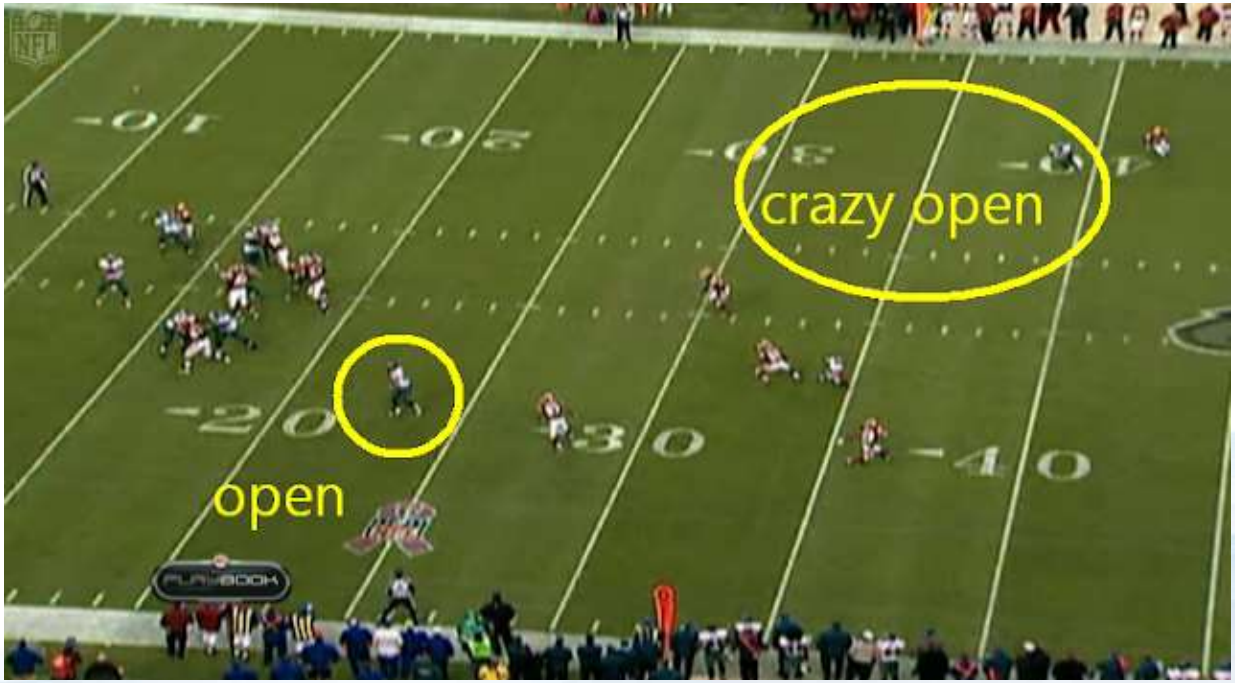


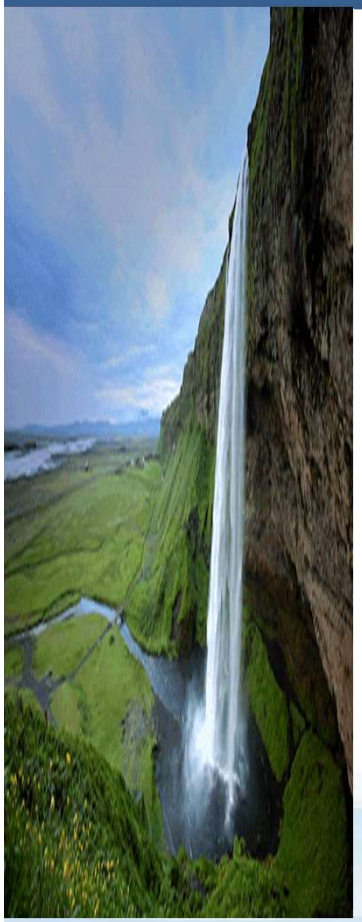


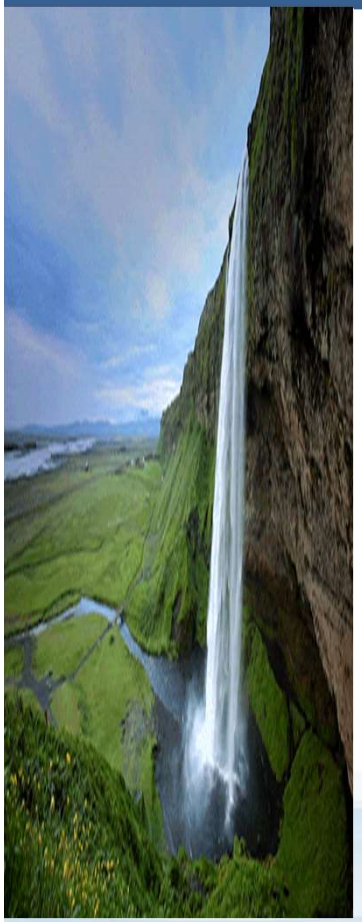












Constraint Management

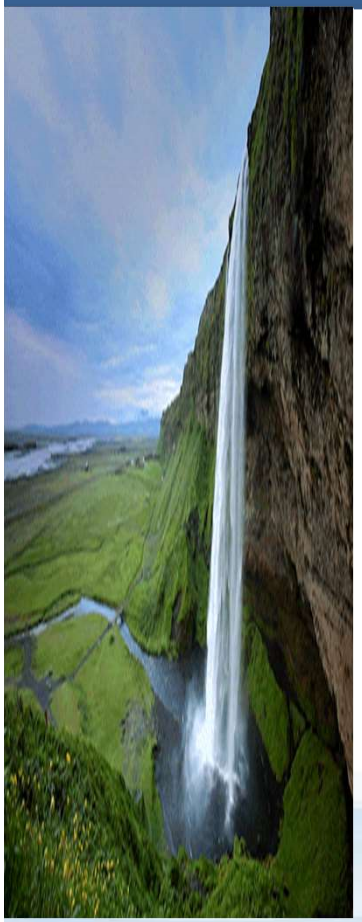
Identify the Constraint

Exploit the Constraint

Subordinate to the Constraint

Elevate the Constraint

Return to Step 1



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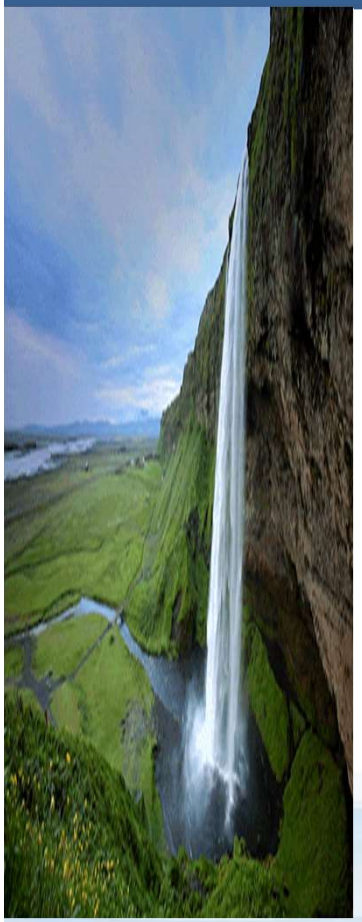

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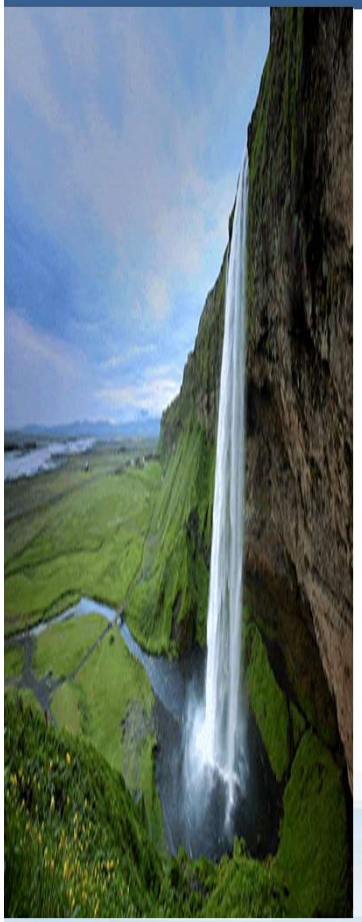

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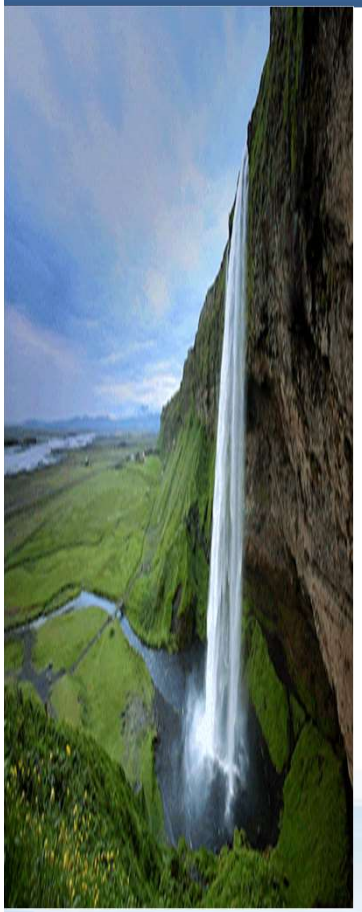
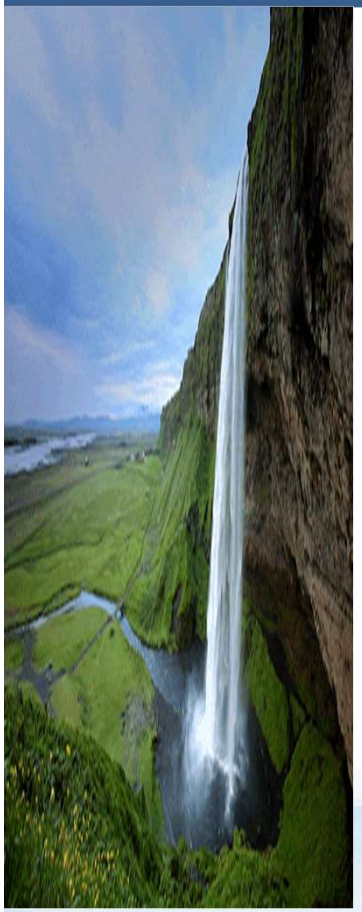


Exploit the Constraint

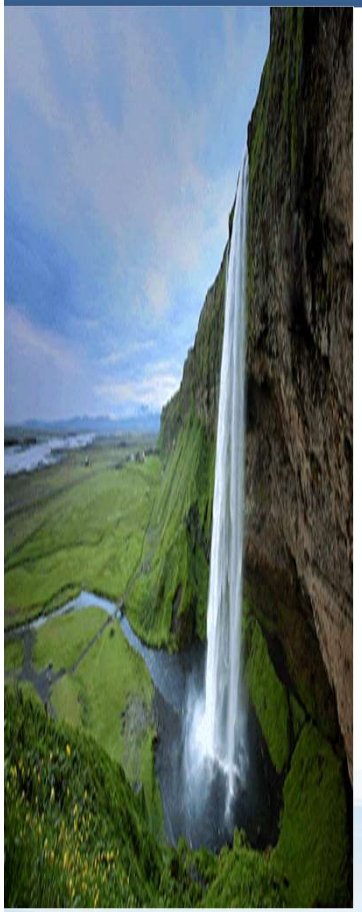
No down time on the constraint



Exploit the Constraint

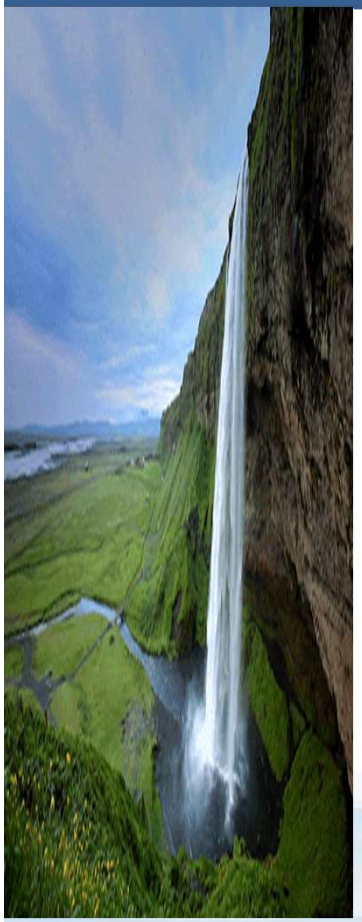
Sloth

From The Seven Deadly Sins and the Four Last Things. Attributed to Hieronymus Bosch and completed around 1500.



