

Designing Patient Flow in the Hospital to Make Patients Safer

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Why should we care about patient flow?

1. To make our patients safer
2. To increase throughput (volume, \$\$)
3. To reduce expenses (cost, \$\$)
4. To improve staff satisfaction
5. To improve patient satisfaction

A question to run on

What can I do as a healthcare leader to improve patient flow?

Agenda

- **Introduction** **5 minutes**
 - What is the fundamental problem?
 - What management model will help us improve it?

- **Some examples of designing flow** **15 minutes**
 - Smoothing Flow at Boston Medical Center:
Changing the Surgical Schedule
 - Designing Flow out of the Emergency Department at Caritas
Norwood Hospital



Luckily, this type of communication does not happen in commercial aviation.....

- US Air 562 from Boston to Albany in its final approach
- Captain: “Albany this is US Air 562”
- Air Traffic Controller: “Roger US Air 562 this is Albany Control. You’ll have to hold at your present altitude. We’ve got a lot more planes in our airspace than usual. The airlines decided to add some flights but no one told us and we’ve got some rerouted planes due to bad weather in metro New York.”

- US Air 562 from Boston to Albany in its final approach

- Co-pilot: “Boy, we’ve got to get this plane down or we’ll have some angry passengers. There’s the airport. Lets pick a runway. I usually call the gates myself and find out if any are open and then I just go for it. If you don’t, the controller will give it to someone else”

• A Physician and Two Nurses Discussing a Patient in the ED
Waiting to Be Admitted

• Physician: “ This guy is ready to go upstairs. Its now 5pm, he came in at 10 this morning. The unit clerk called admitting but I guess they are at dinner”.

• First Nurse: “Ok, I’ll call around to the floors and see if there are any empty beds....I know who to call.”

• Second Nurse: “Oh, I usually call the supervisor. Did you call report?”

• First Nurse: “Oh no, I leave it on the floor’s voicemail just before I leave the ED with the patient so they can’t slow the transfer down”.

Hospitals have been managed sub-optimally

- Too much is happening by chance. Too little is happening by design and therefore *we function at low reliability*
- Managers have been managing inputs: studies per FTE; deviation from budget, etc. but not *the system*.
- The hospital is full of *batching*; Patients are admitted and discharged in batches. Tests are run in batches. Surgeries are done in batches without consideration of *the effect on the system*.
- *Safe patient care* is easier to reach with continuous flow *and not with the artificial variability of batching!*
- There is a need for scientific management in the hospital industry

Reason's Swiss Cheese Model of Error

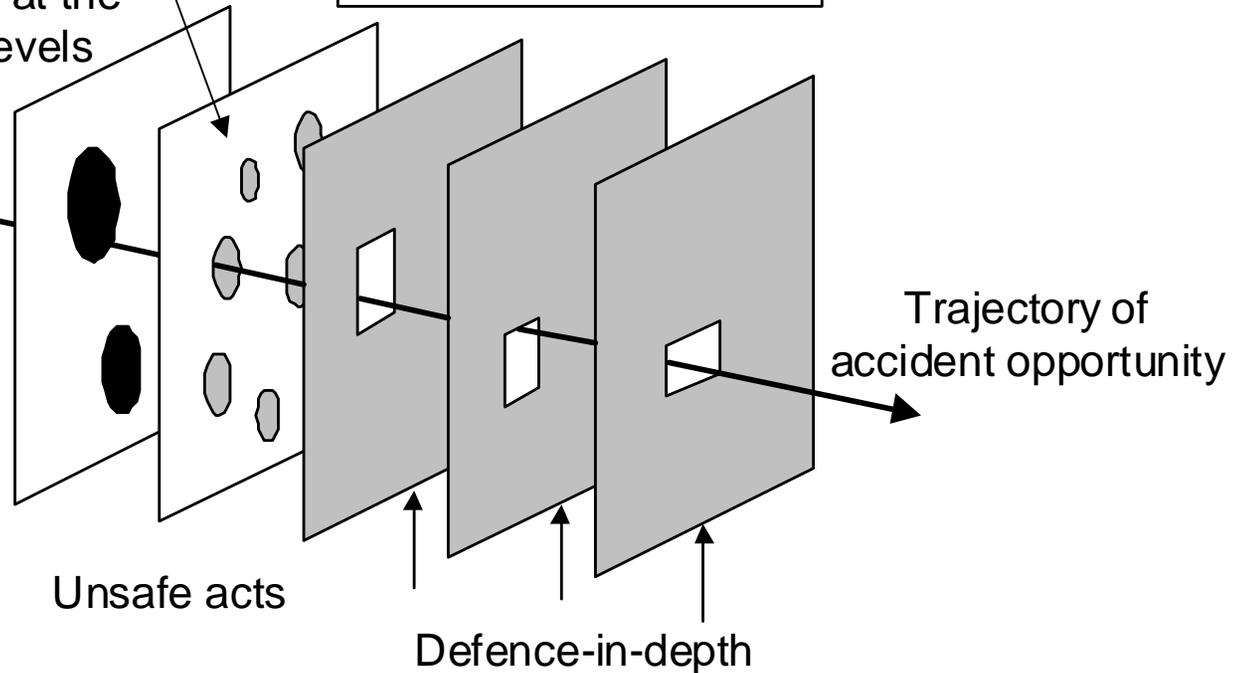
We are managing the efficiency
Of individual inputs and not the
system

Local triggers
Intrinsic defects
Atypical conditions

Latent failures at the
managerial levels

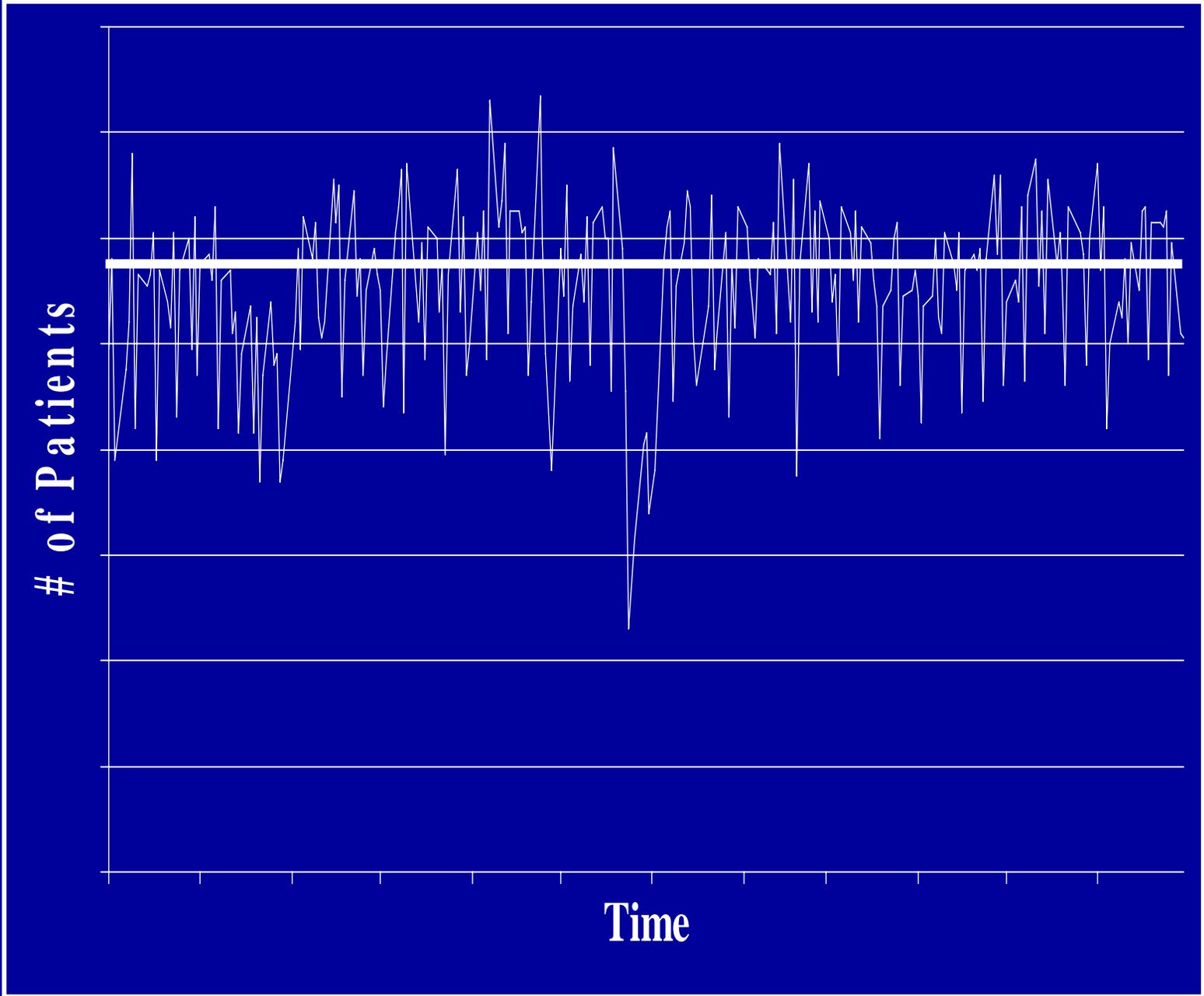
We allow patients to aggregate
and move in batches that
overwhelm our staff

Psychological
precursors



**“Hard work and good intentions are necessary
but insufficient for exceptional care”.**

“Every System is perfectly designed to get exactly the results that it gets.”