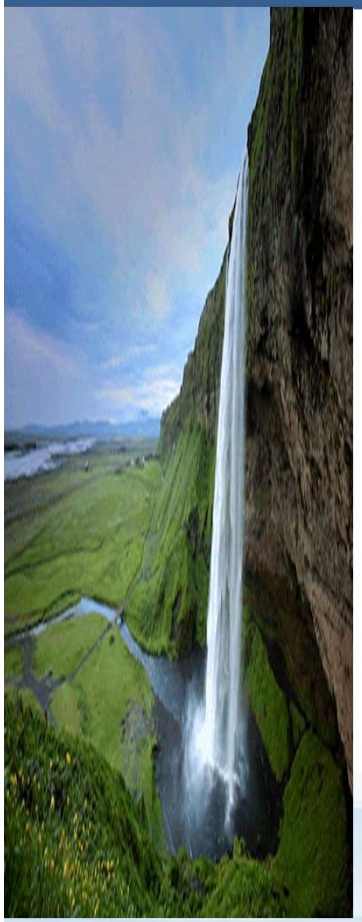
Exploit the Constraint

Don’t run out of work

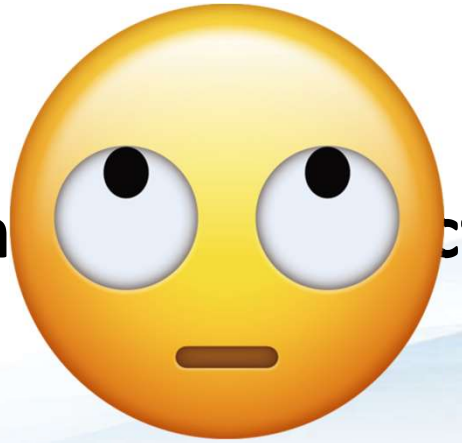


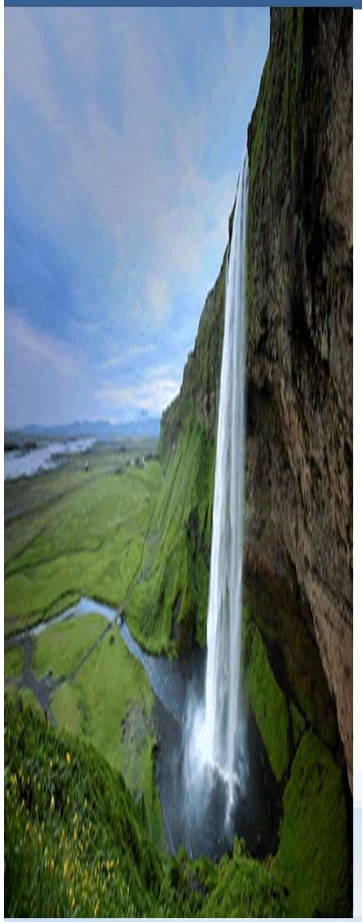
Exploit the Constraint

No non-constraint activities



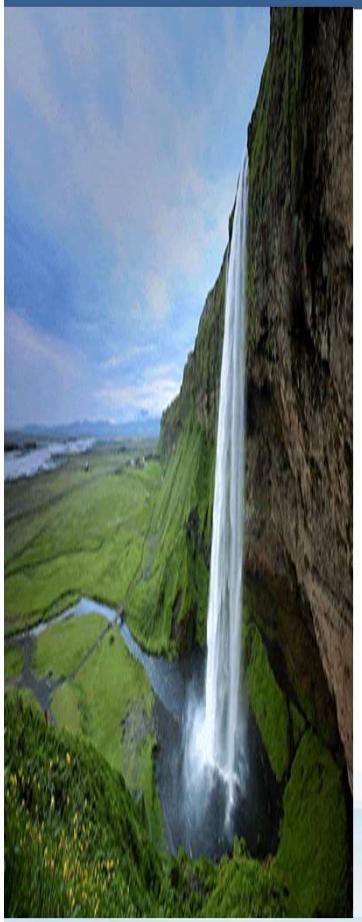
Exploit the Constraint

No non  **ctivities**

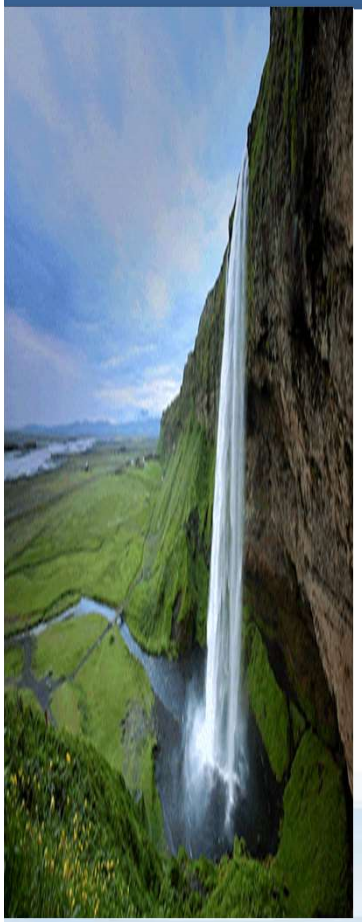


Exploit the Constraint

No non-value add activities



Subordinate to the Constraint



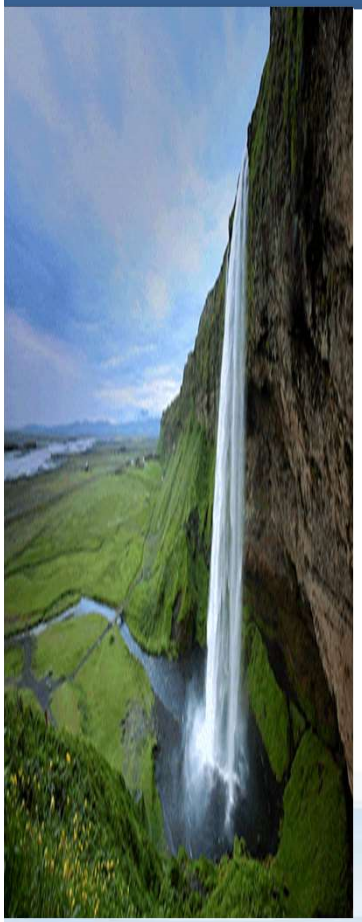
Subordinate to the Constraint

Full Kit

Value Stream Mapping

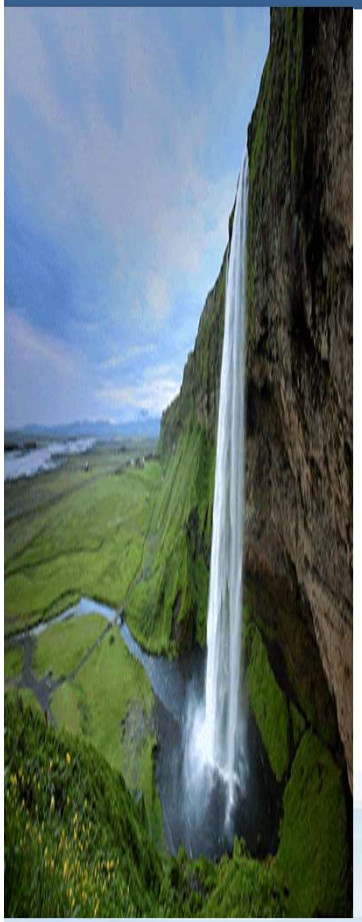
Drum-Buffer-Rope

Buffer Management



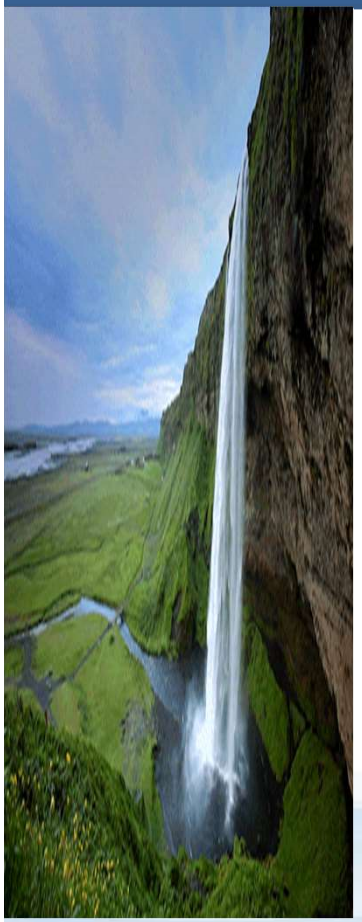
Full Kit

Minimize constraint touch points



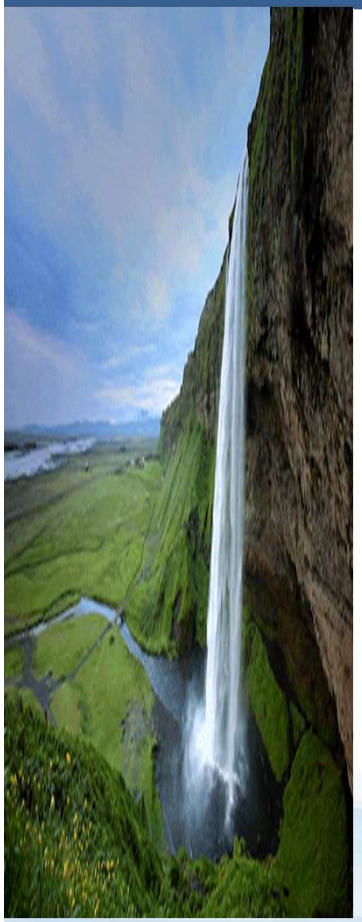
Full Kit

Equipment, Forms, Telephone Calls



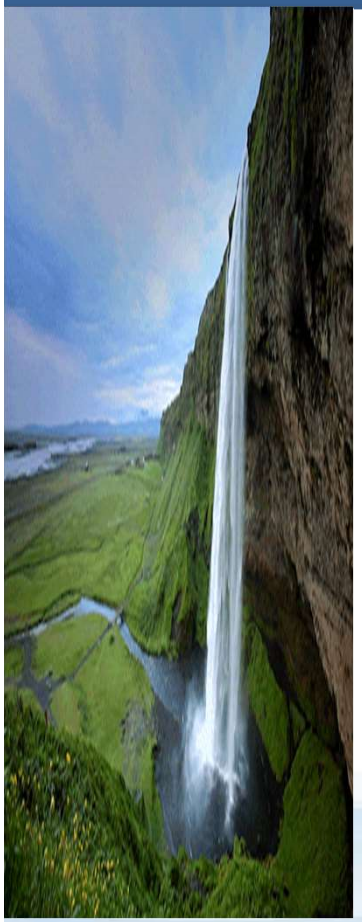
Full Kit

Nurse Initiated Order Sets (NIOS)



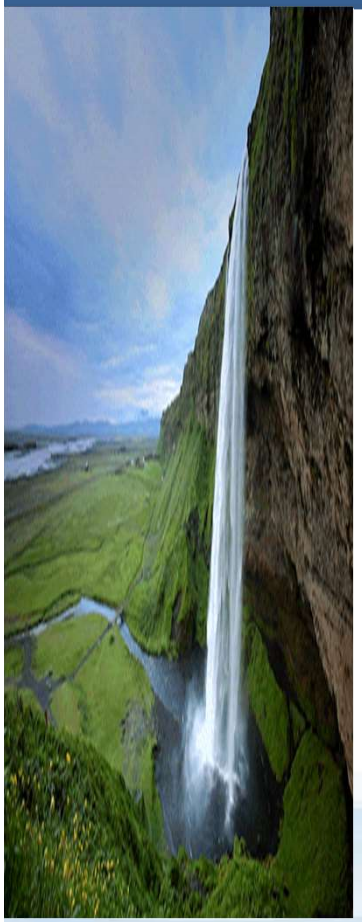
Full Kit

Utilize waiting times



Value Stream Mapping

Minimize constraint activities that do not add value *from the patient's perspective*



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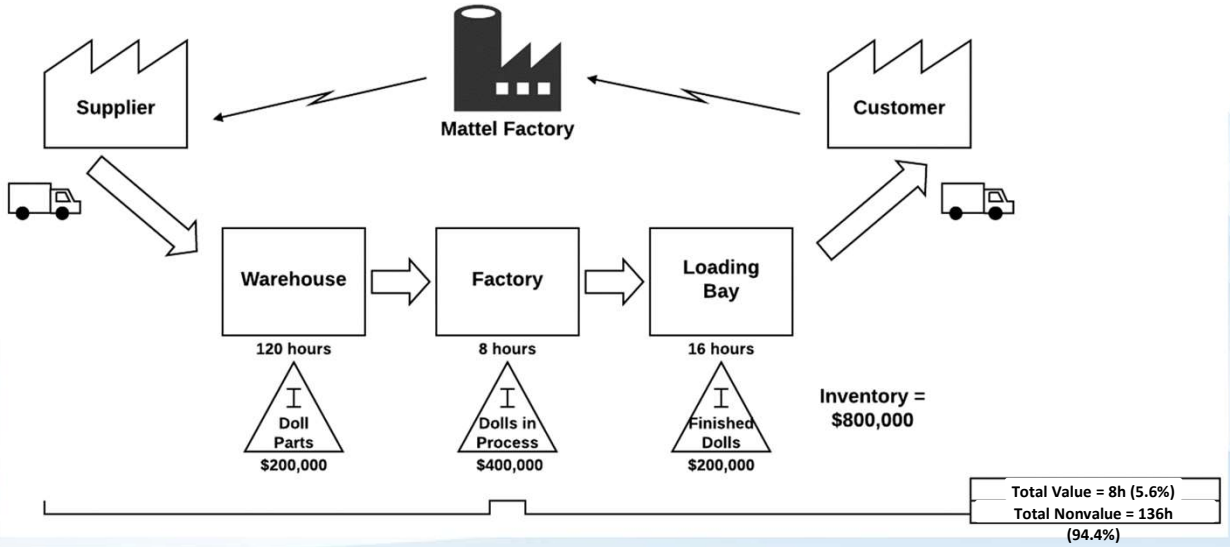

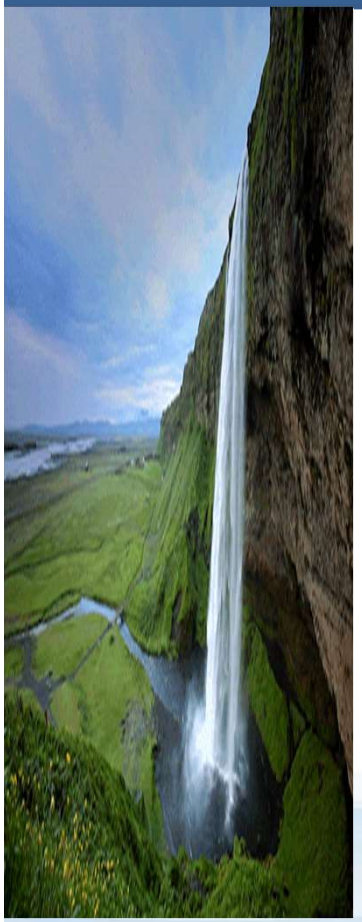

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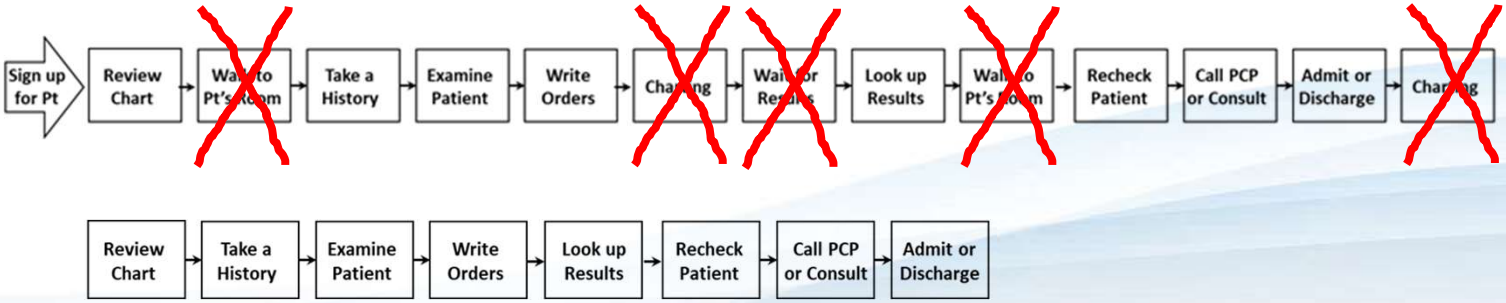
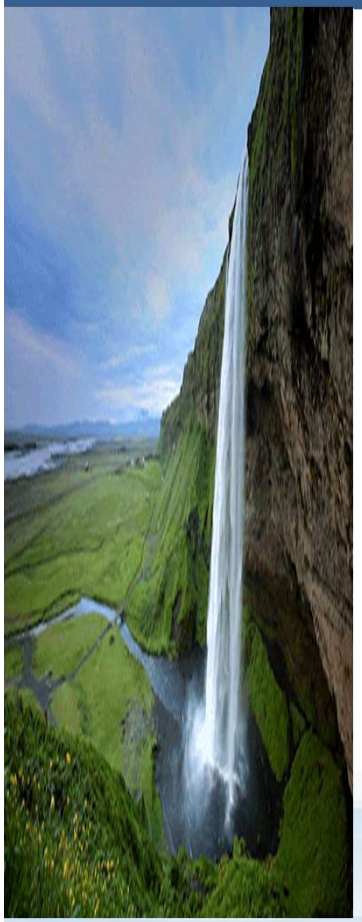
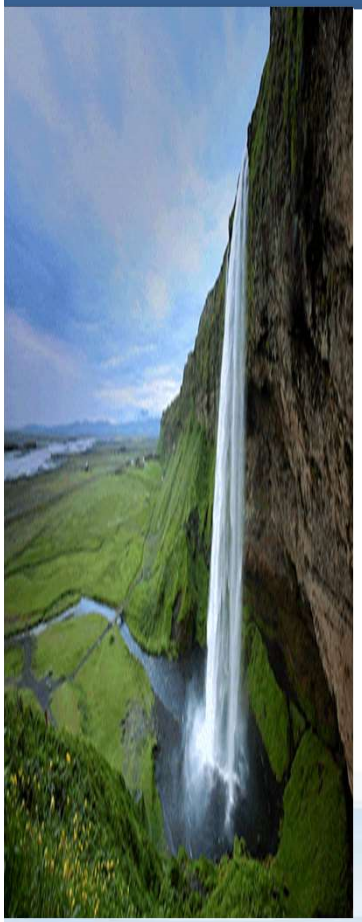




Drum-Buffer-Rope



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Epicare CHRISTOPHER S. «Search»

ED Track Board (EM ED)

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1 0 Billy (Paramedic Student) 35304

Expected | My + Unassigned ED | All Patients | MAIN (20) | My Patients | WR | More Views

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14							Chest Pain	2	05:13	YOLAND...	ANF			resident		[6/6/6]	[2/3]		A..	Y
23	M)						Back Pain	3	05:03	ALENA R	ANF			4508		[5/7/7]	[0/2]		A..	Y
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SW-C							Letter for School/Work	5	02:02	BENJAM...		CD	D...	SW approp						Y
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27							Ingestion	2	01:32		AMN					[4/5/5]				N
19							Alcohol withdrawal	2	00:43		ANF					[4/8/8]	[0/1]			N
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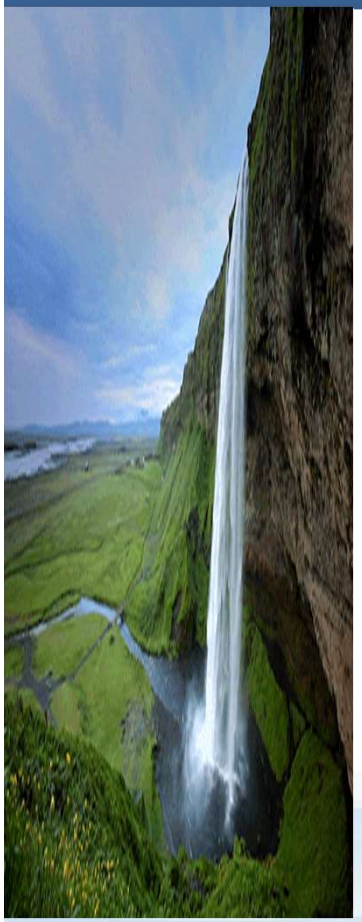

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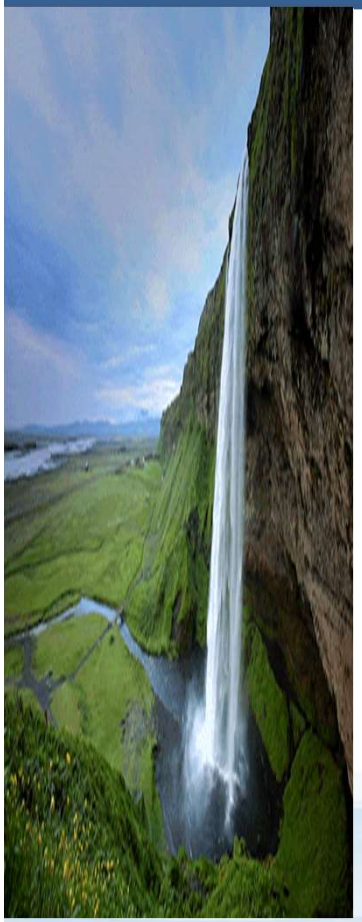
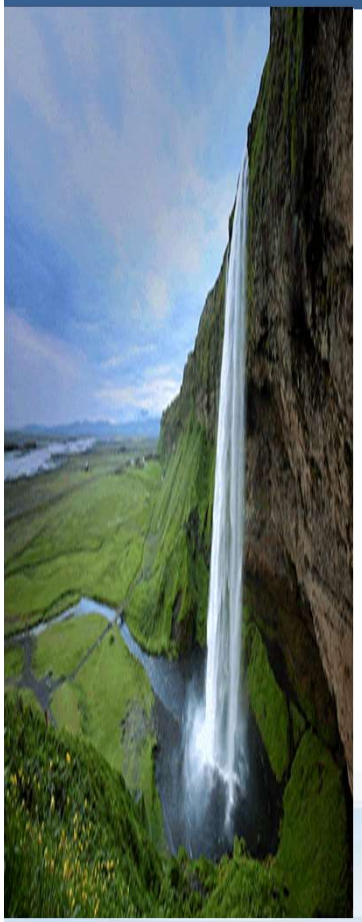


Pull Till Full

ED flow orthodoxy

2020 TOCICO Virtual Conference



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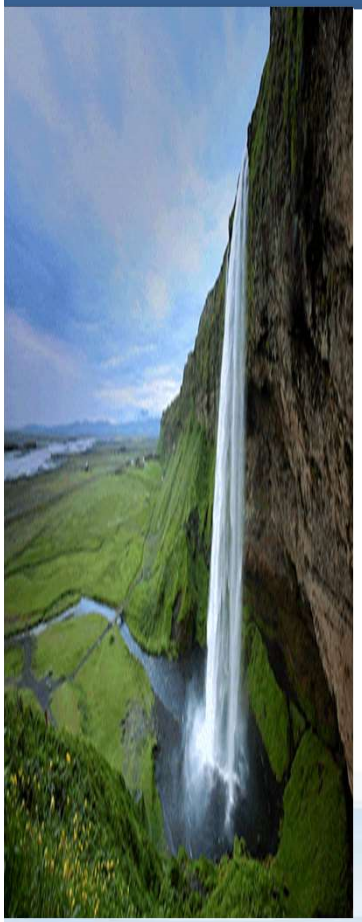
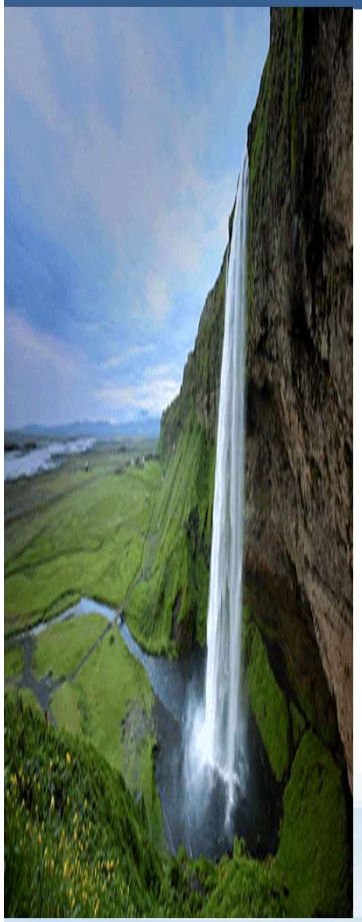


Pull Till Full

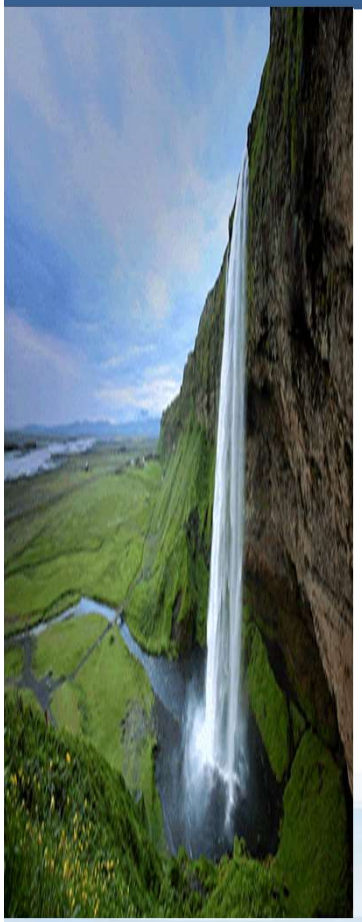
PITFALLS



Pull Till Full

Multitasking/Task switching

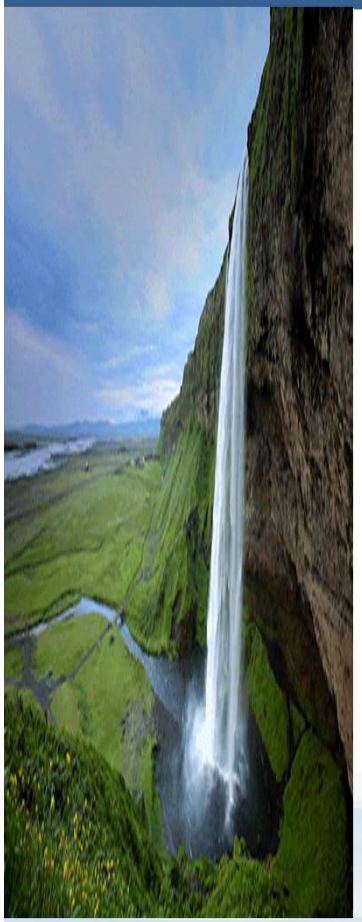
PITFALLS



Pull Till Full

Leapfrogging

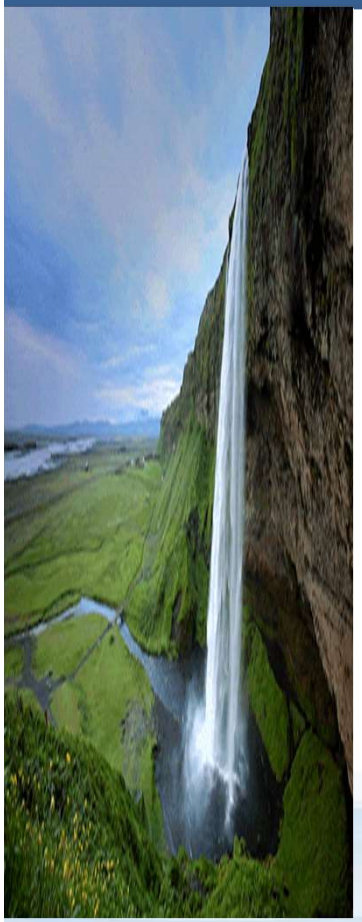
PITFALLS



Pull Till Full

No full kit

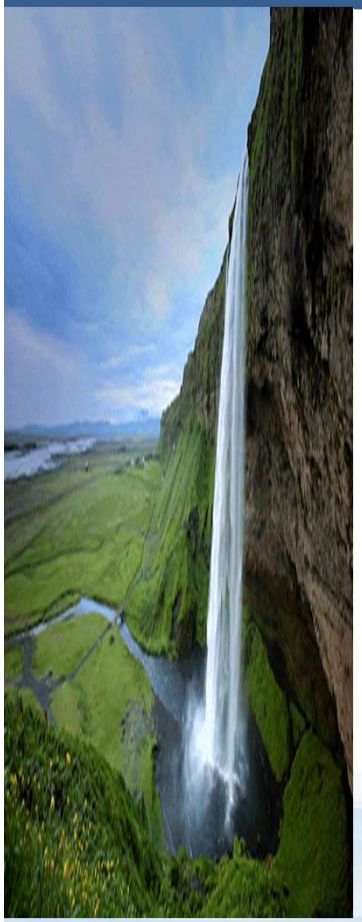
PITFALLS



Pull Till Full

Overwhelmed constraint vs Idle constraint

the lesser of two evils



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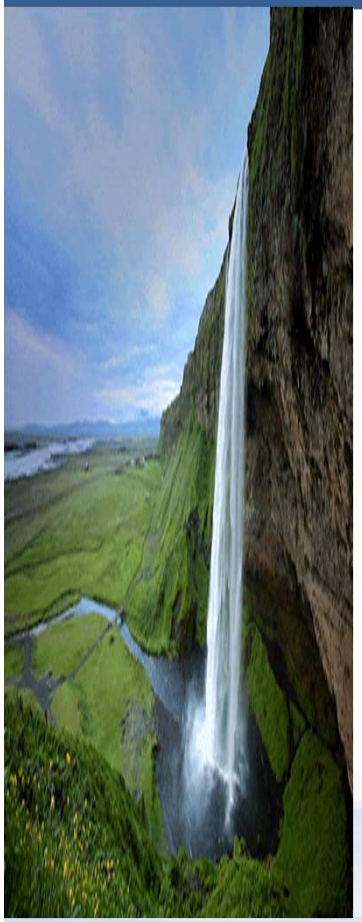
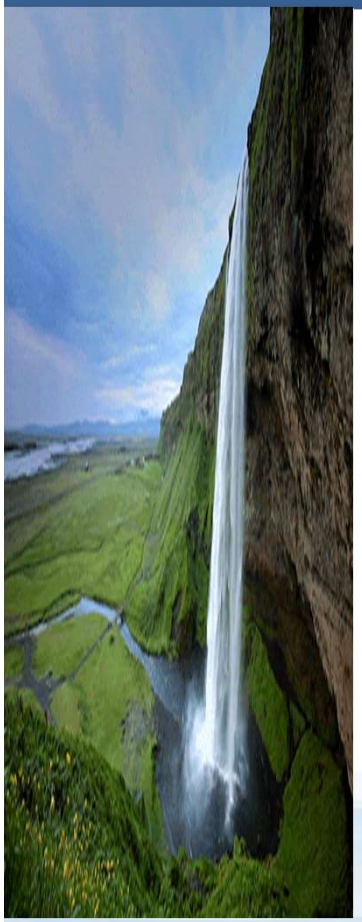
ED flow orthodoxy

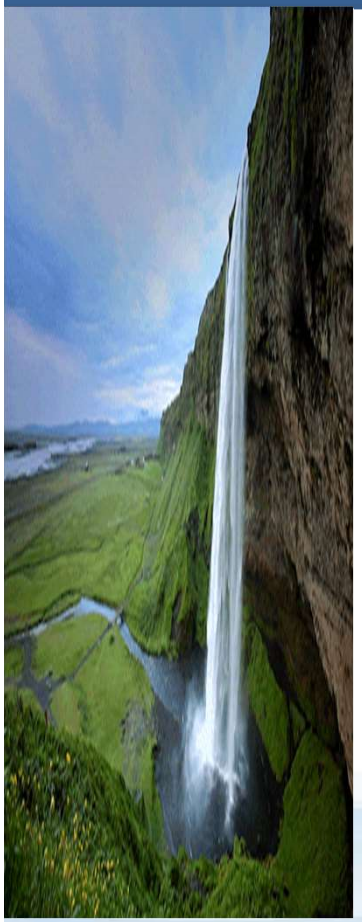


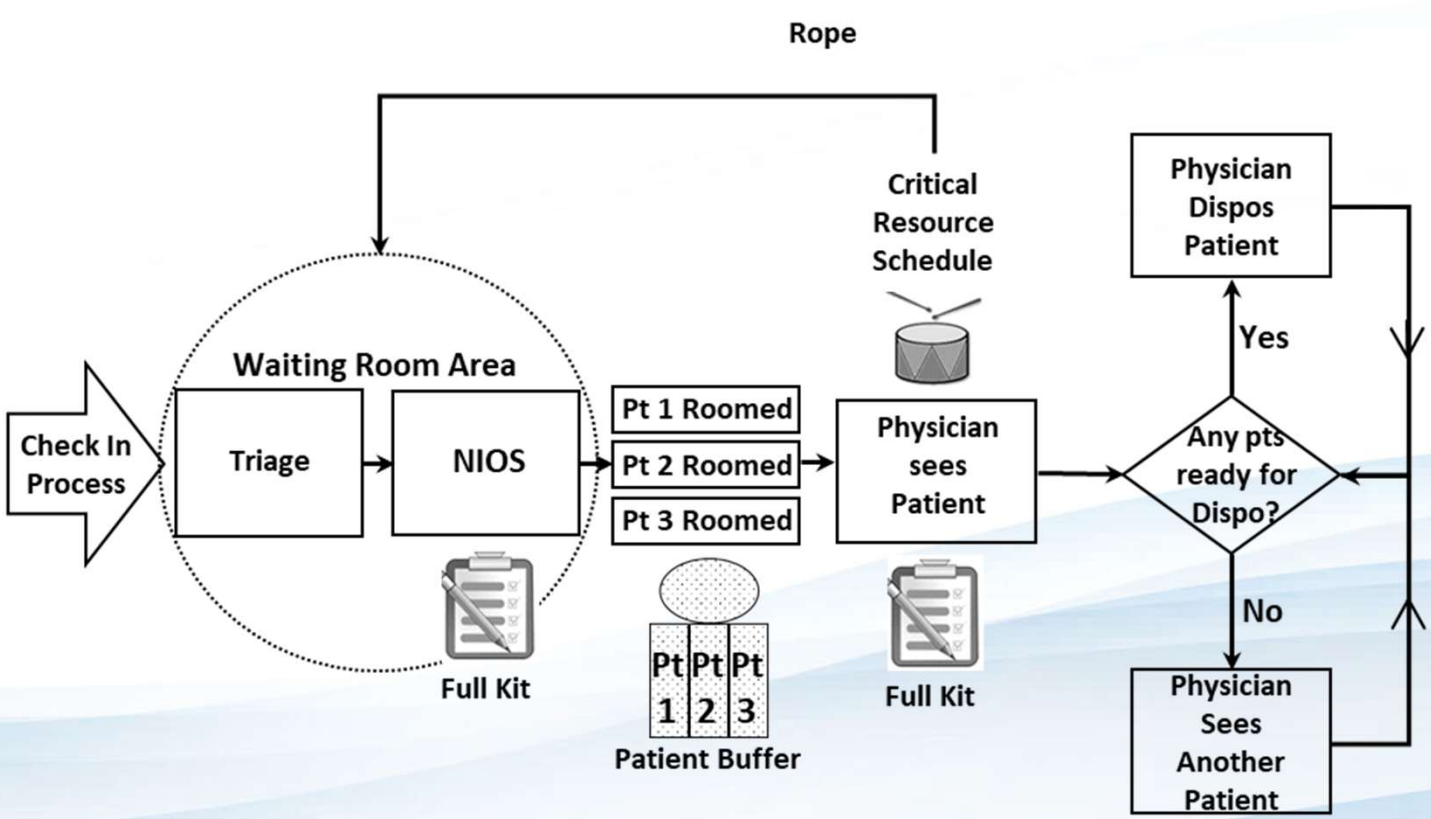
Pull Till Full

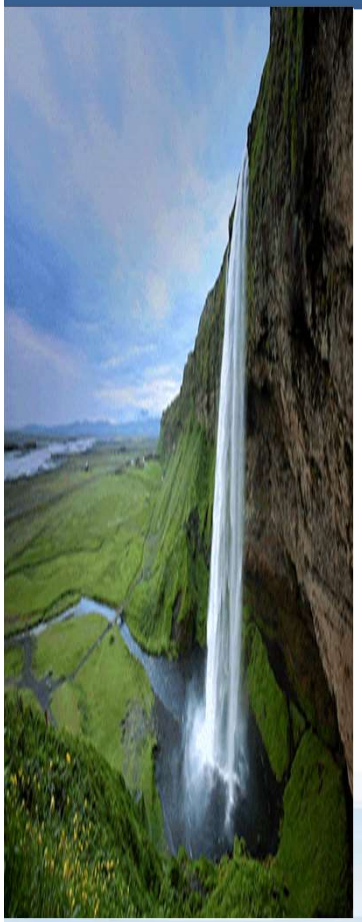
Let’s challenge the orthodoxy!