Variability

1. **“Natural”**: you can't control it ...you just have to manage it. (e.g.. sick patients coming to the ED). Tool to manage it: queuing theory
2. **“Artificial”**: you can control it....you must eliminate it to create flow. (batching) (e.g. elective surgery scheduling, reading stress tests)

When we “batch and push” we create artificial peak loads that create overcrowding

- **Internal Diversion –patients sent to alternative floors\Intensive Care locations**
- **Internal Delays – PACU backs up**
- **External Diversion - ED diversion; inability to accept transfers**
- **Staff overload – increased errors and staff unhappiness**
- **System Gridlock – Increase in LOS**
- **Decreased Volume**
- **Unhappy patients**

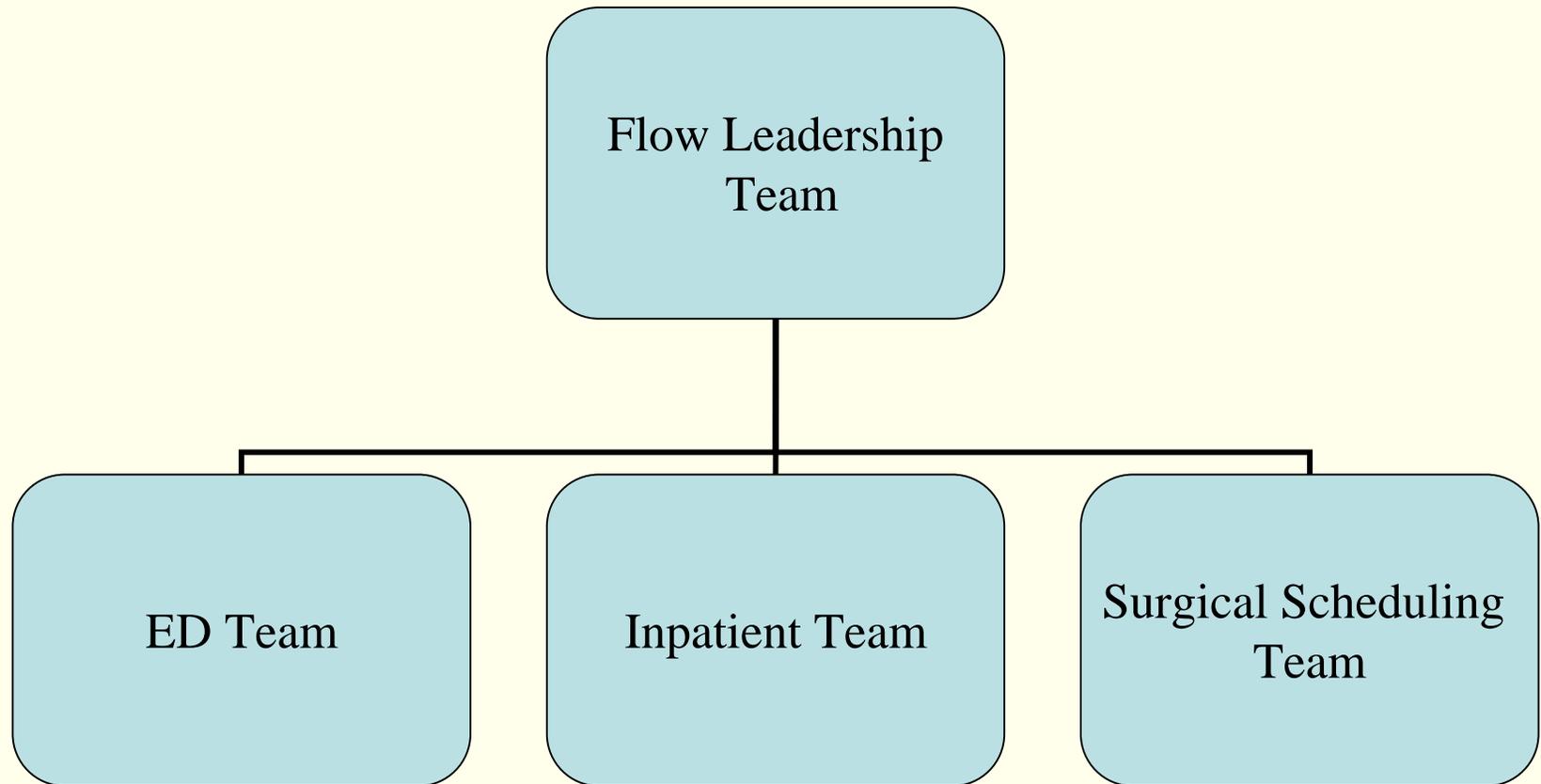
What business model should we use to improve flow? Performance Improvement

1. Focus on the patient and his or her family
2. Deep Process knowledge (*Design*)
3. Decisions driven by data
4. Teamwork
5. Empowerment

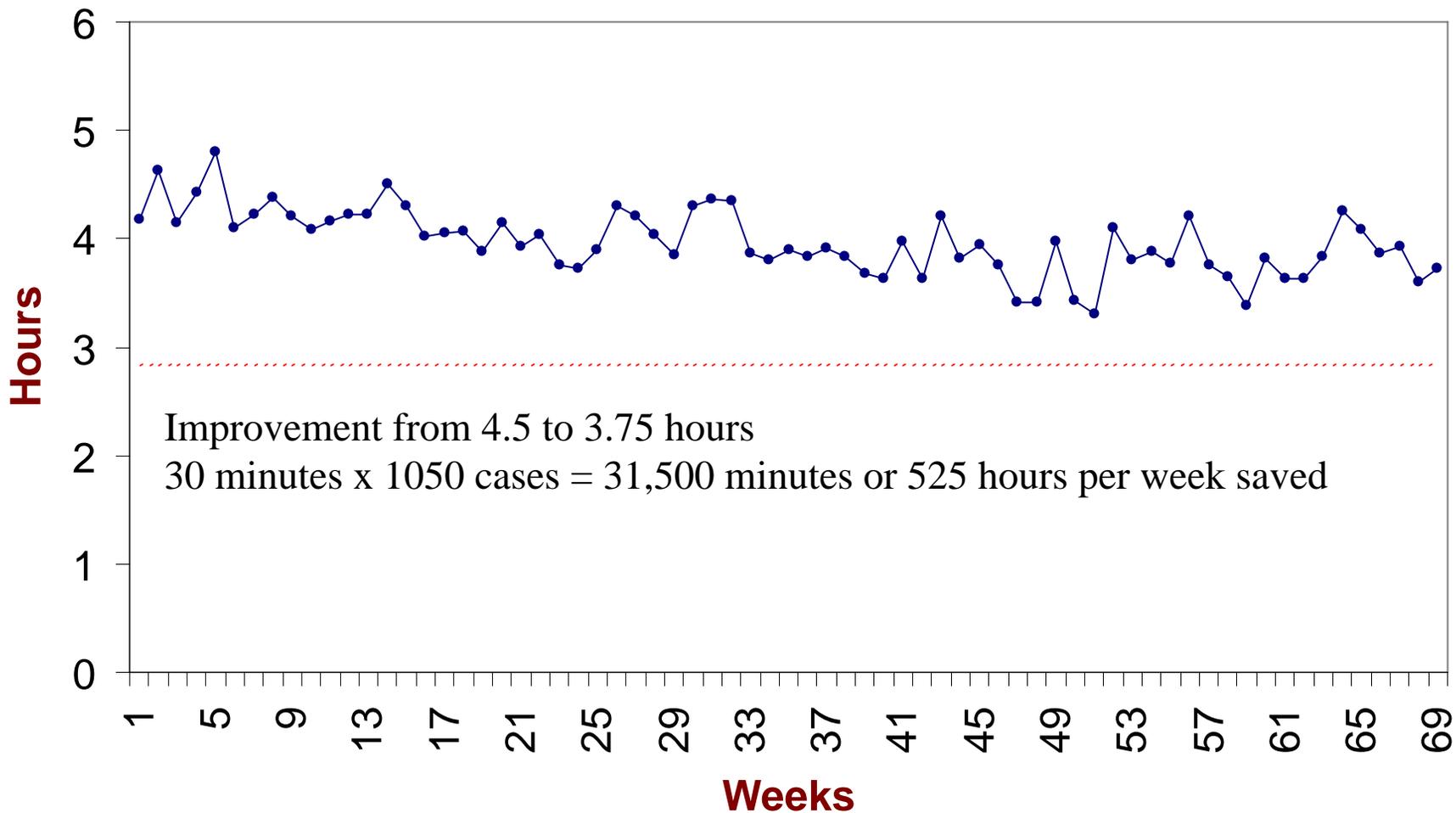
“How can we use the ideas of individuals on the team to redesign our systems to measurably improve the health and satisfaction of our patients and their families while driving out waste?”