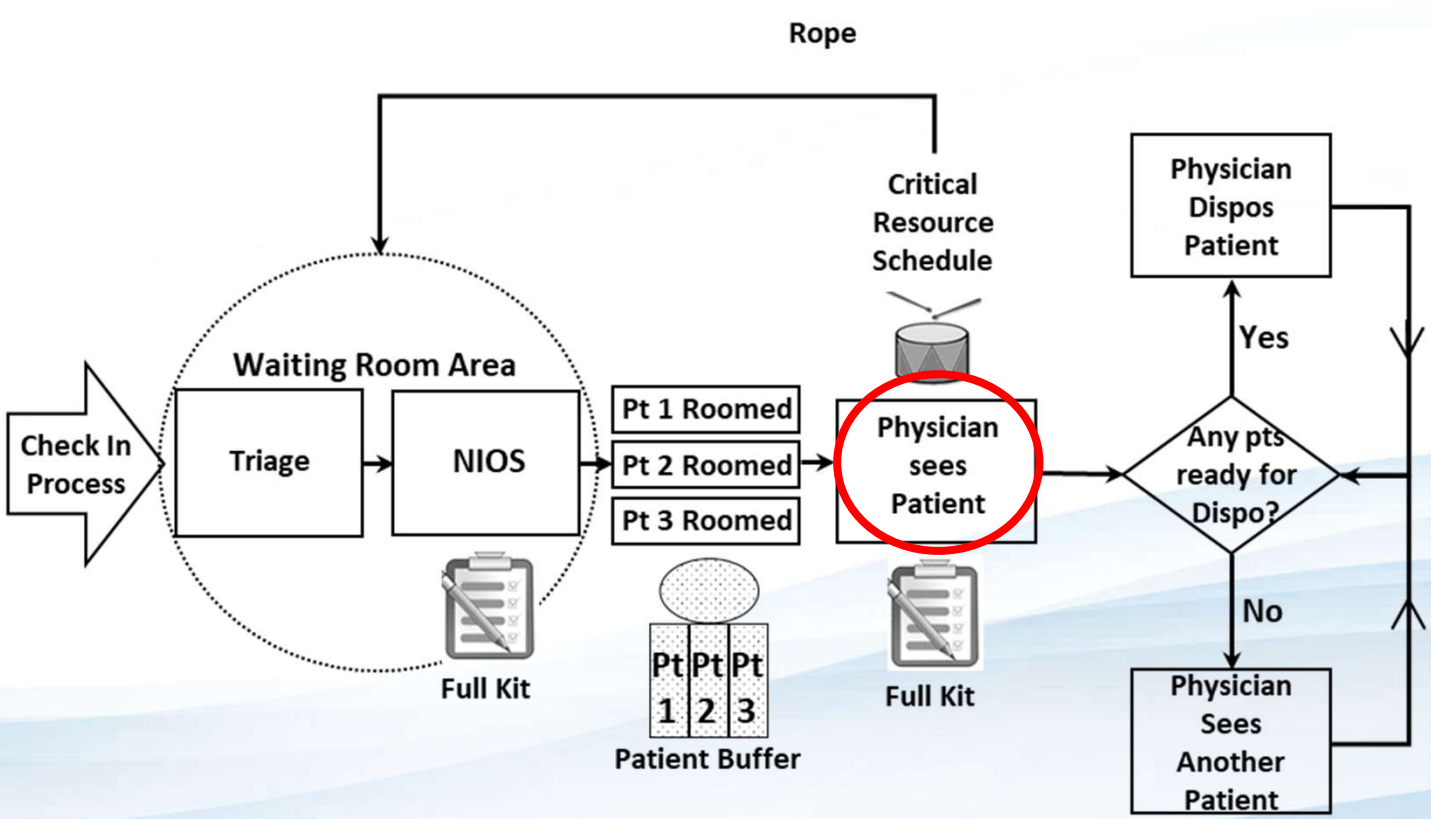


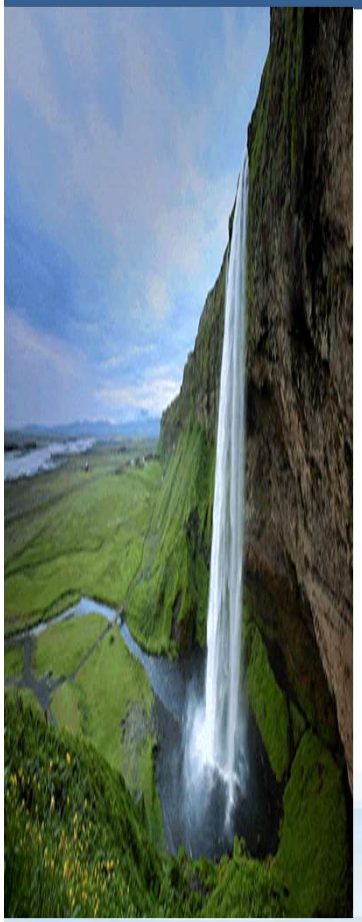
DBR in the Emergency Department

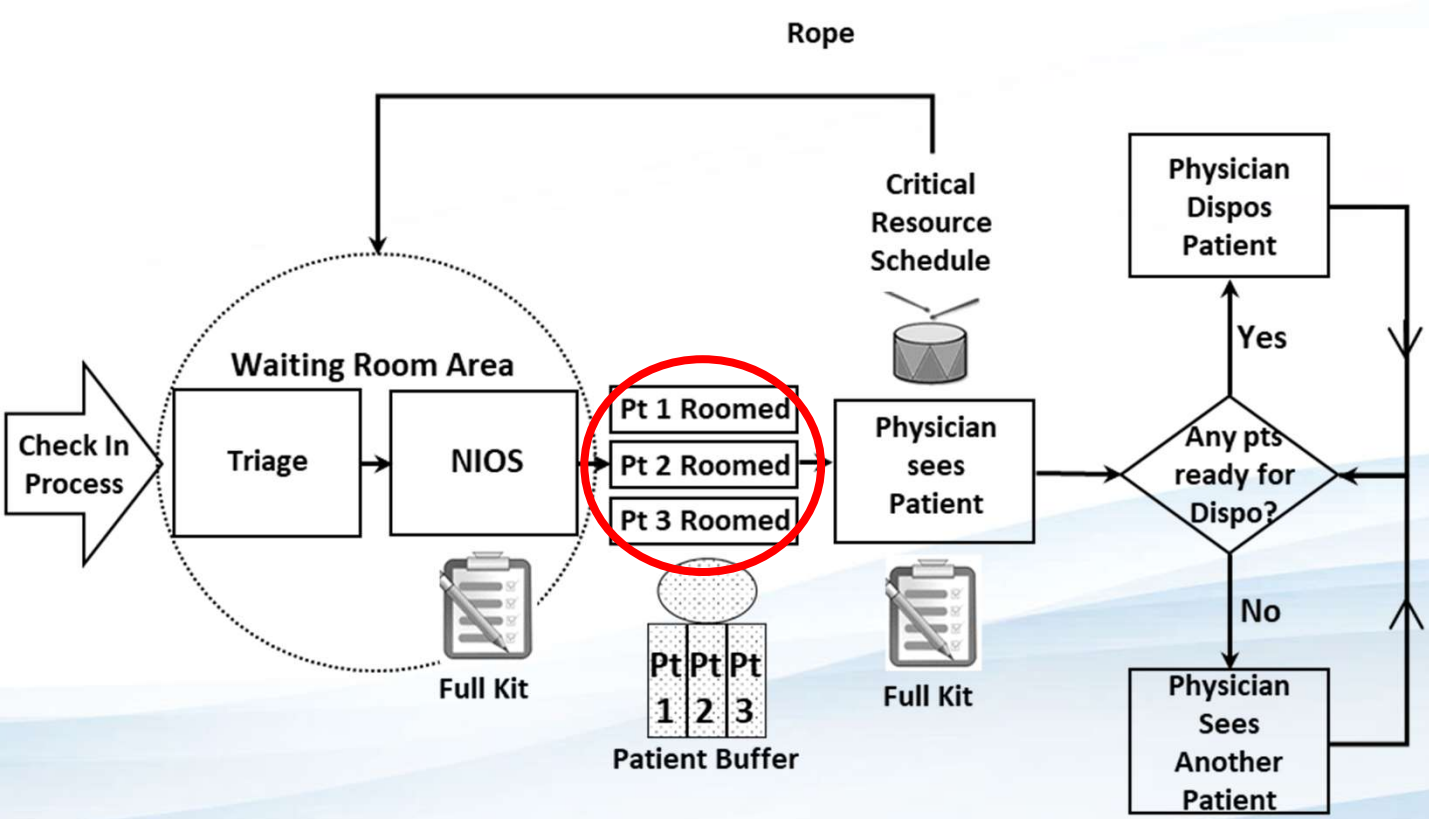


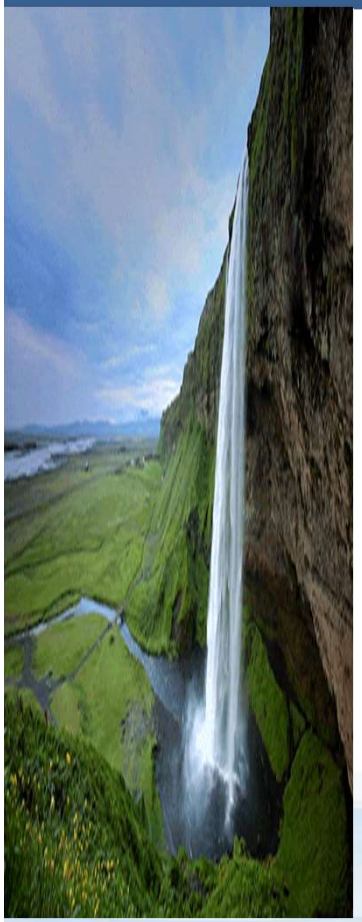


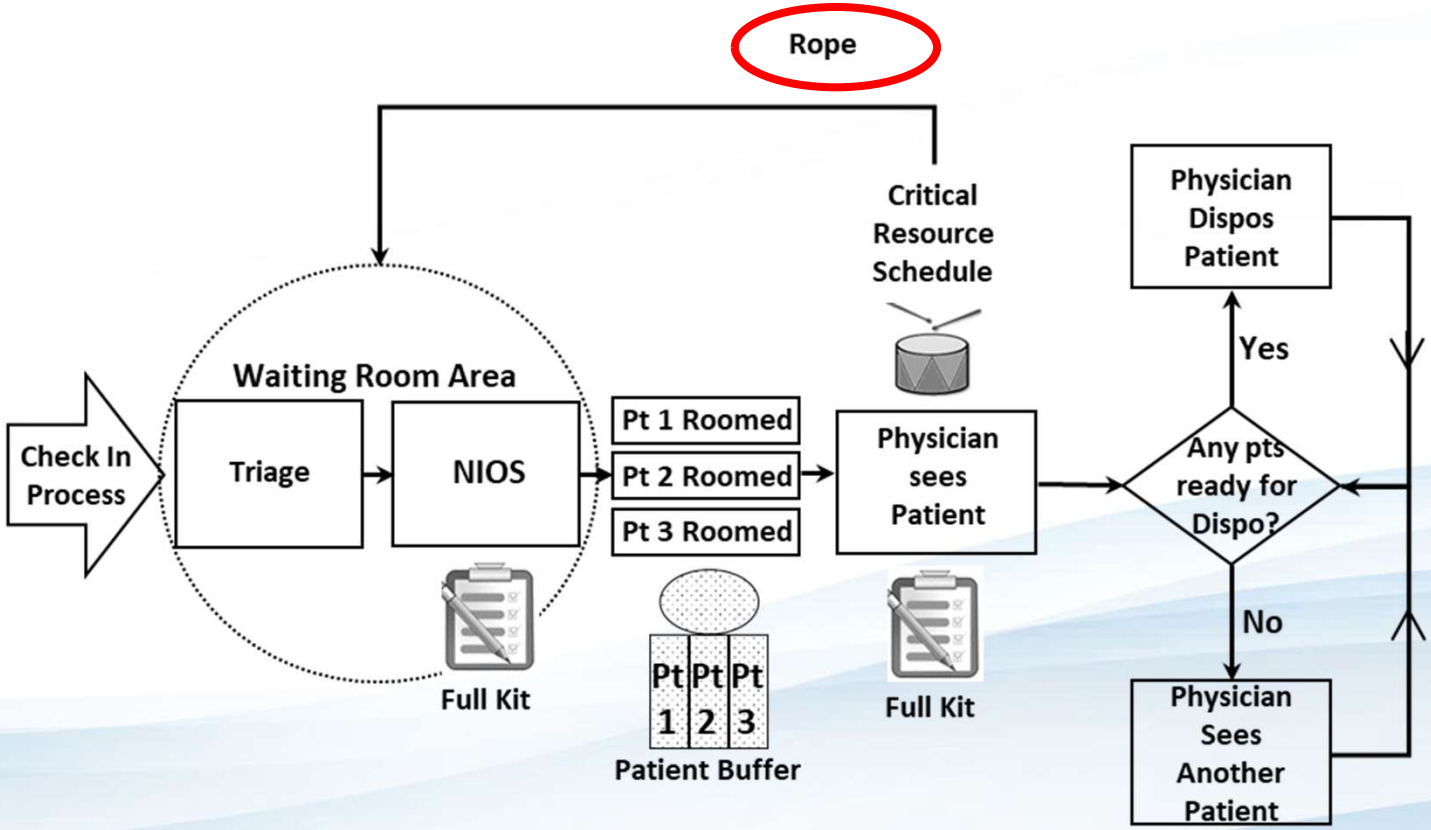


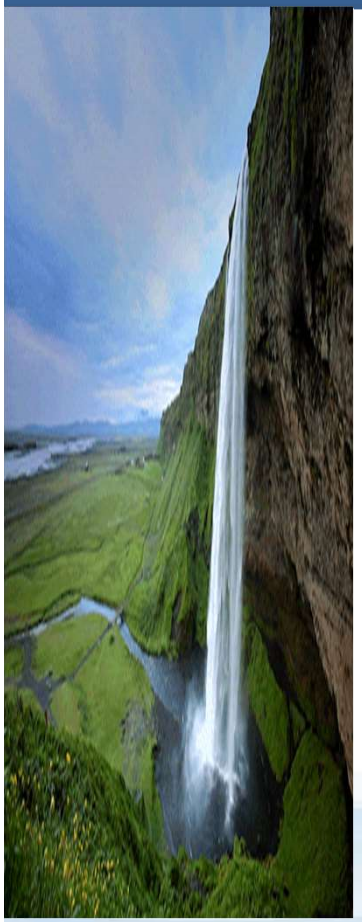


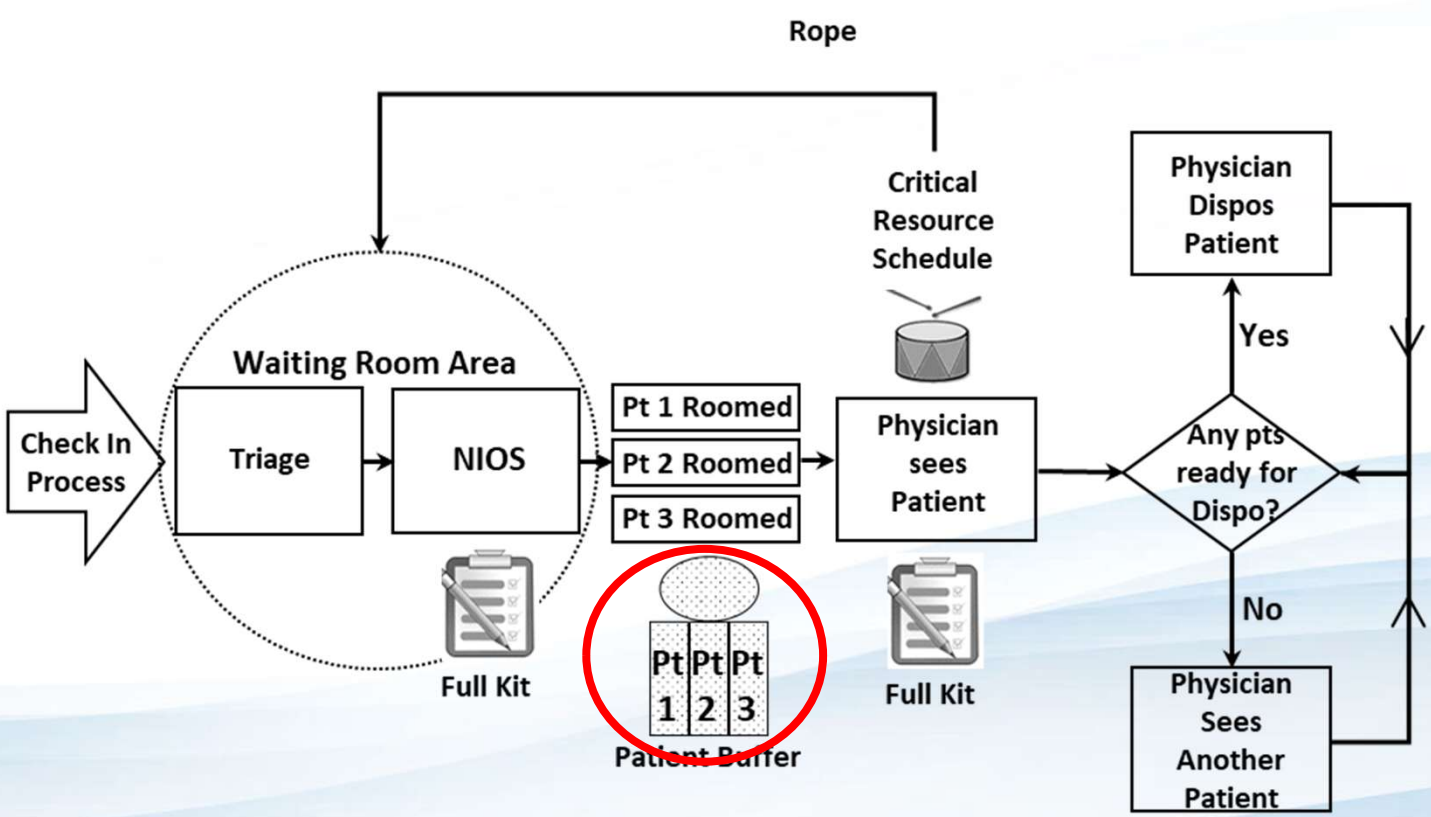


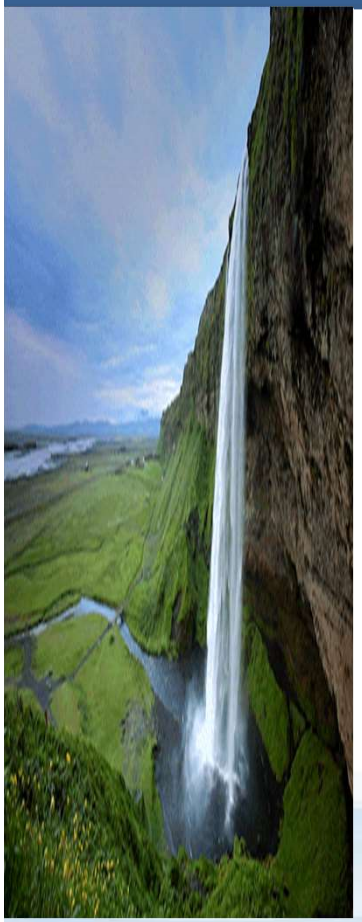


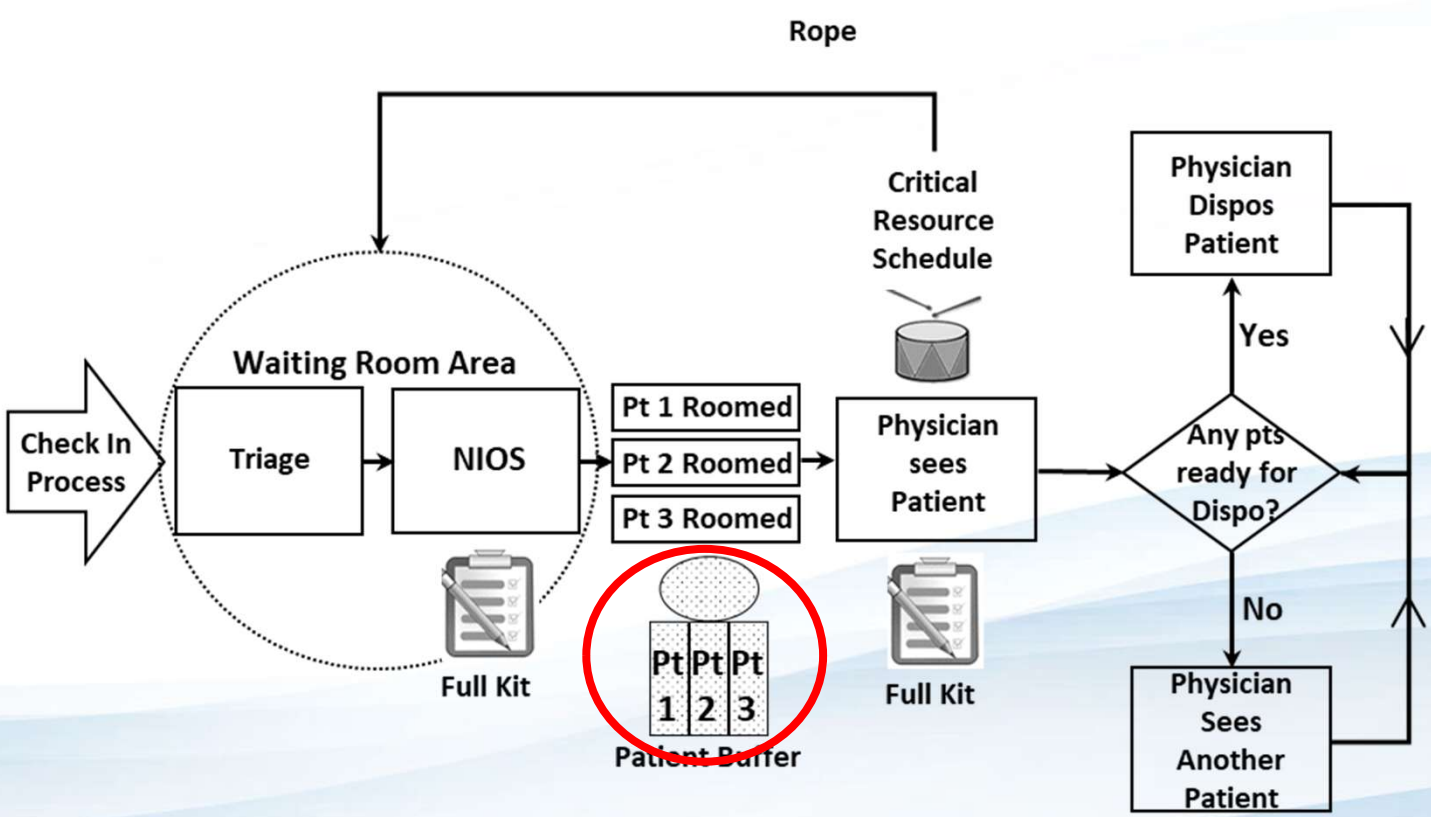


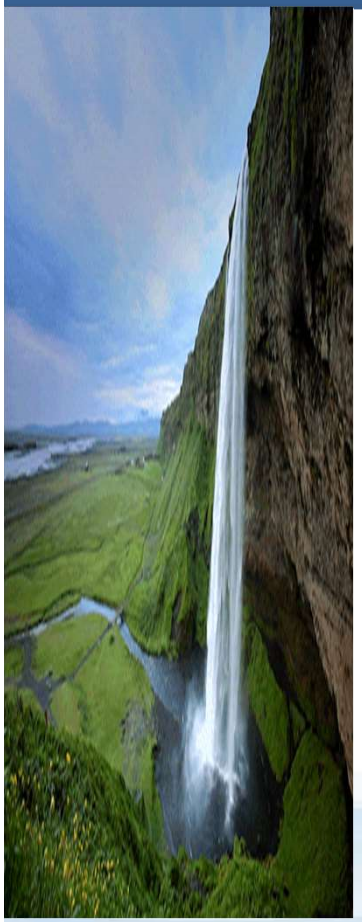


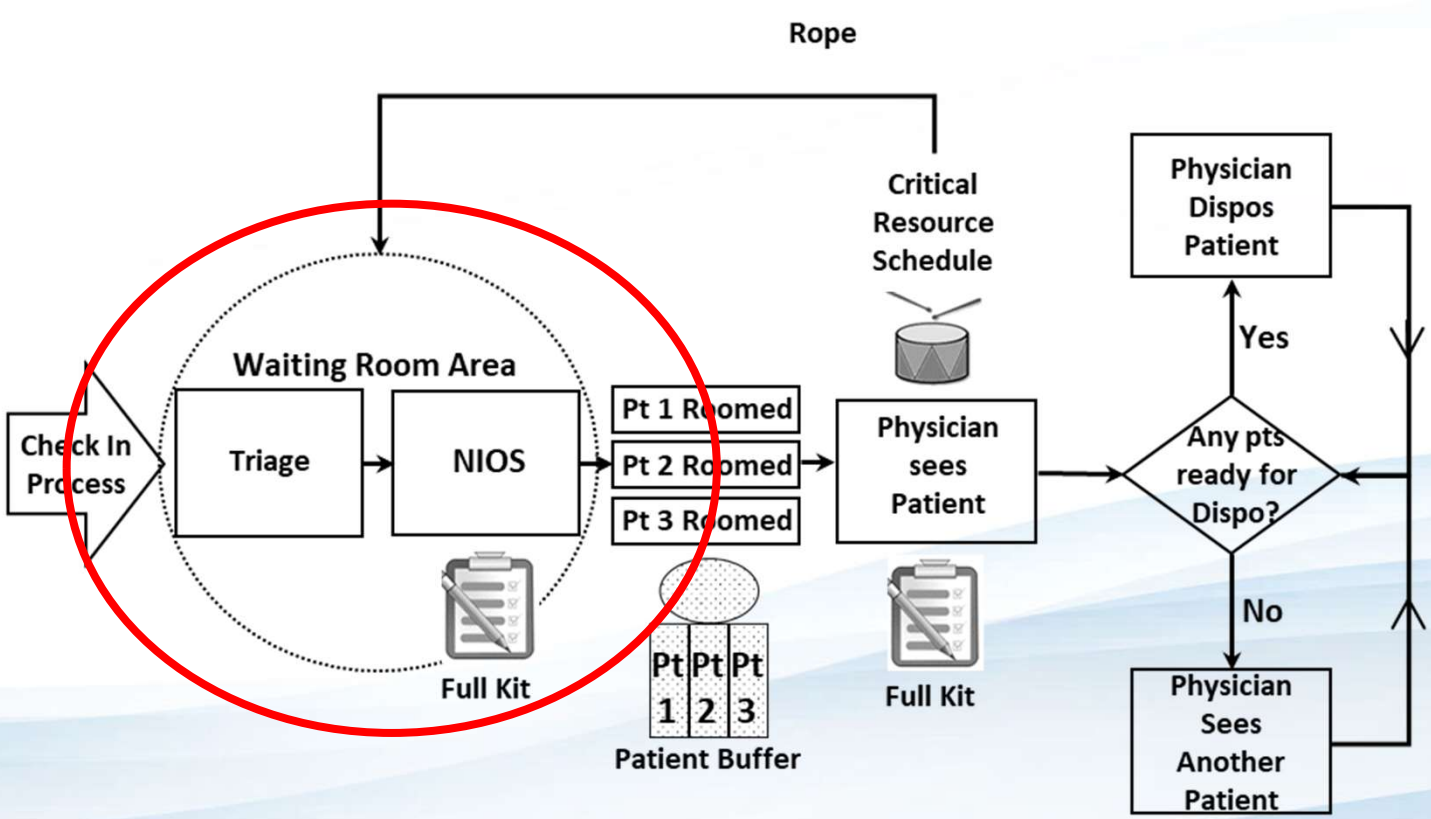