Flow Teams at Boston Medical Center



Average total ED throughput time Boston Medical Center



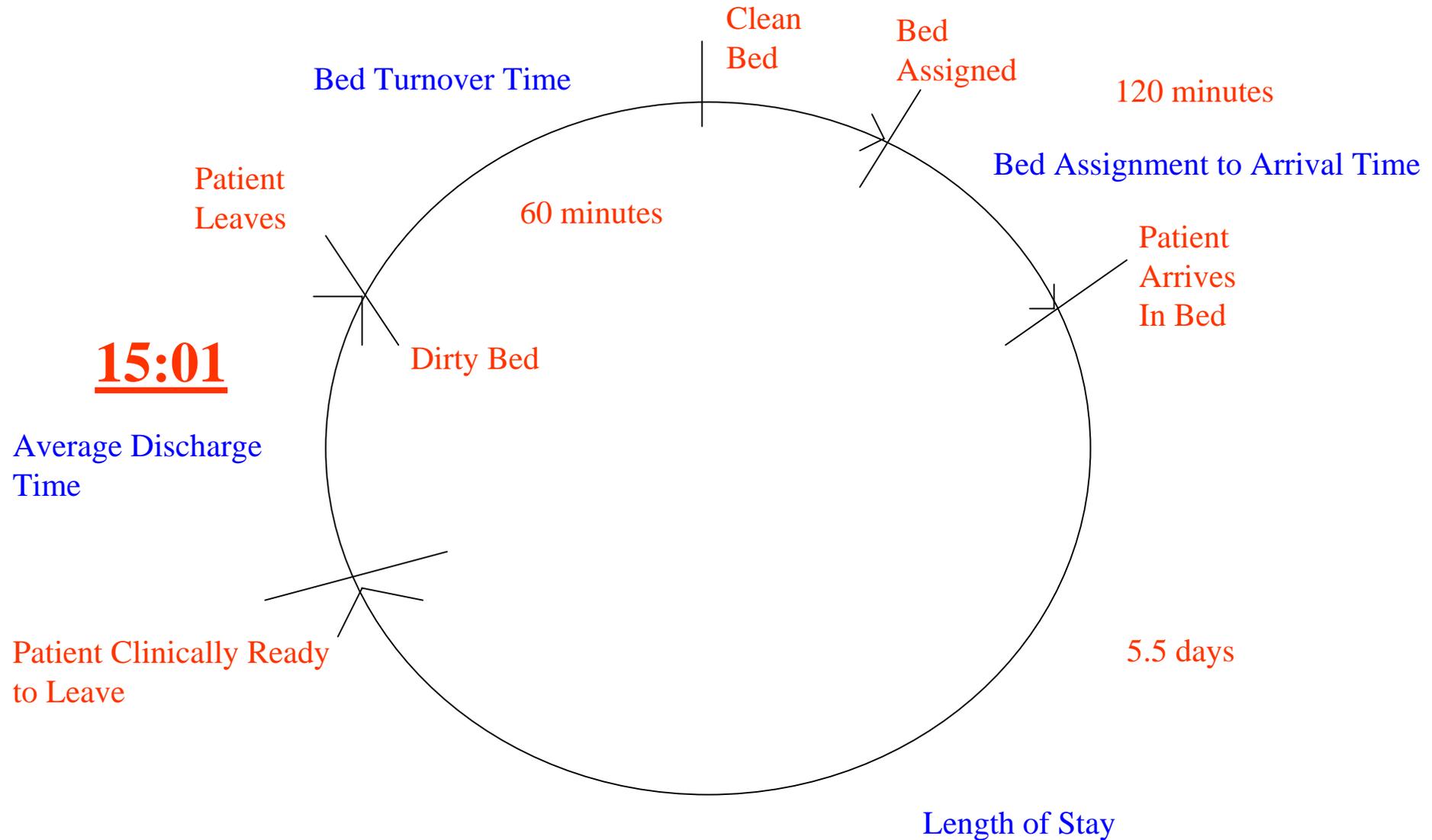
Series2 Series3

Improving Inpatient Flow Team

- Janet Gorman
- John Chessare
- Linda Guy
- Jane Damata
- Dina Brauneis
- Brian Brisbois
- Sue Doherty
- Jacque O'Shea
- Cil Weekes
- David Roney
- Kim Wood



The Inpatient Cycle, Key Points, Key Process Indicators



Maximizing Throughput: Smoothing the Elective Surgery Schedule to Improve Patient Flow

James M. Becker, MD

Keith P. Lewis, MD

John B. Chessare, MD, MPH

Eugene Litvak, PhD

Richard J. Shemin, MD

Gail Spinale, RN

Demetra Ouellette

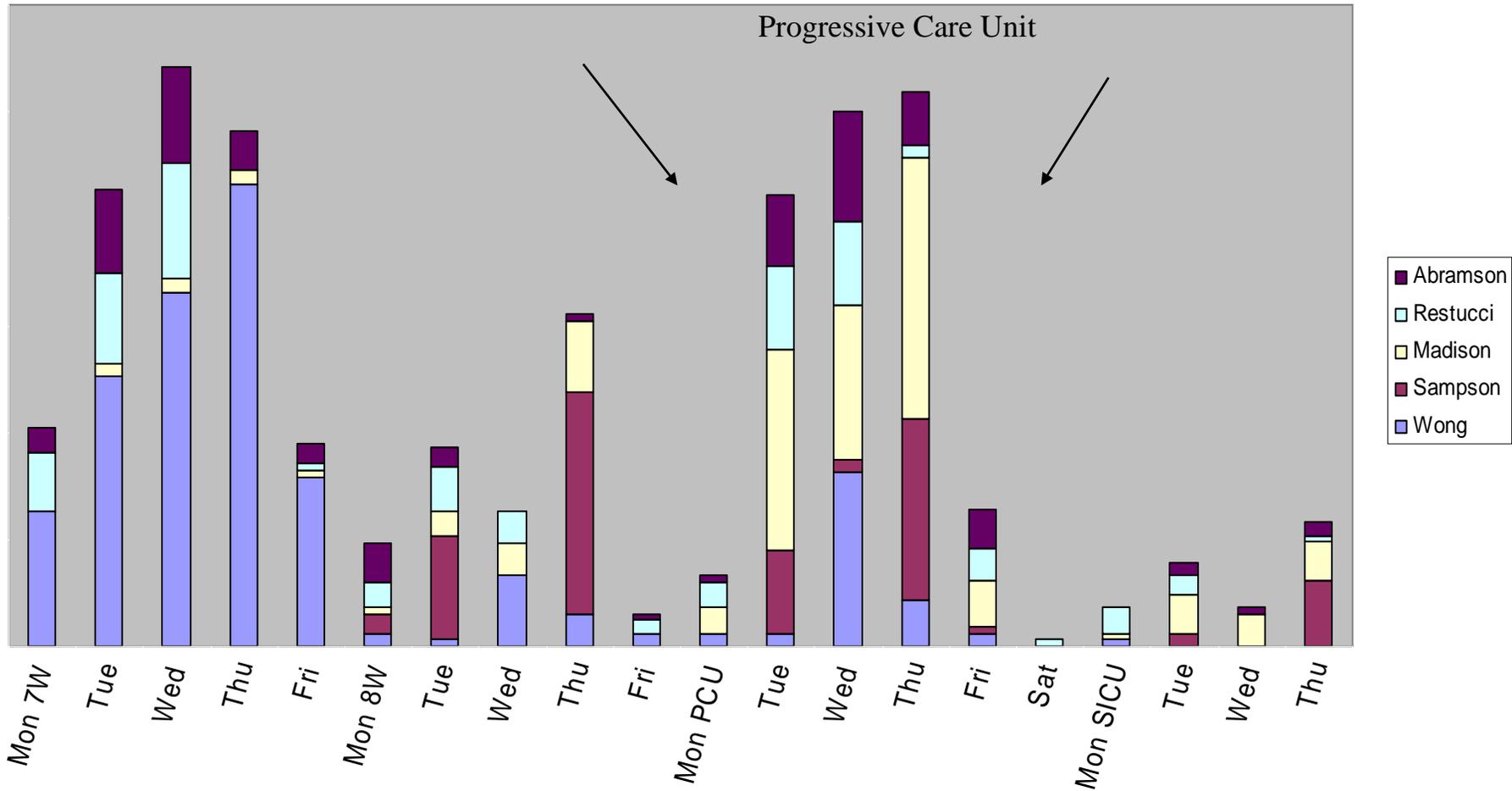
Abbot Cooper



Surgical Smoothing

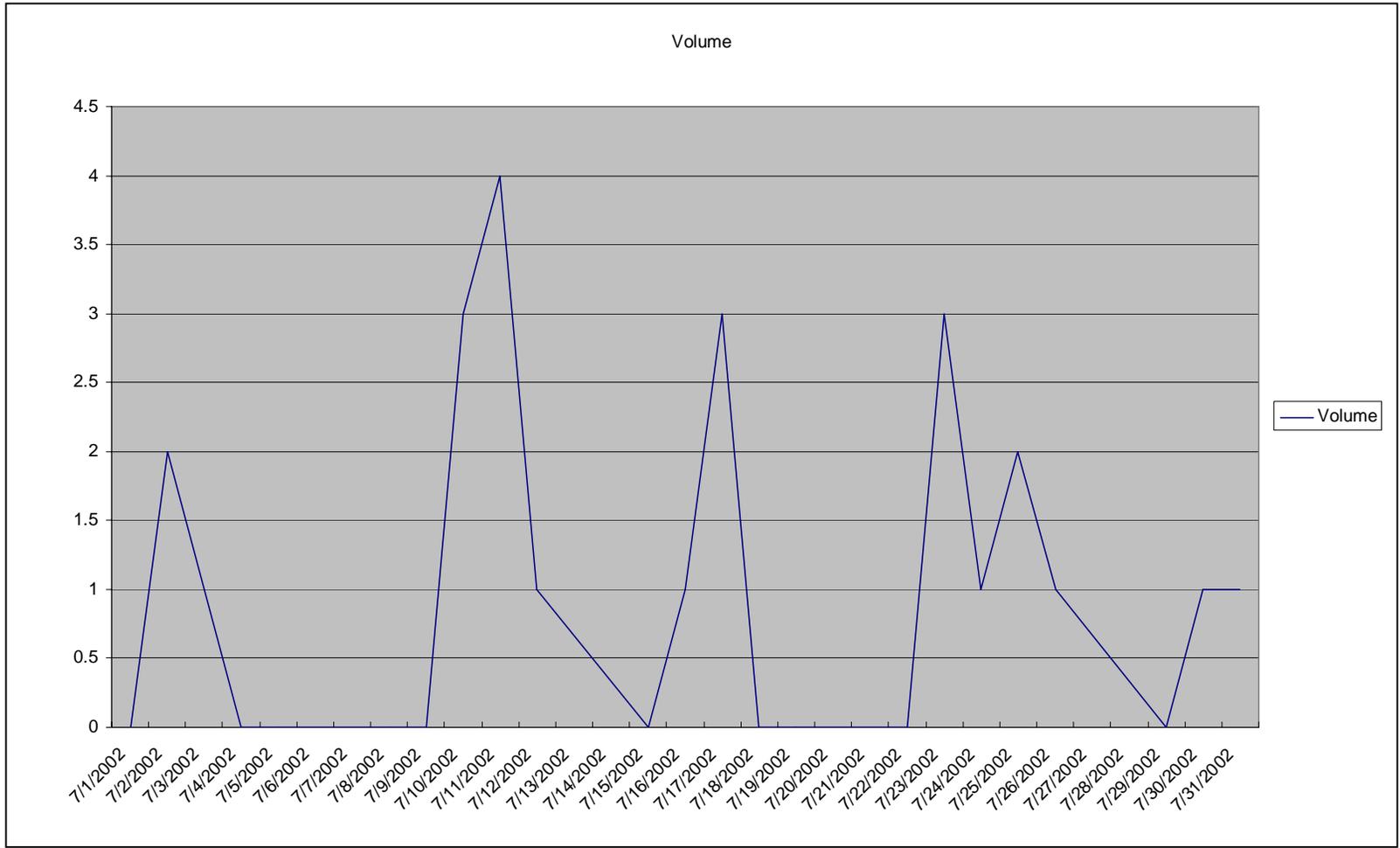
1. **Smoothing Elective Vascular Surgery**
2. **Smoothing Elective Cardiac Surgery**
3. **Separating Elective From Urgent Surgery in the Menino Pavilion**
 - Creating reliable urgency data
 - Separating a room for urgent/emergent cases
 - Eliminating Block Scheduling

Bed Need by Day of Week for Vascular Surgery (18 months of data)