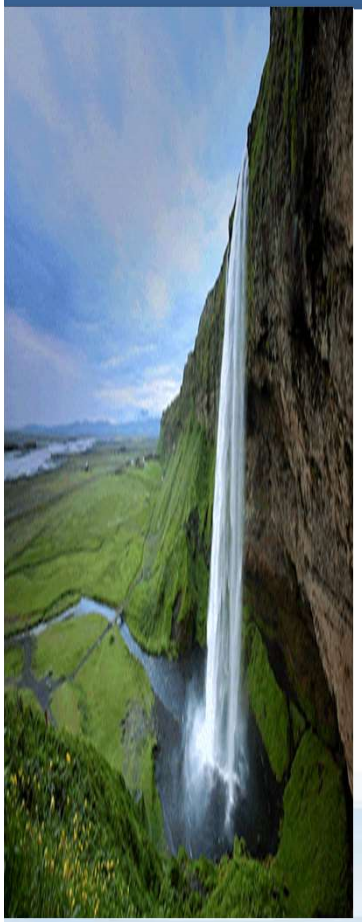


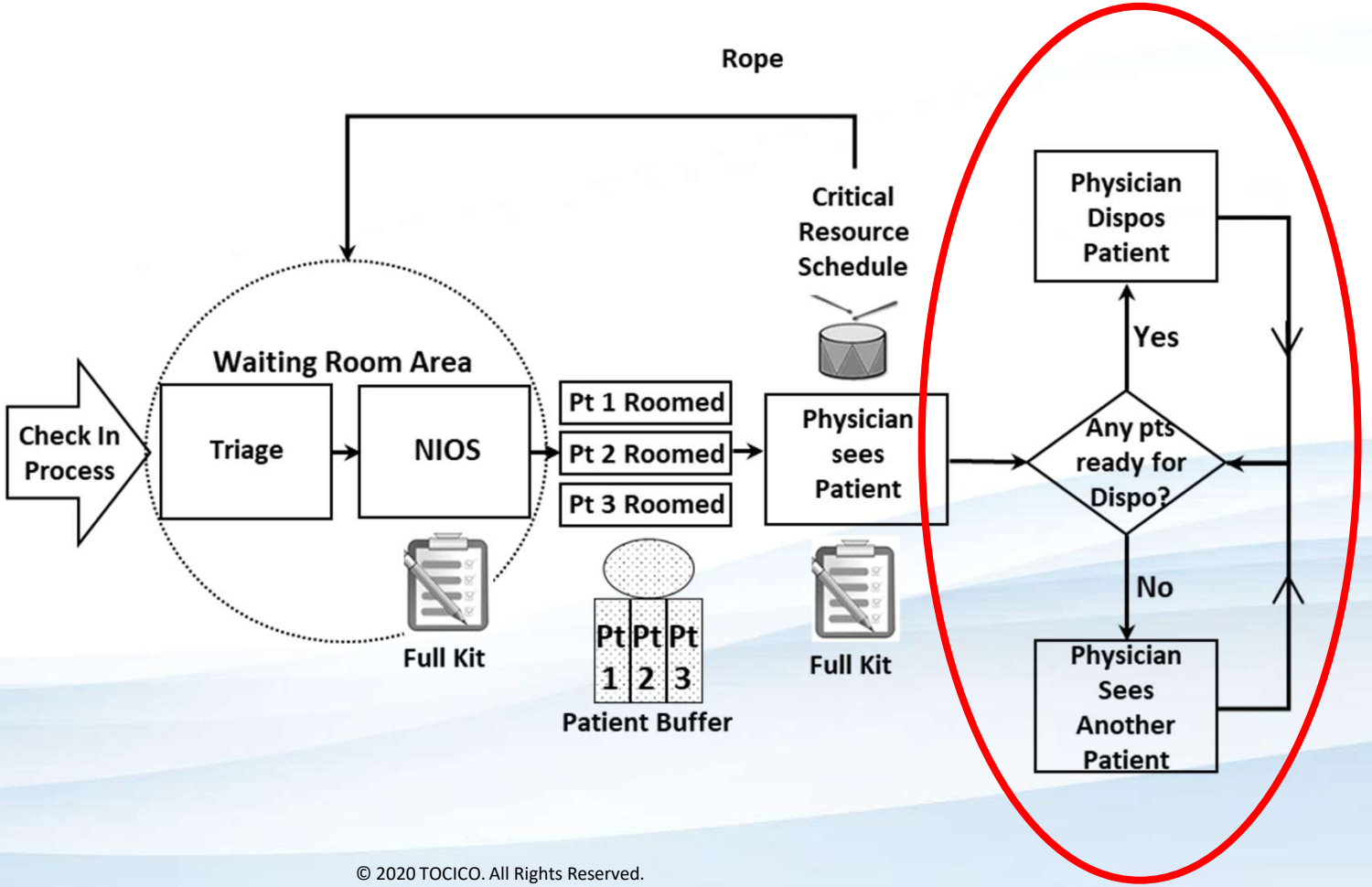


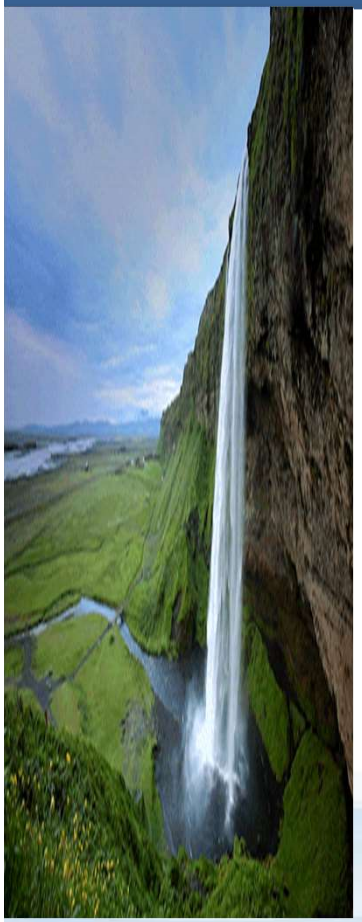


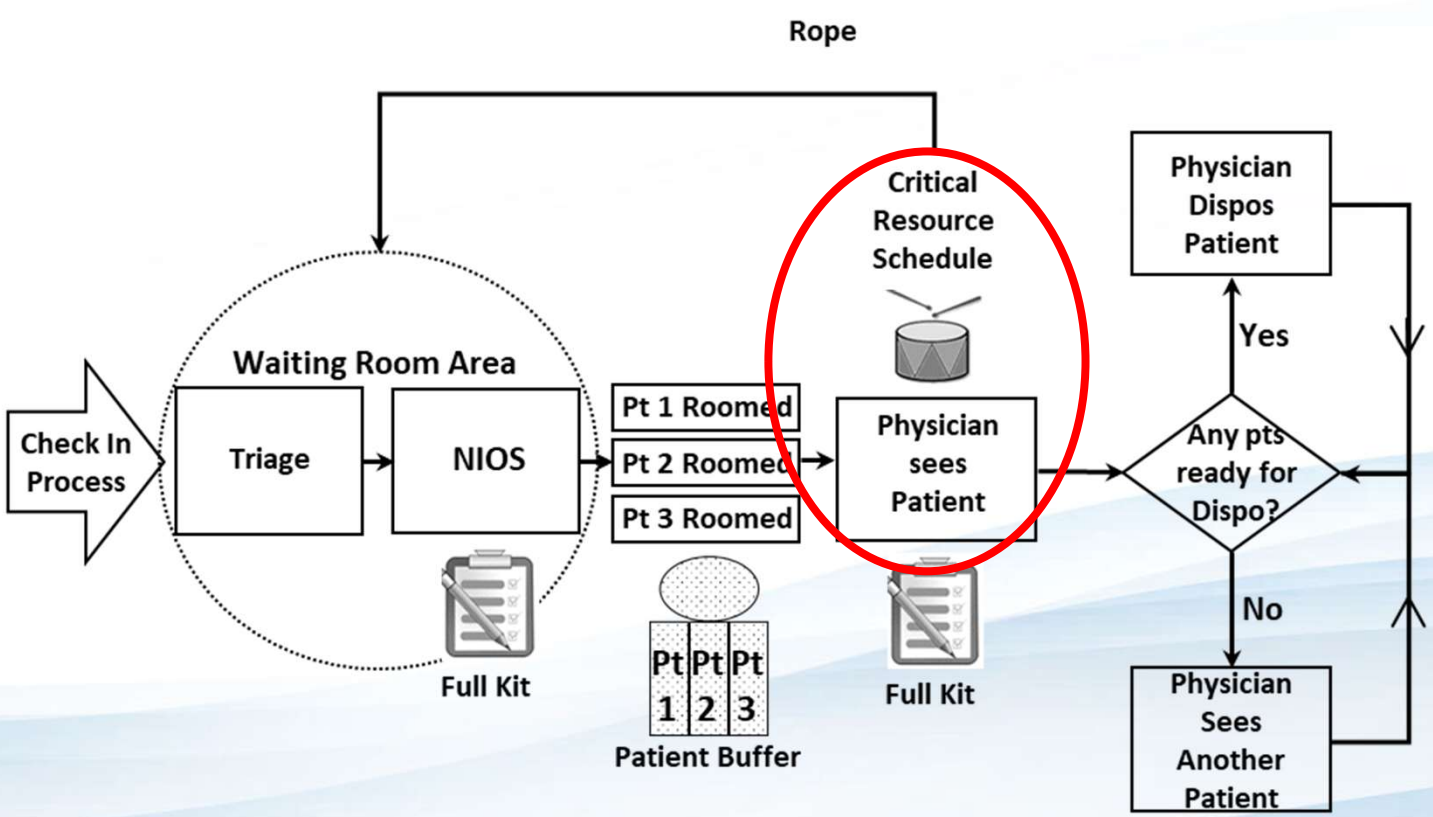


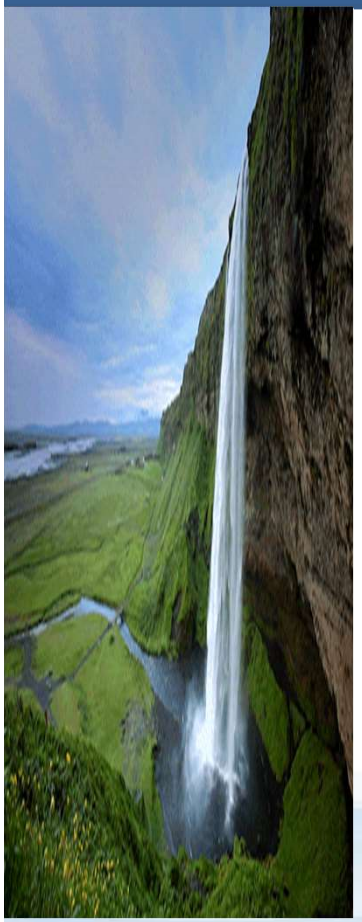


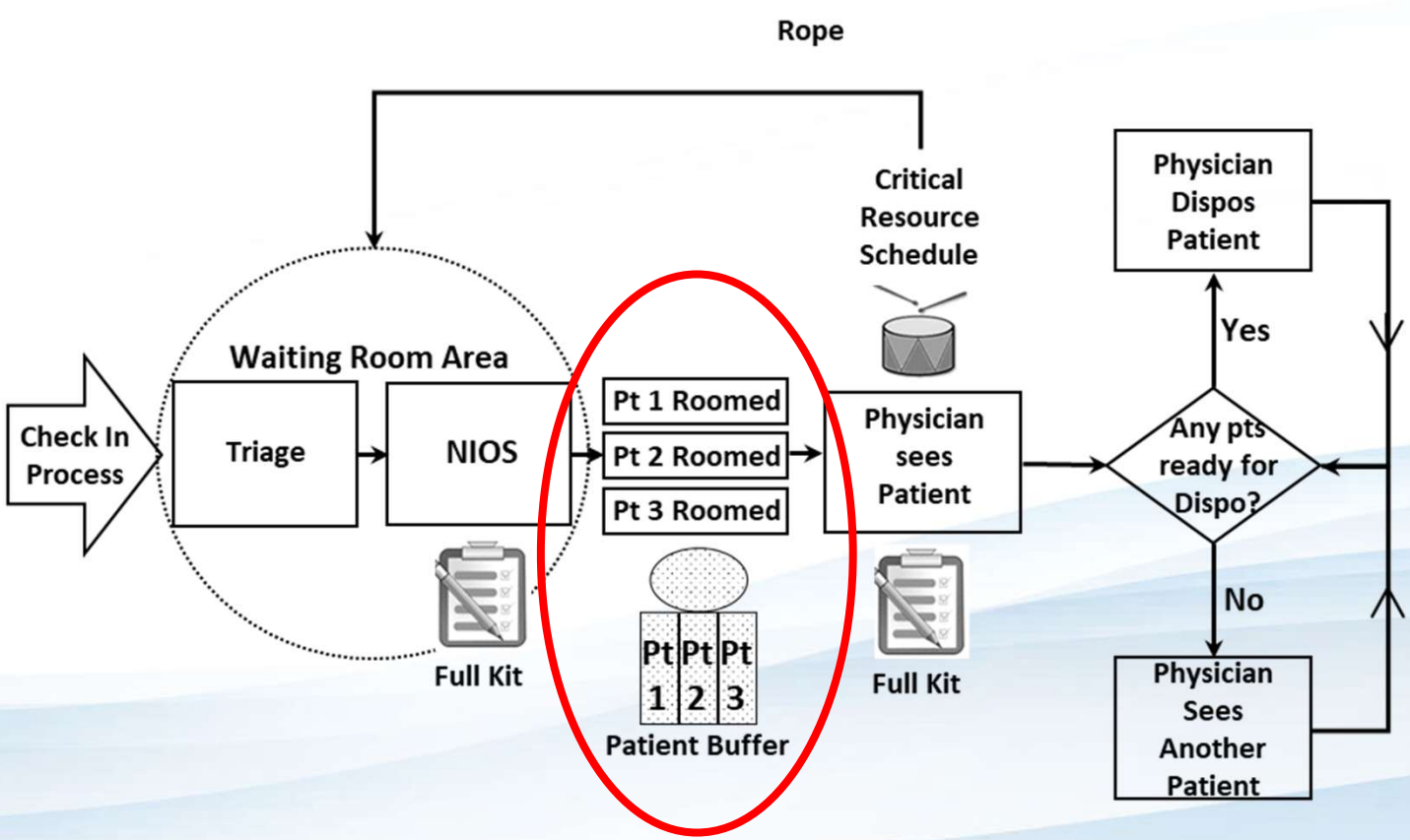


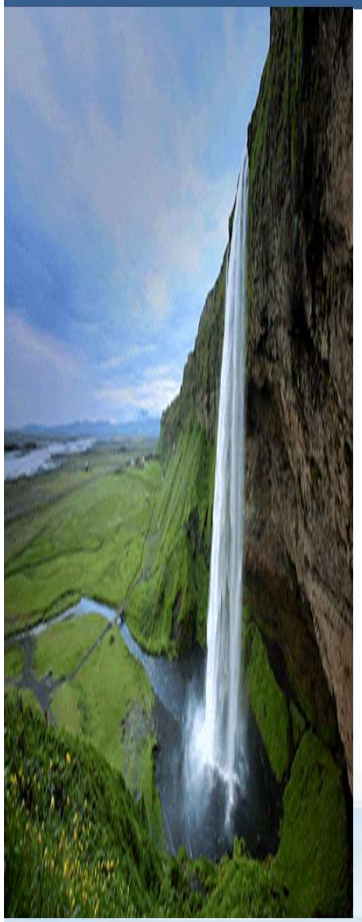


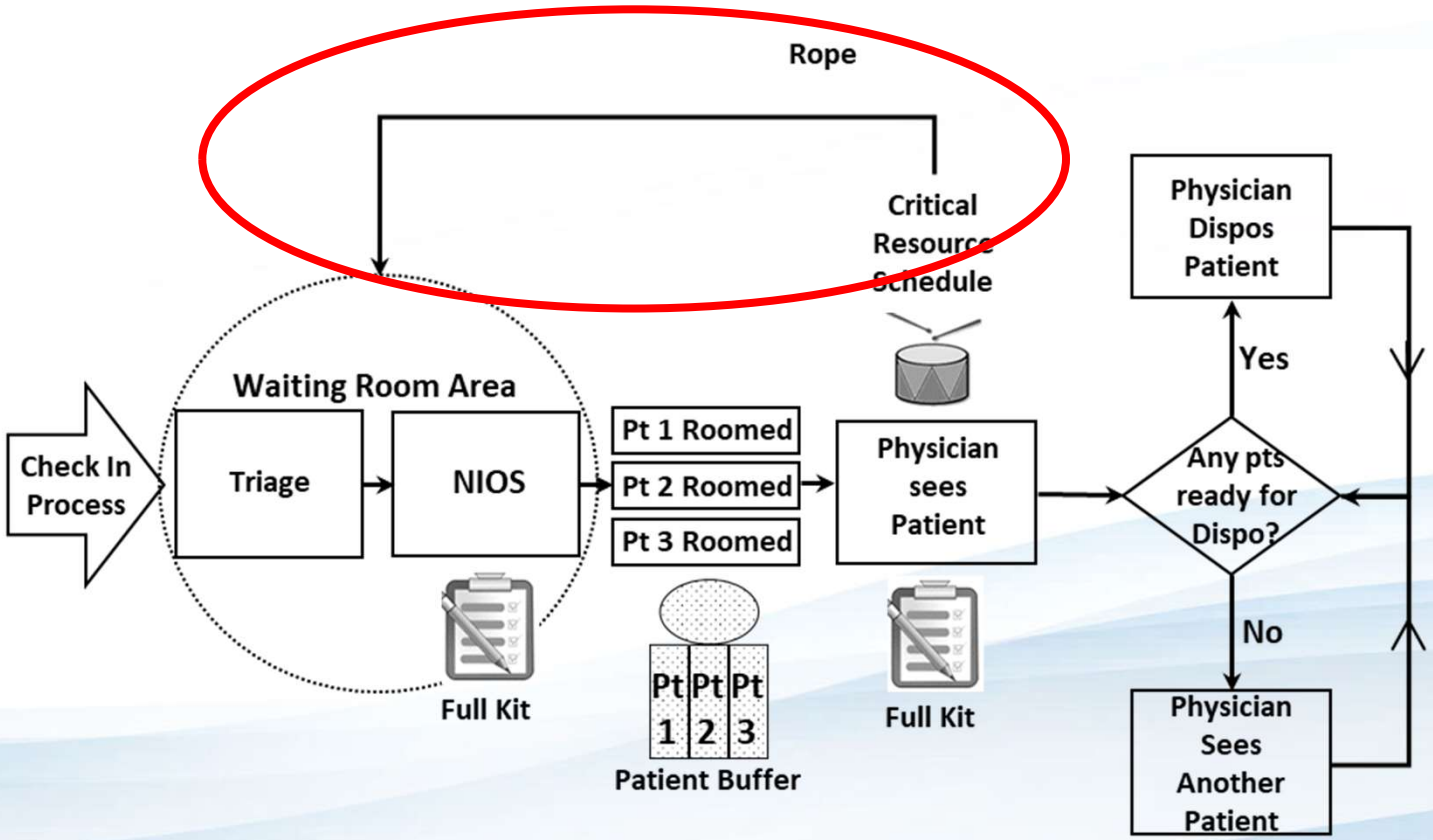


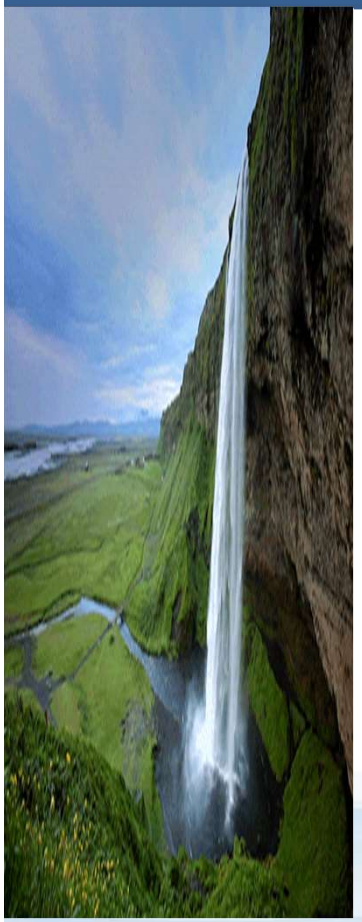


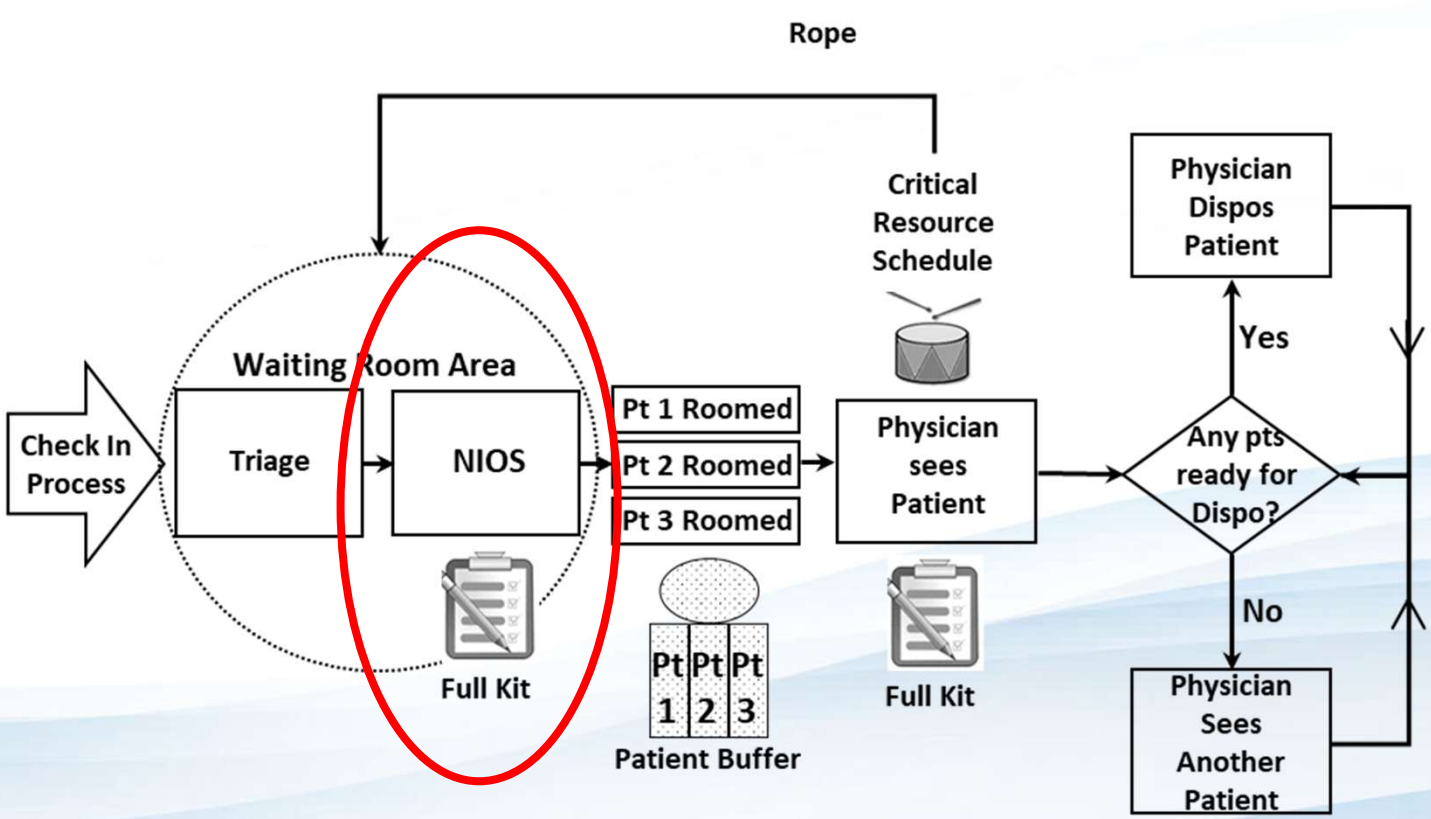


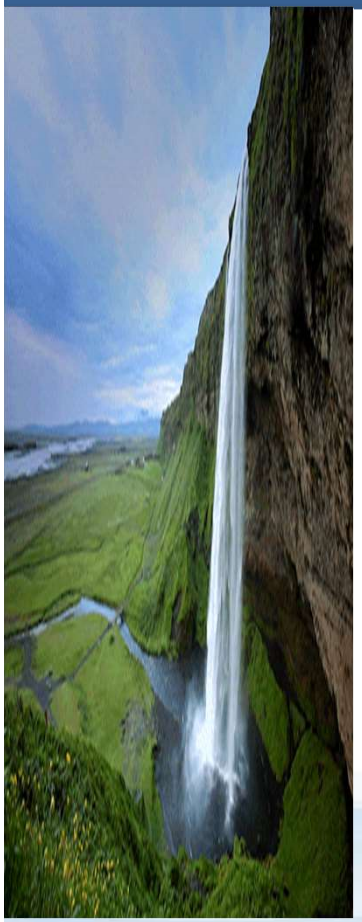


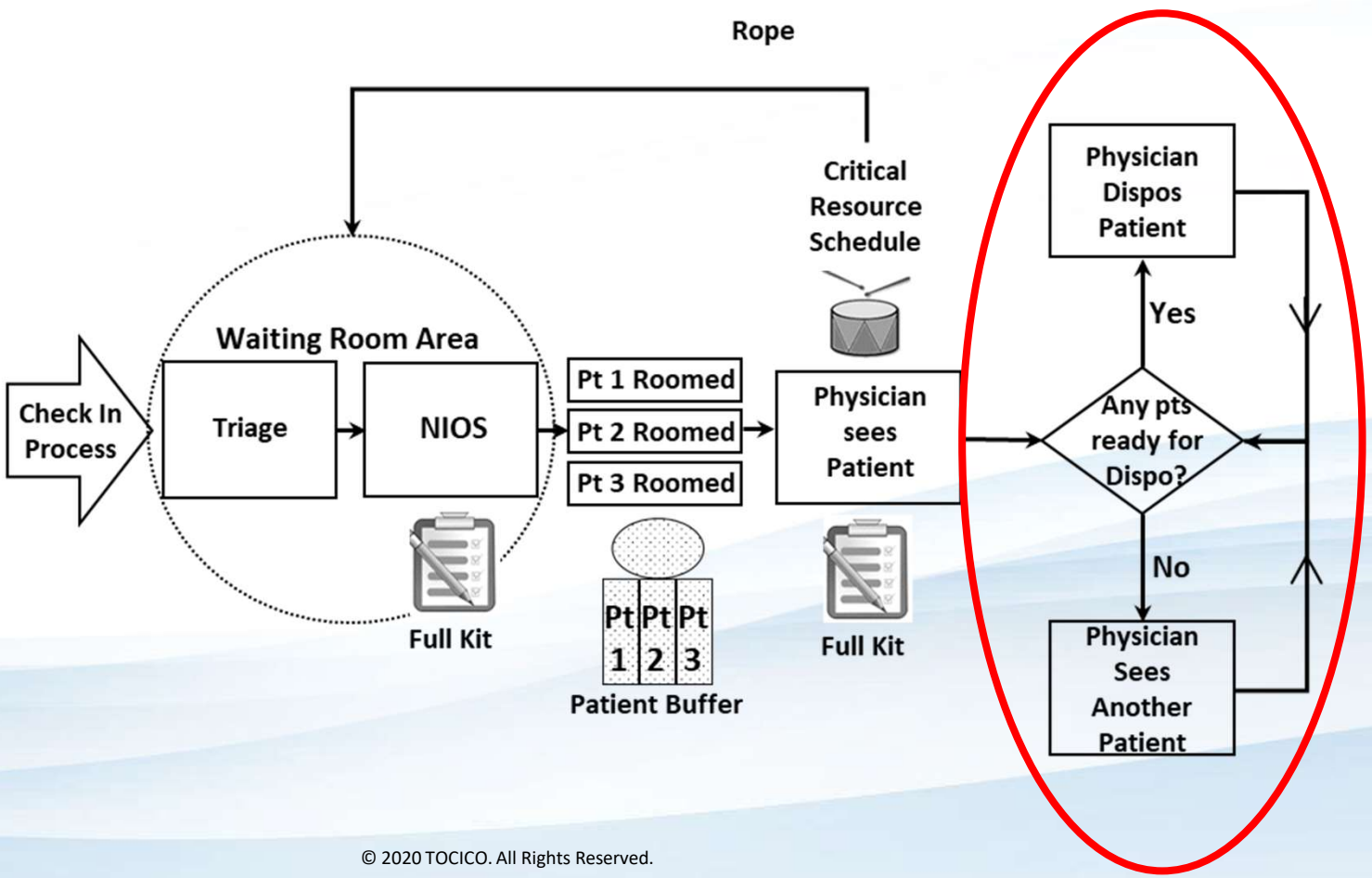


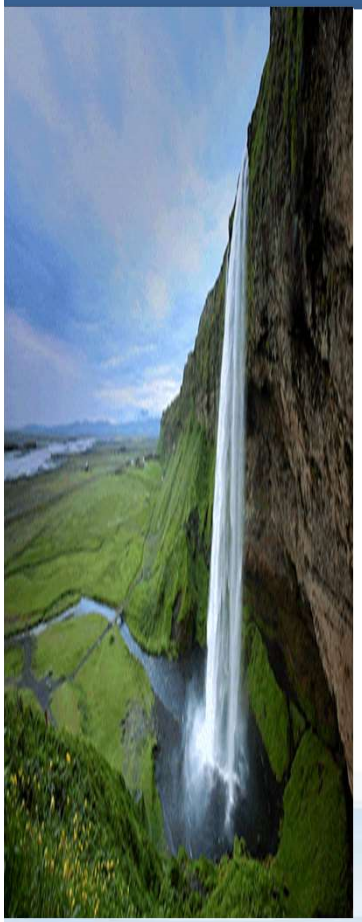