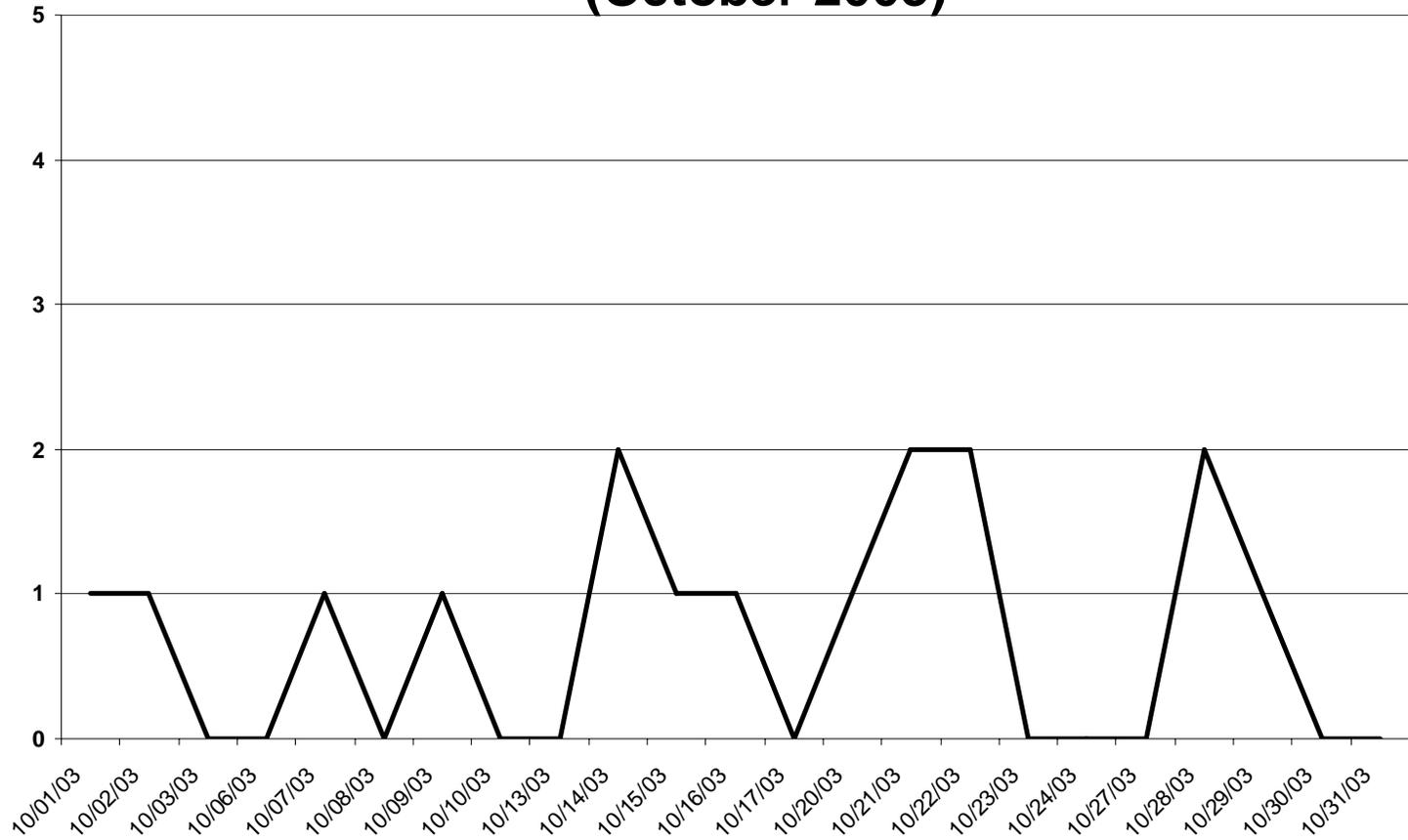


Vascular Elective PCU Cases by Day

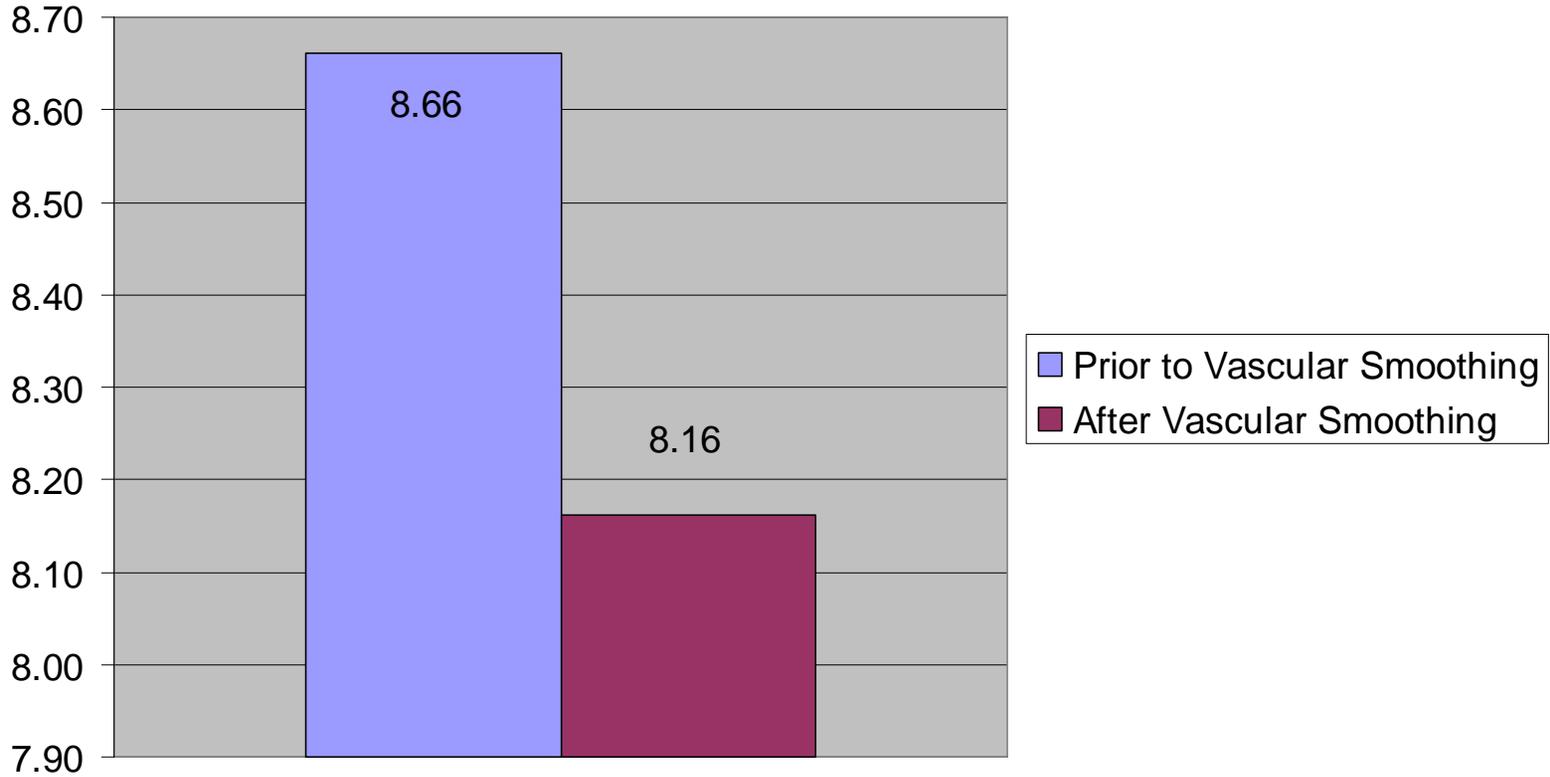
Random Month July 2002



Vascular Scheduled PCU Cases - Weekdays Only (October 2003)



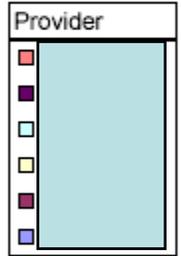
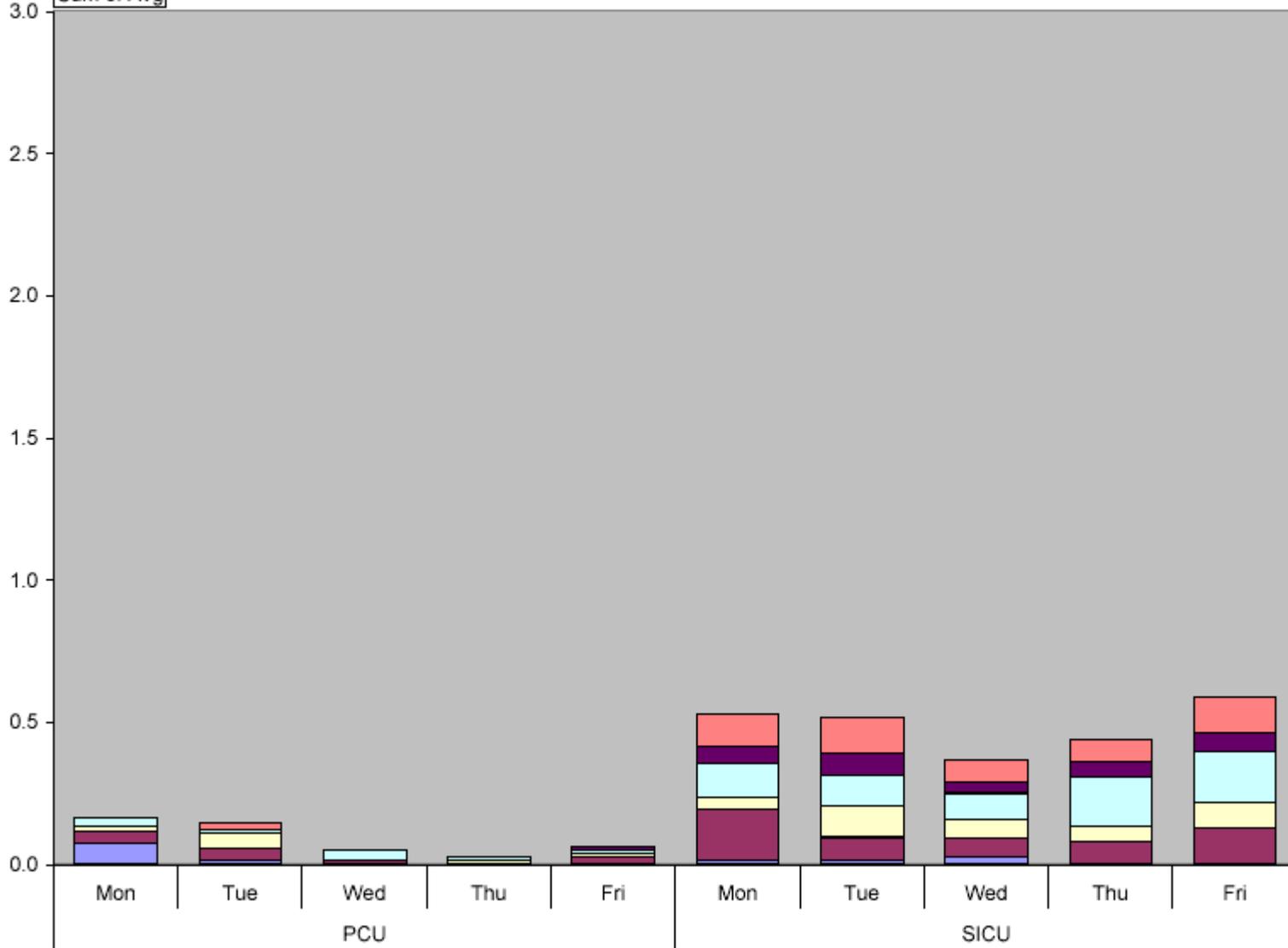
E6W Direct Nursing Hours per Patient Day



Case_Type | Unsched

Average CT Surgery Unscheduled Cases Weekdays

Sum of Avg

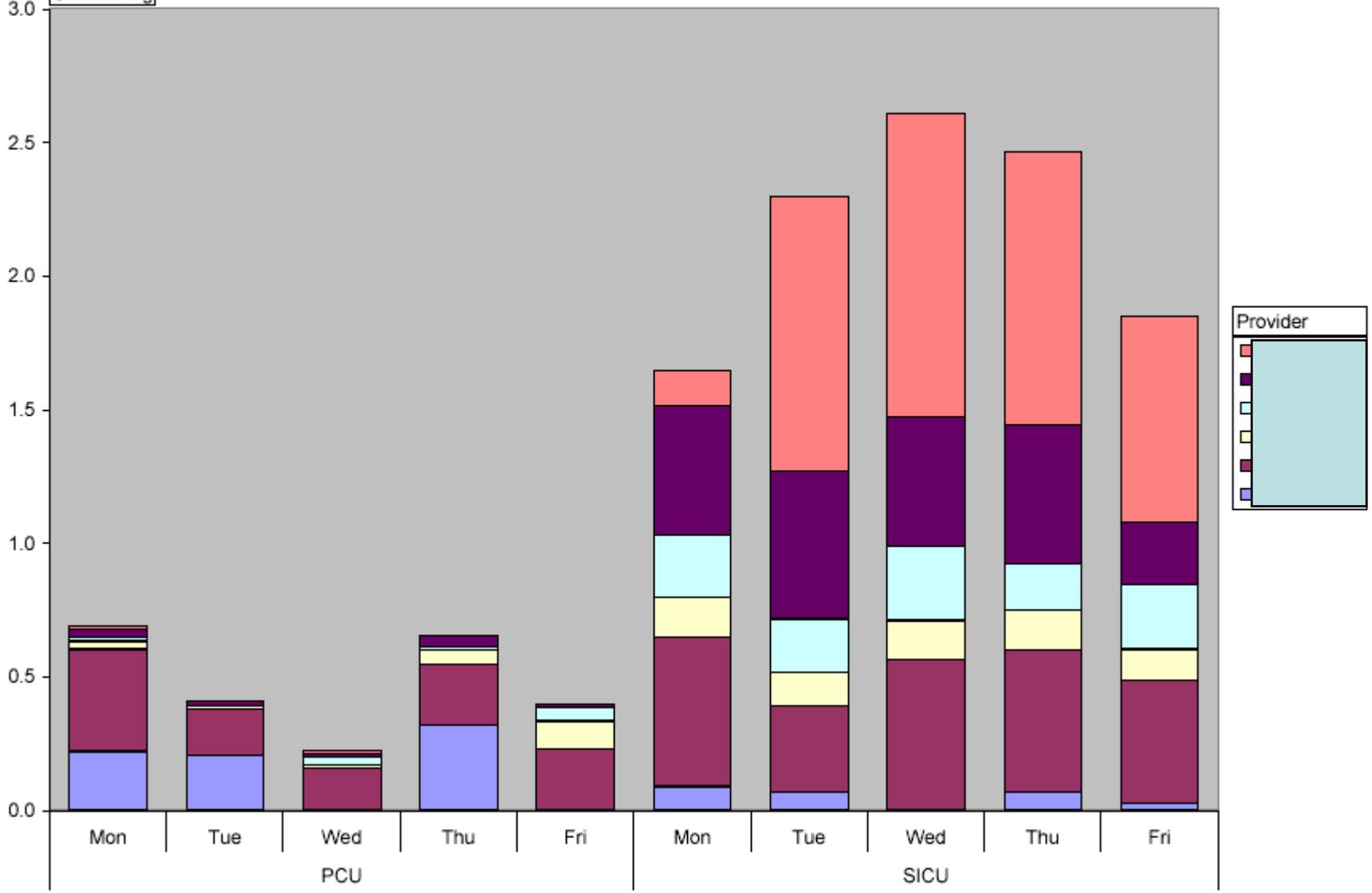


Location | DOWDesc

Case_Type Sched

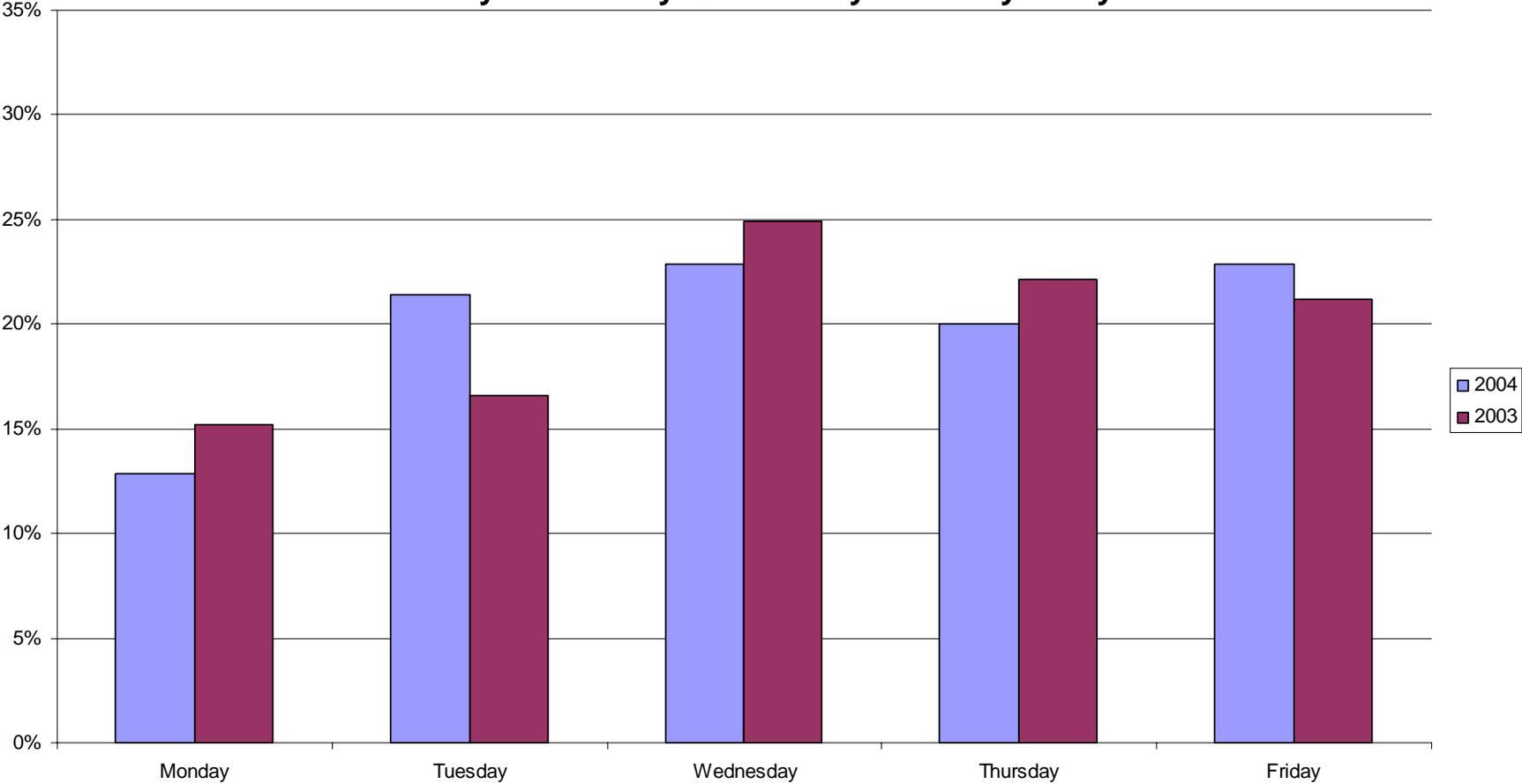
Average Scheduled CT Surgery Cases by Weekday