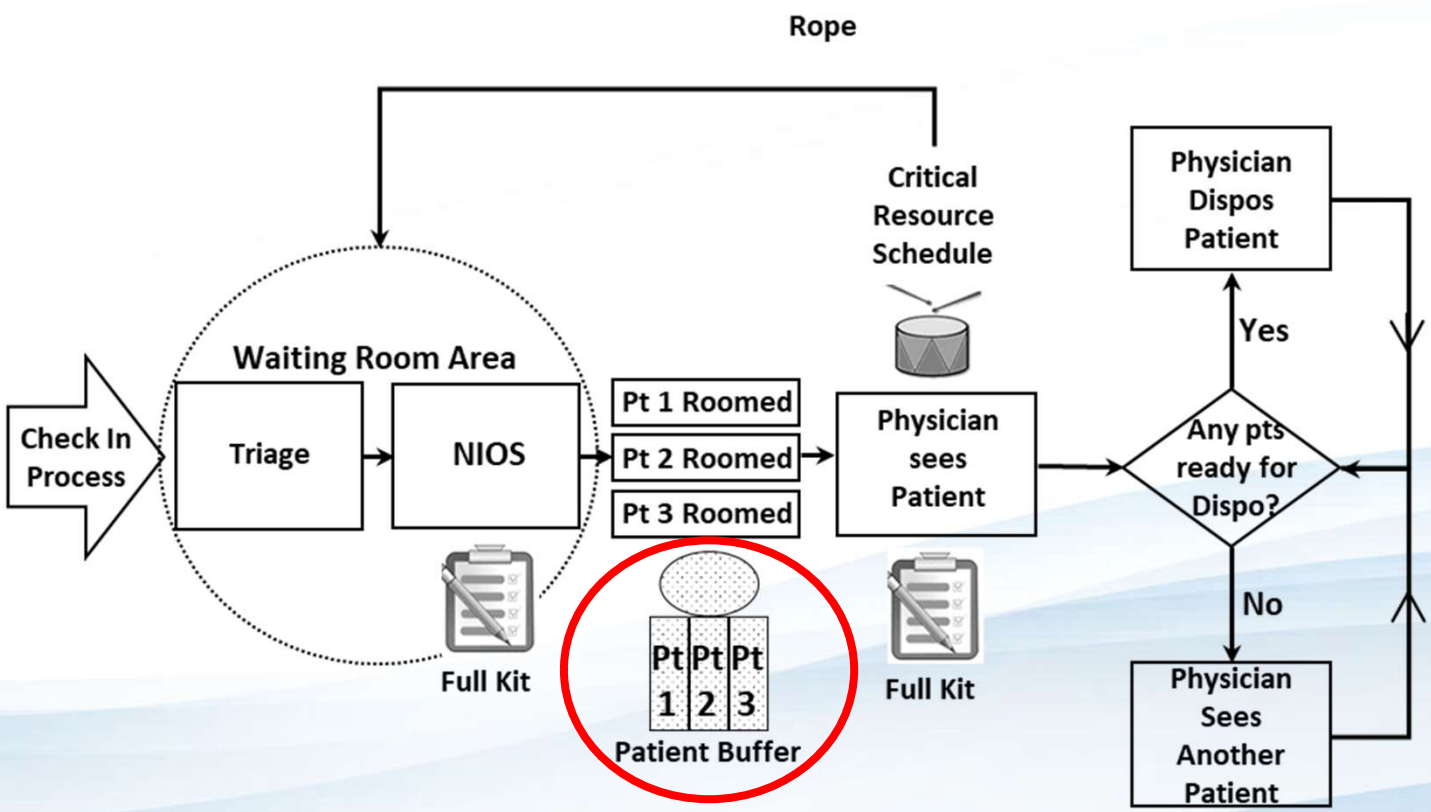


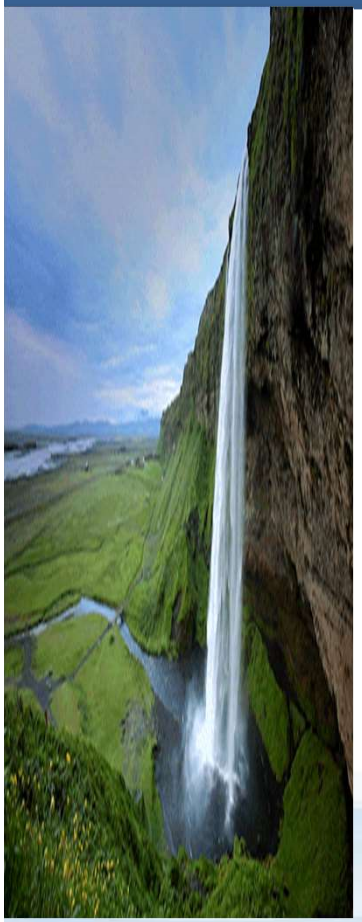


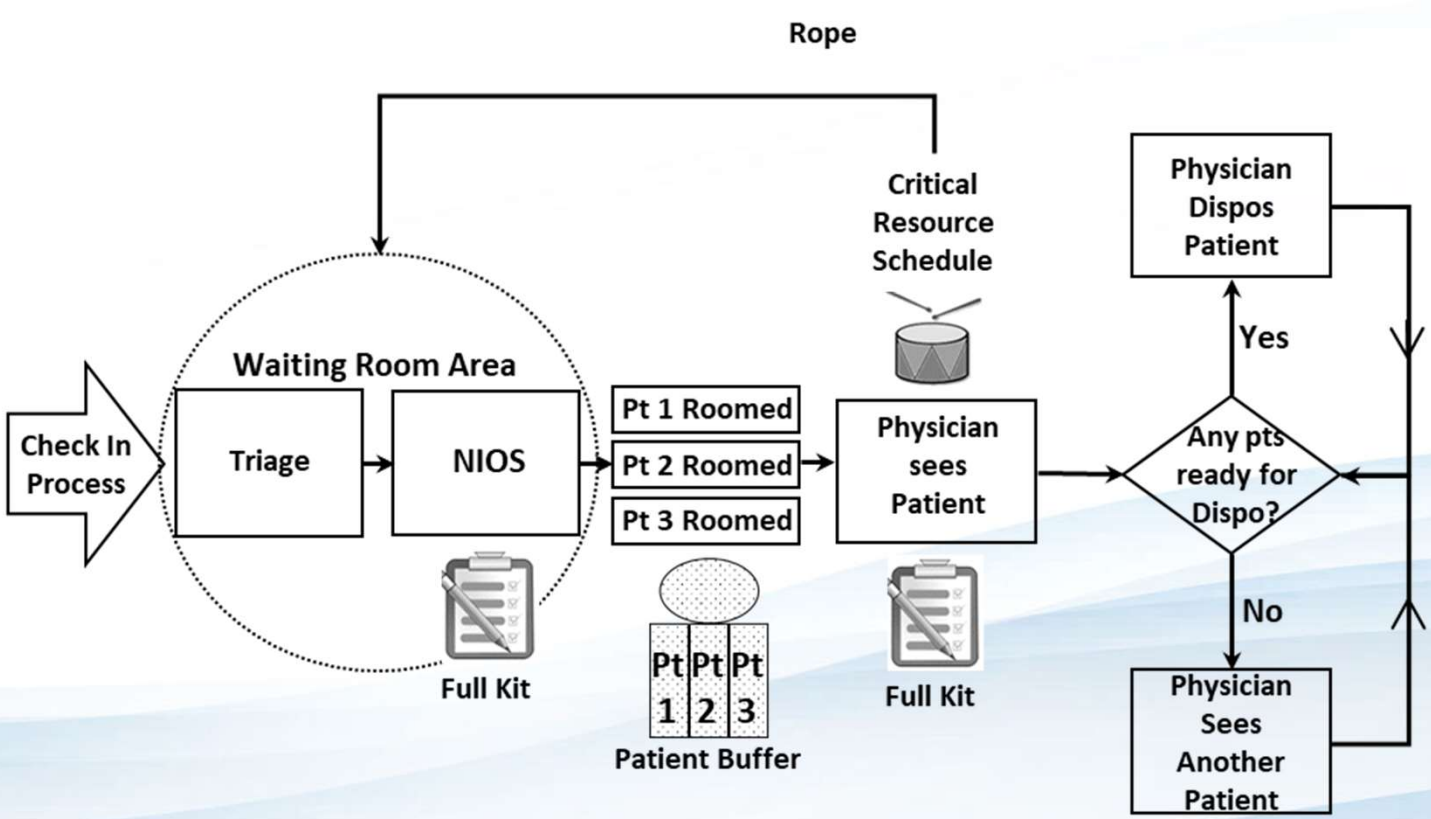


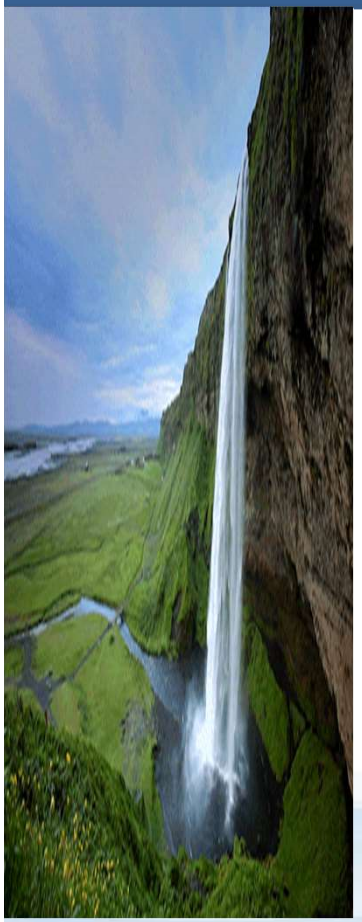






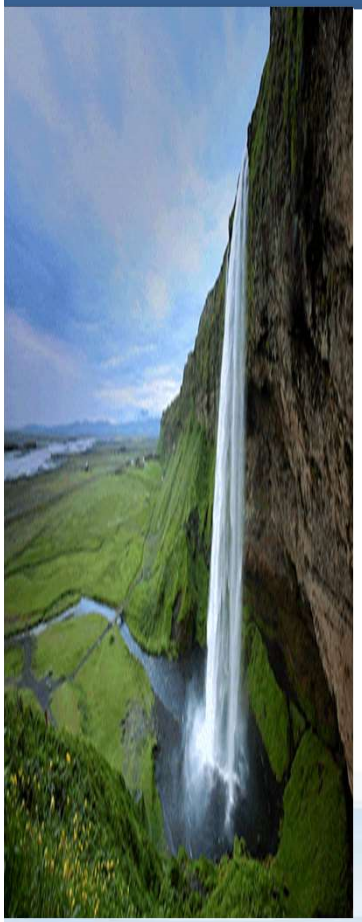






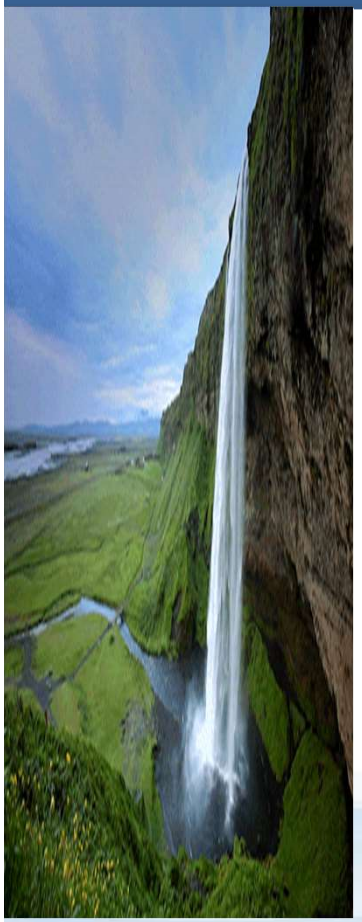
Elevate the Constraint

Is it time to add provider coverage?



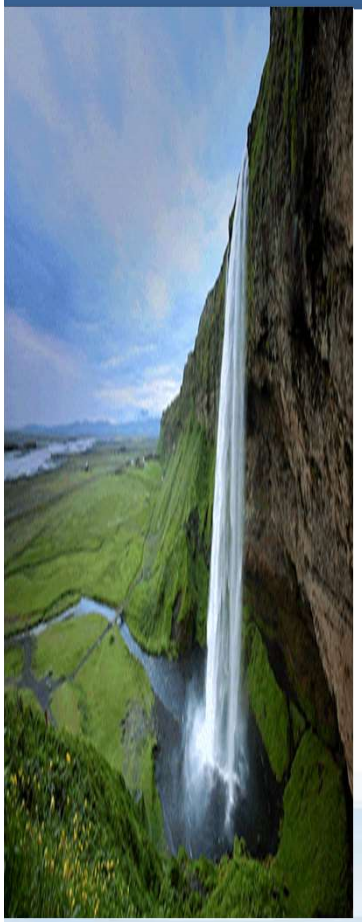
Elevate the Constraint

Ensure sufficient non-bottleneck capacity *first*



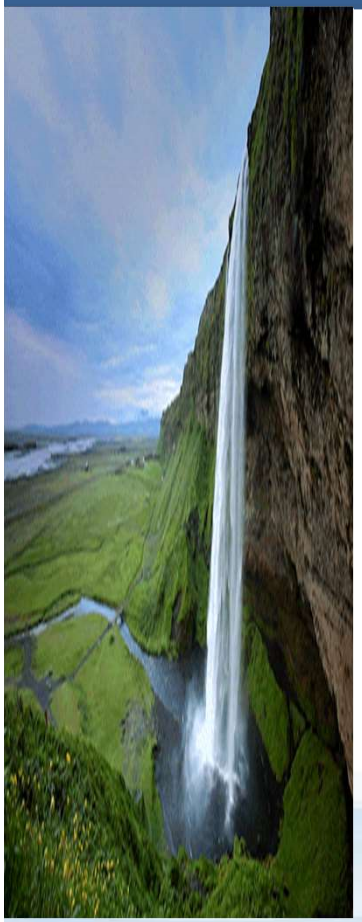
Elevate the Constraint