Sum of Avg

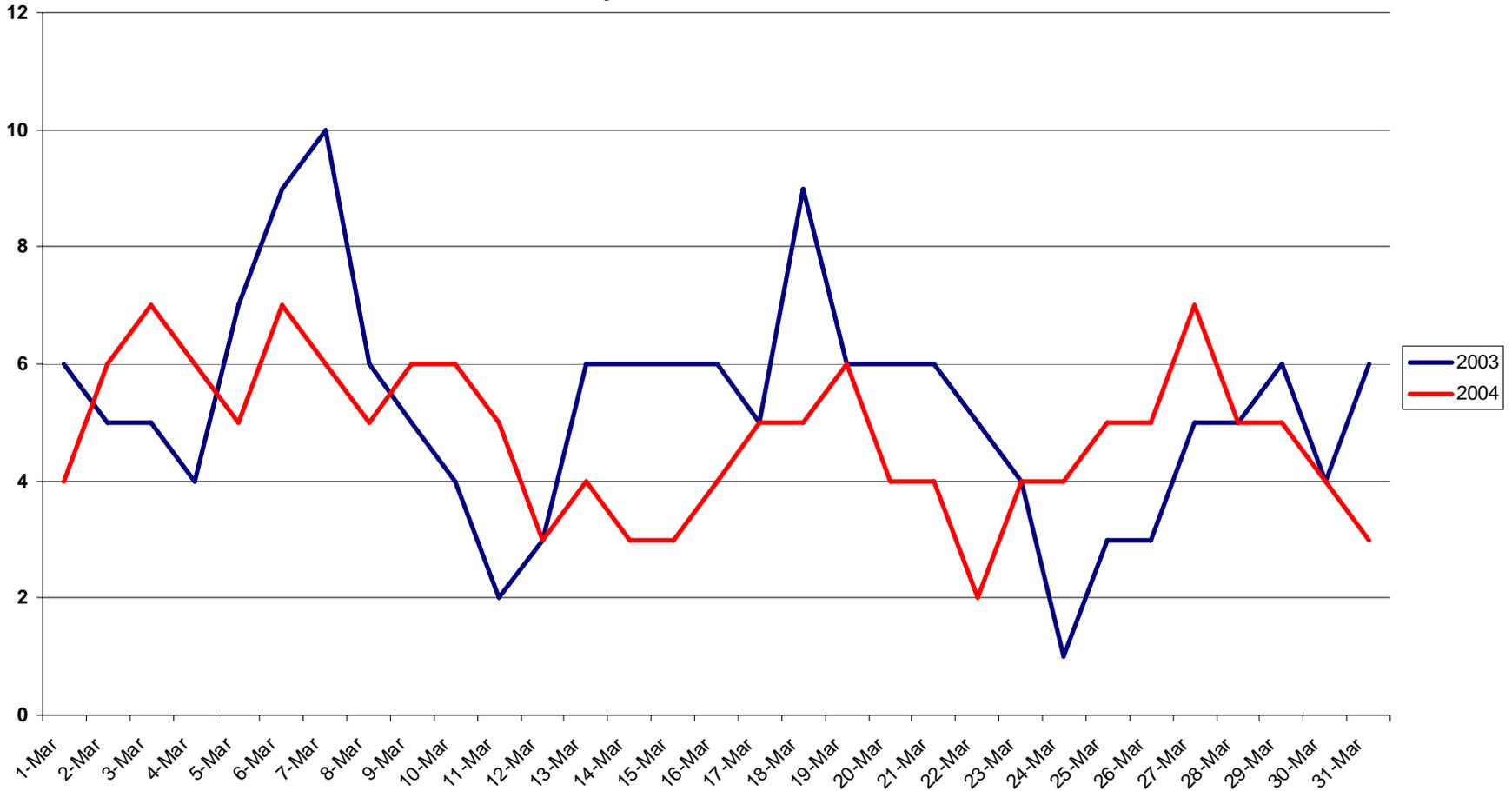


Location DOWDesc

Cardiac Scheduled Cases Histogram January & February Non-holiday Weekdays Only



March Daily PCU Census - 2003 vs. 2004



2003 range $10 - 1 = 9$

55% reduction in variability

2004 range $7 - 2 = 5$

Operating Outside of the Block at BMC

Separating the Flow of
Elective Surgery from
Urgent/Emergent Surgery



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Menino Pavilion compared to Newton Pavilion

Variable	NP	MP
# Rooms	13	8
# Cases Day	30-35	25-32
# Cases Year	8601	6608
Cancellation Rate	10%	20%
#Add Ons Per Day	1-2	5-12
#Weekend Cases	0-4	5-20
Unique Services	Cardiac, Ophth	Pediatrics, Trauma, Gastric Bypass, OB

Pre-change Problems with the Daily Schedule – Menino Pavilion

- Urgent/emergent bump elective cases
- Overall 50% block utilization
- Variable use of block (vacation, meetings)
- Most cases booked 3-4 days out
- 33% of daily schedule is “add ons”
- Variable release time between services
- Cases can be lost waiting
- People live in *fear* of losing their block

The Radical Changes

#1

Eliminated Block Booking

#2

One Urgent Room Created

OR 5



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Bumped Cases Before and After Separating “Flows”

Before

April 03 – April 04

- 349 emergent cases (M – F)
7:00 AM to 3:30 PM
- 771 elective patients were
delayed or cancelled

After

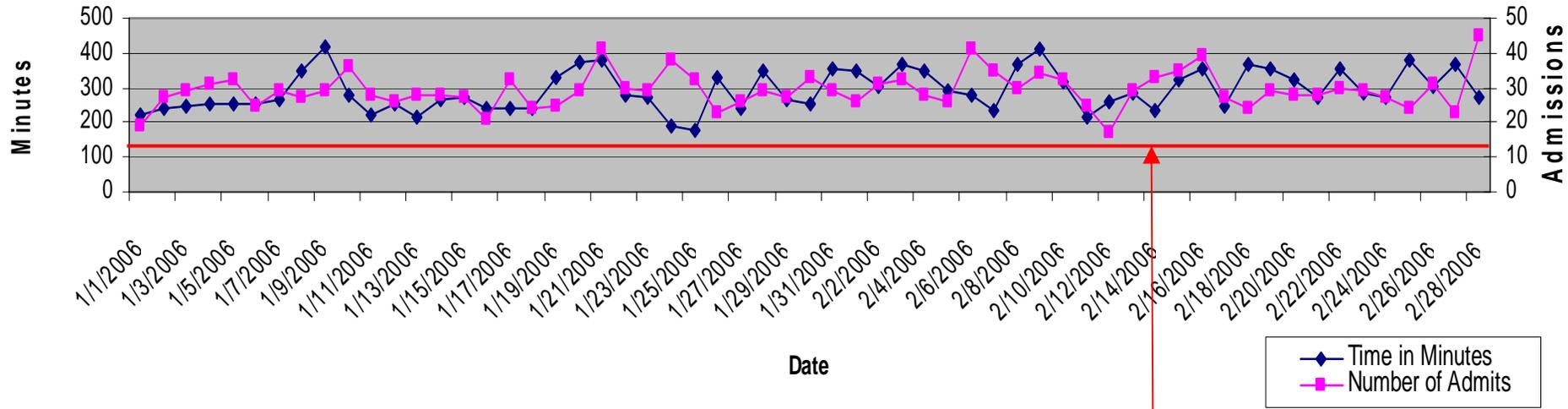
April 04 – April 05

- 354 emergent cases (M – F)
7:00 AM to 3:30 PM
- 7 elective patients were
delayed or cancelled



Norwood: Biggest Operational Dilemma

Daily ED Admits and Time from Decision to Departure



Goal = 120 minutes

Time

Range = 176 – 418 minutes (3 hours – 6 hours)

Mean = 300 minutes (5 hours)

Number of ED Admits

Range = 23 – 45

Mean = 30



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What is the true constraint?
Physician workup in the ED.