Look for alternatives to a new full-time hire



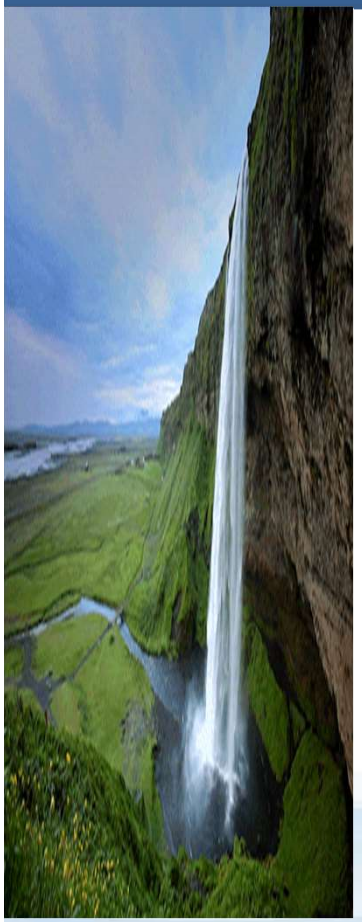
Elevate the Constraint

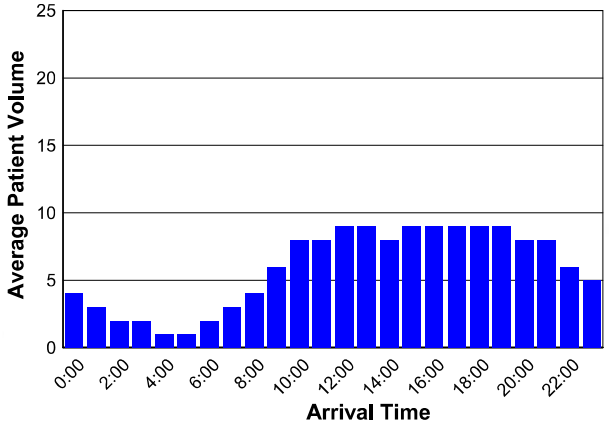
Add provider capacity with non-physicians



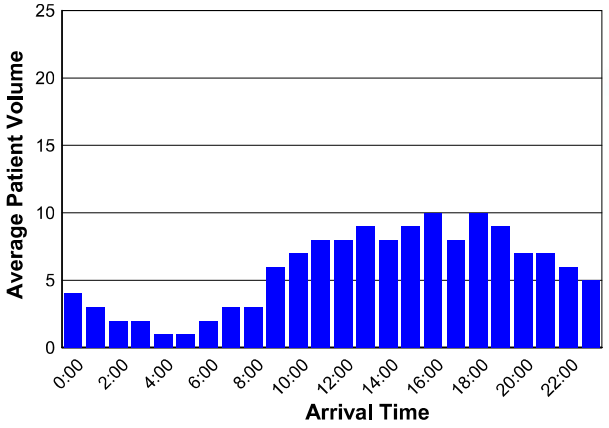
Elevate the Constraint

Be smart about where you add capacity





January – October, 2008



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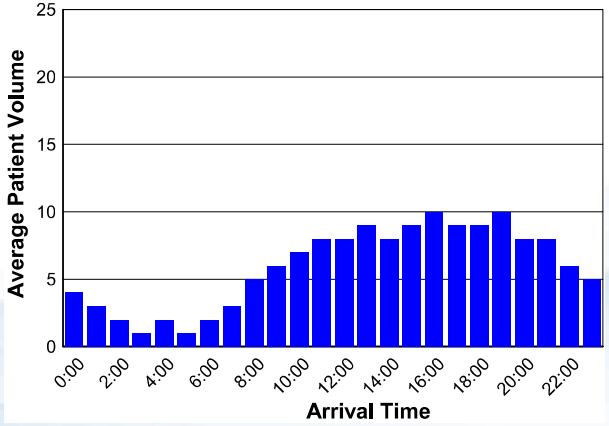
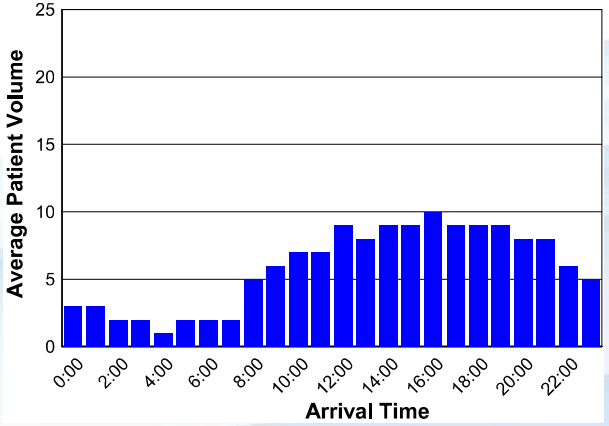
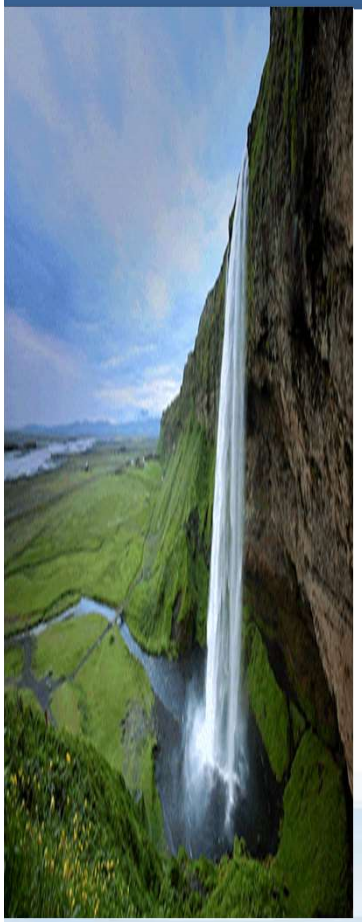


May, 2008

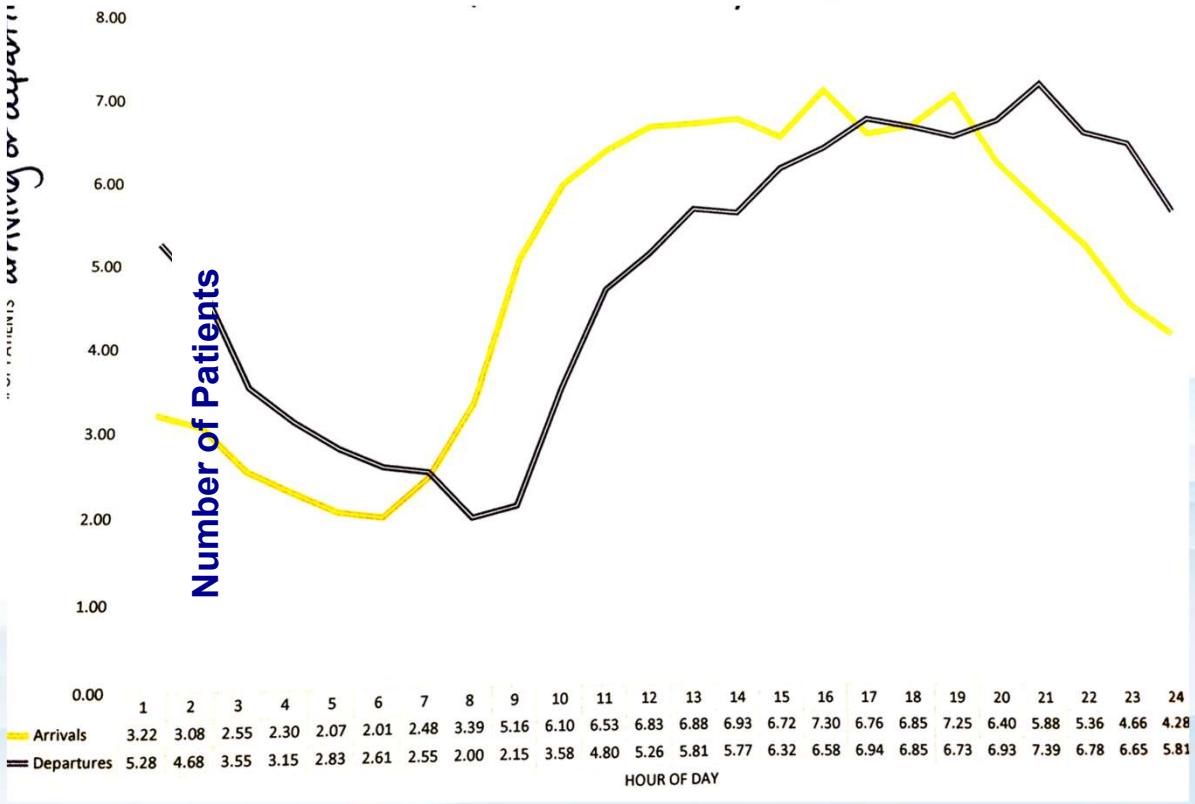


September, 2008

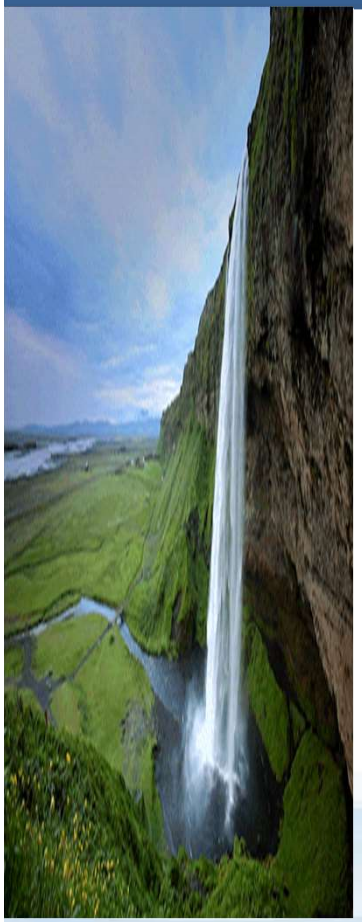


LEH Hospital Visits

August 2015 – January 2016

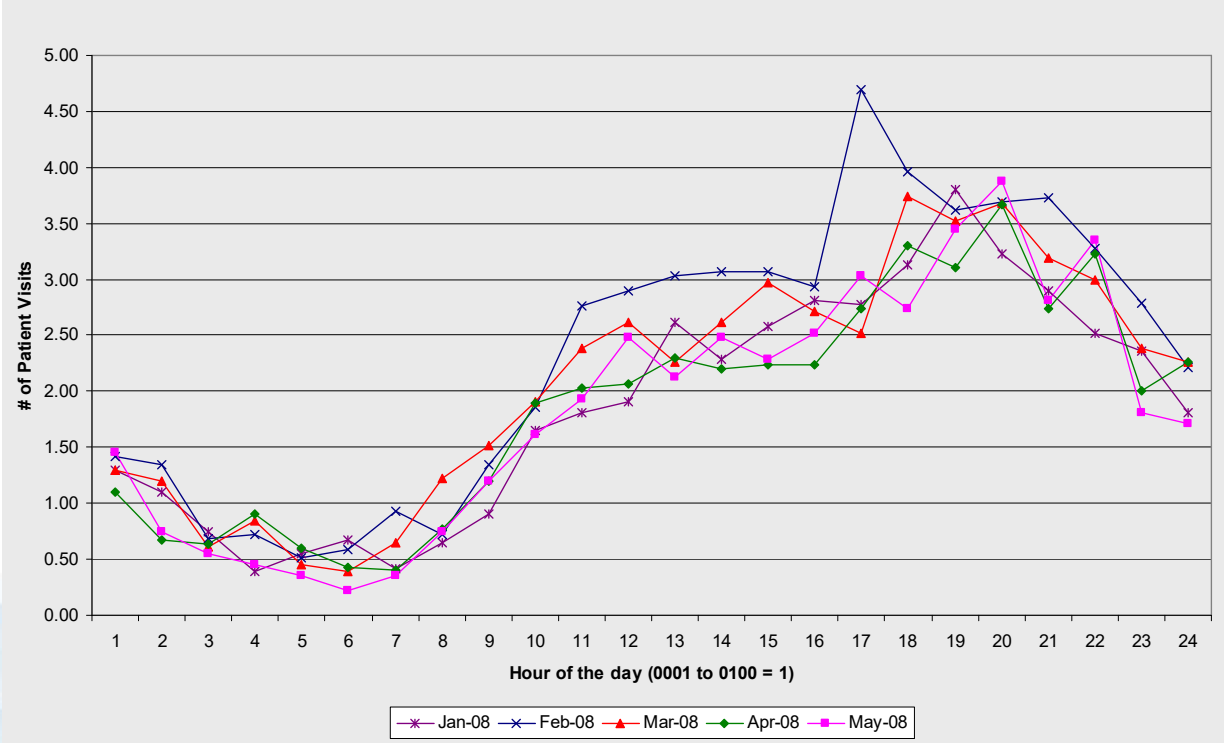


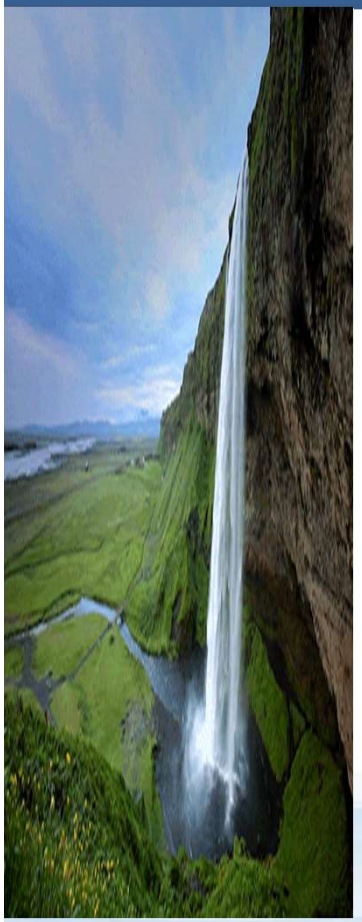
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Arrivals	3.22	3.08	2.55	2.30	2.07	2.01	2.48	3.39	5.16	6.10	6.53	6.83	6.88	6.93	6.72	7.30	6.76	6.85	7.25	6.40	5.88	5.36	4.66	4.28
Departures	5.28	4.68	3.55	3.15	2.83	2.61	2.55	2.00	2.15	3.58	4.80	5.26	5.81	5.77	6.32	6.58	6.94	6.85	6.73	6.93	7.39	6.78	6.65	5.81



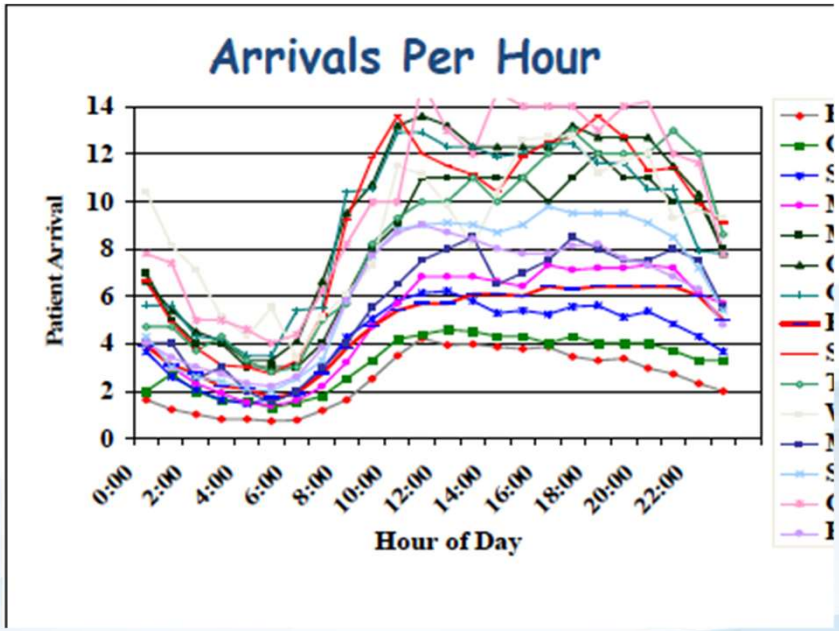
Randall Children's Hospital Visits

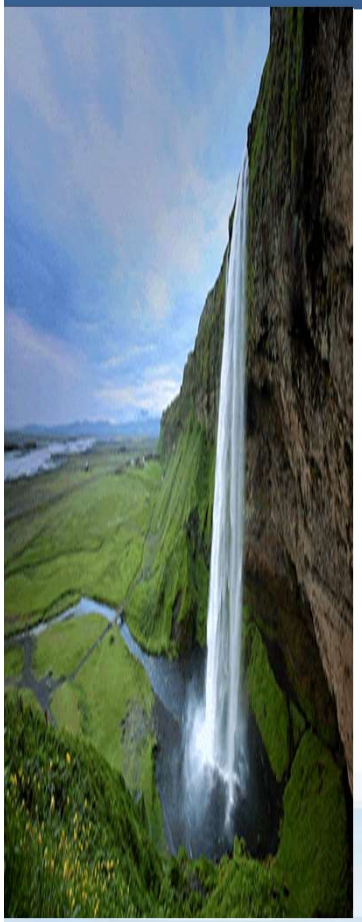
January 2008 – May 2008





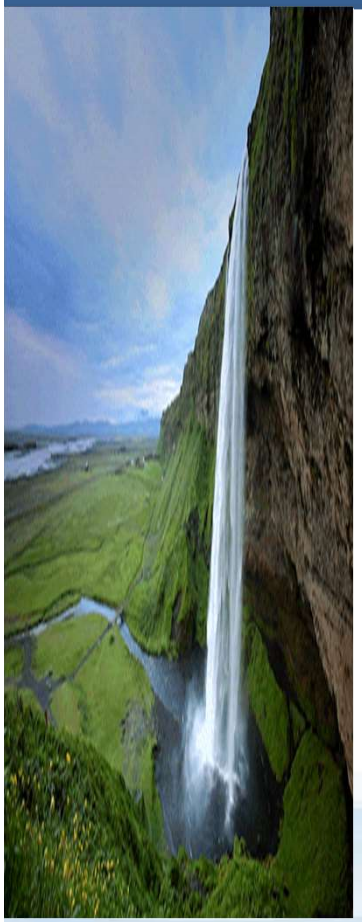
ACEP Coding and Reimbursement Conference 2016 – Multiple Hospitals

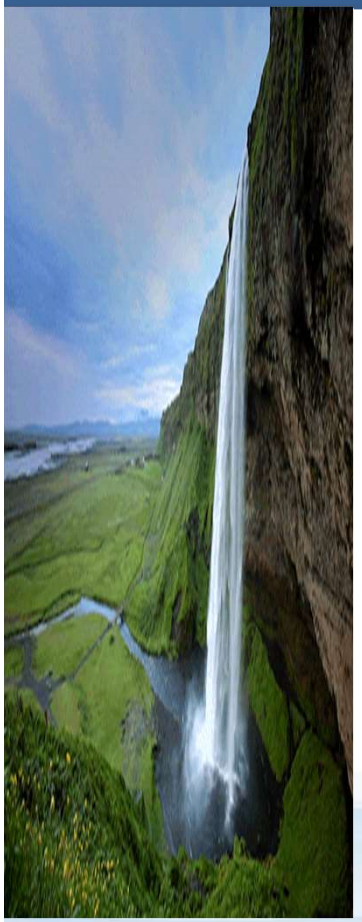


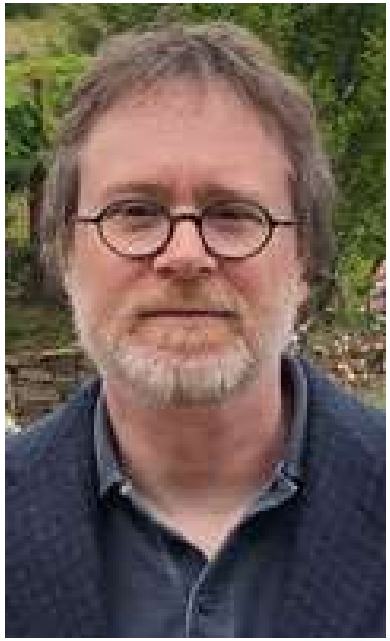


Return to Step 1

Process of ongoing improvement

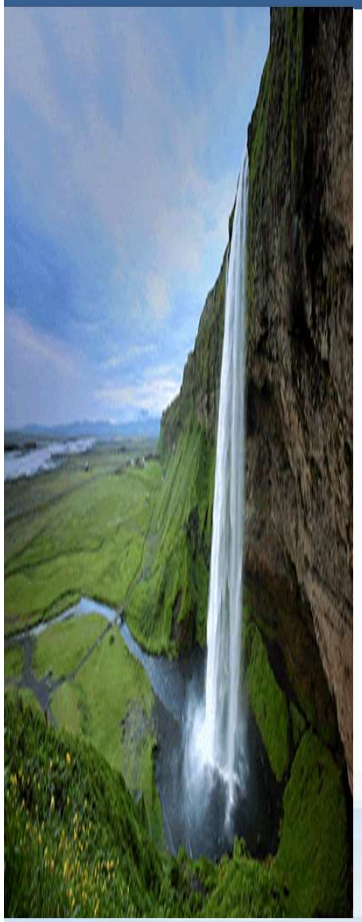


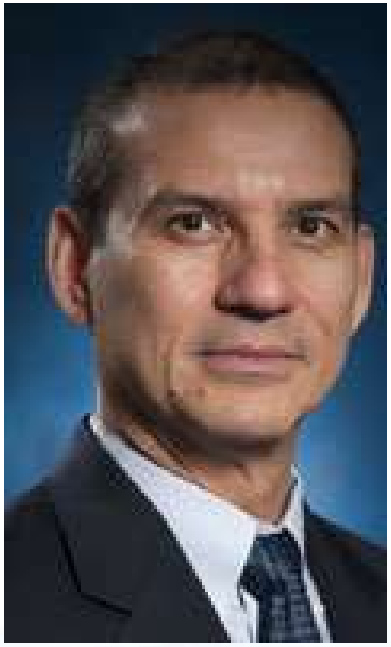




Dr. Strear earned a medical degree from the University of Pennsylvania. He is currently the Director of Patient Flow for Northwest Acute Care Specialists and is an attending physician in emergency medicine at Legacy Emanuel Medical Center in Portland, Oregon. Additionally, he is a Clinical Assistant Professor of Emergency Medicine at Oregon Health and Science University in Portland, Oregon. He began his career in Operational Flow and Process Improvement as the Director of Patient Flow at Legacy Emanuel Medical Center in 2008. His flow team was twice awarded the John G. King Quality Award for accomplishments in clinical quality and process improvement. He is currently patient flow advisor and internal consultant to multiple hospital flow steering committees in the Pacific Northwest. He is co-author of the book: *Smash the Bottleneck: Fixing Patient Flow for Better Care.*

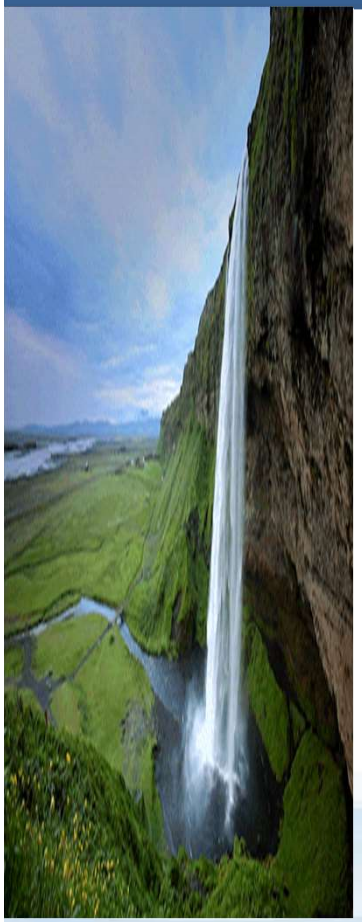
Contact: chris.strear@gmail.com





Dr. Sirias has a master's degree in Industrial and Systems Engineering and a Ph.D. in Business Administration both from The University of Memphis. He is also a certified Critical Chain Project Manager and a certified TOCICO thinking process implementer. Dr Sirias created the Problem Solving Maps methodology to teach mathematics, which is currently being used in several countries to improve student's performance. In addition, Dr. Sirias' research interests include how the Theory of Constraints can be used to improve patient flow in Emergency Departments, Inpatient Units, Operating Rooms and Outpatient Clinics. He is co-author of the book: *Smash the Bottleneck: Fixing Patient Flow for Better Care.* Dr. Sirias is currently a Professor in the Department of Management and Marketing at Saginaw Valley State University.

Contact: danilosirias@thinkingpathways.com



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