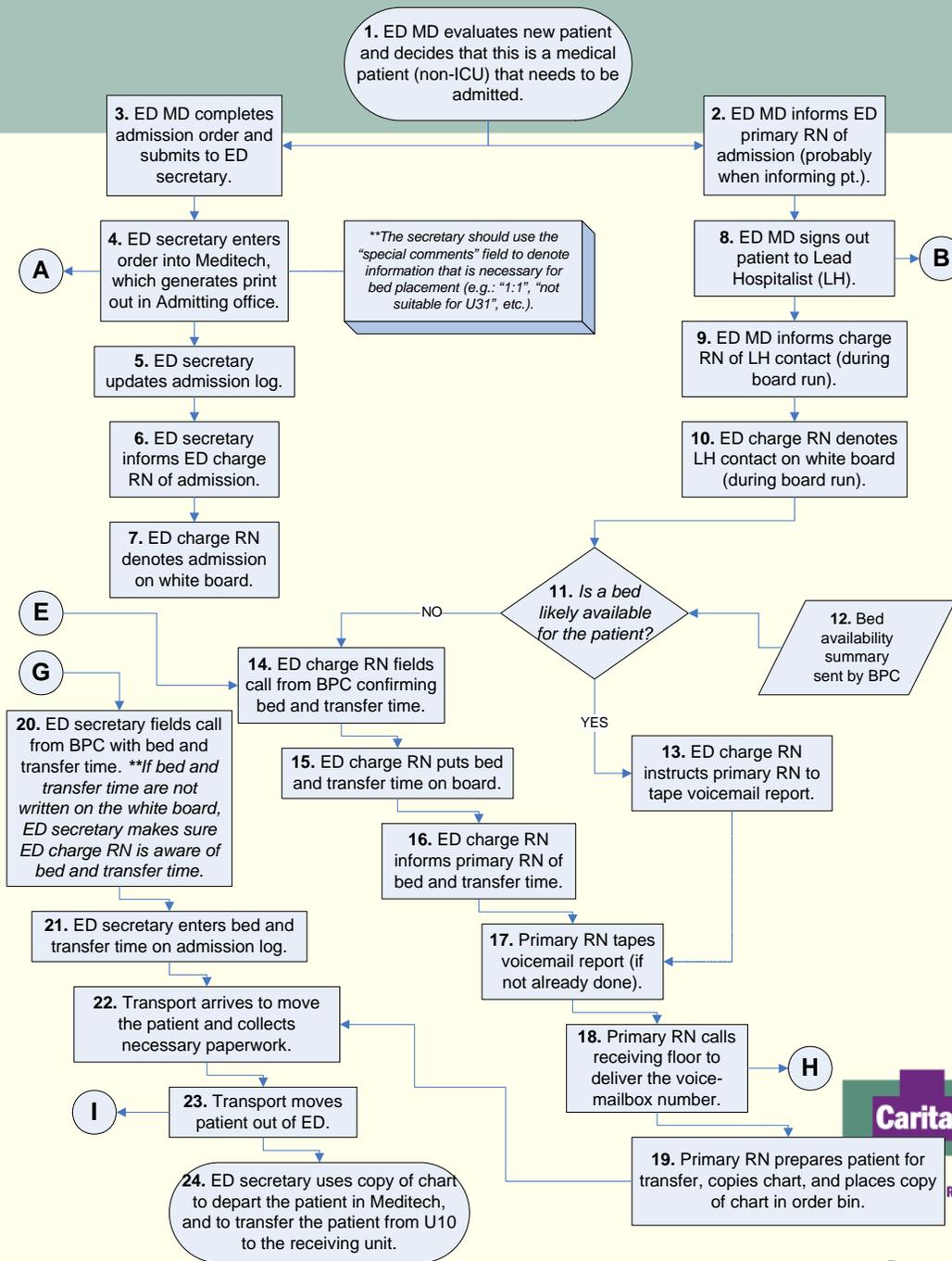
Find it and *elevate* it.
Moved to the inpatient unit.

What is now the true constraint?
Floor not ready.

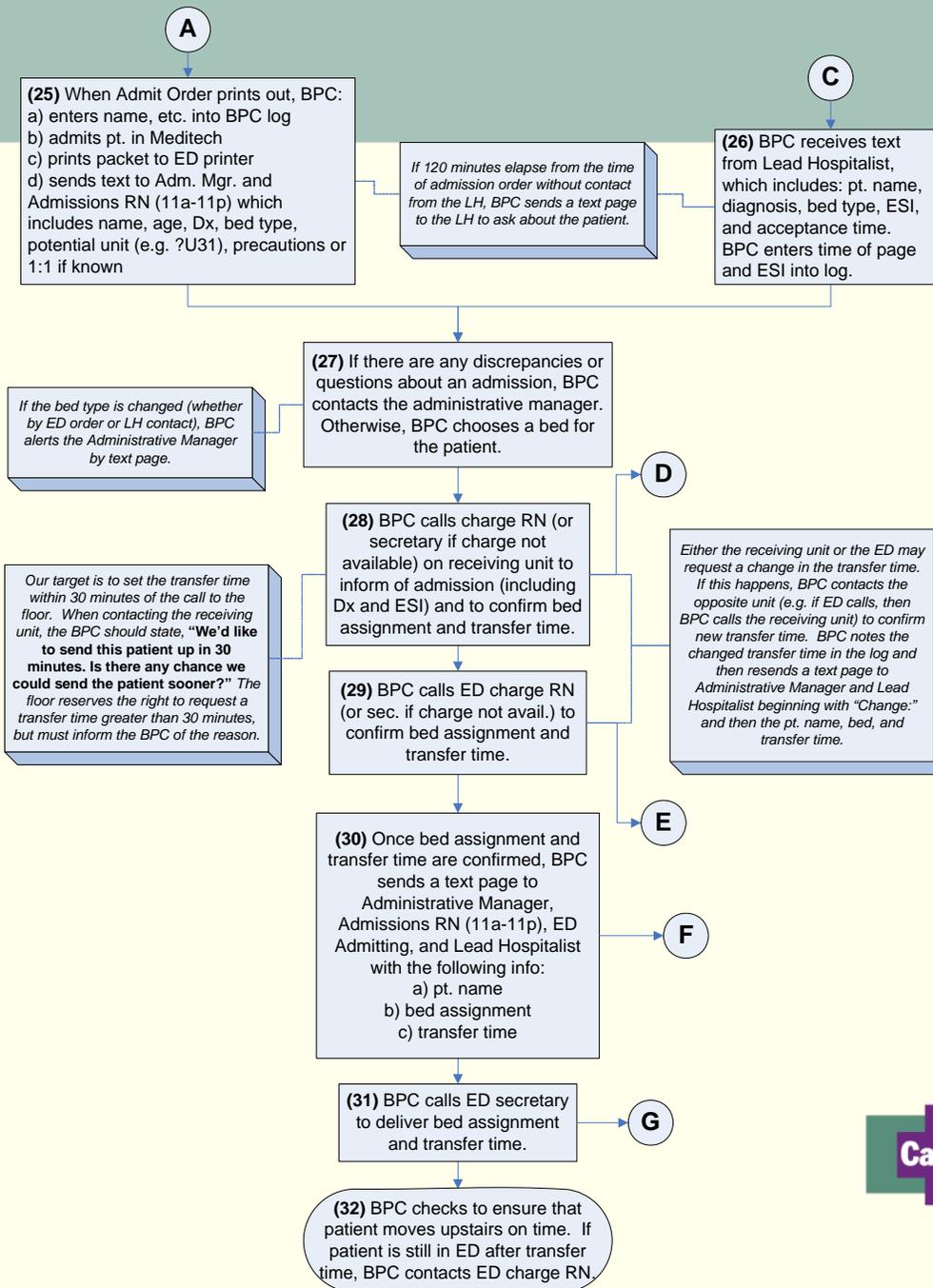
Find it and elevate it.
Create Transfer Time.

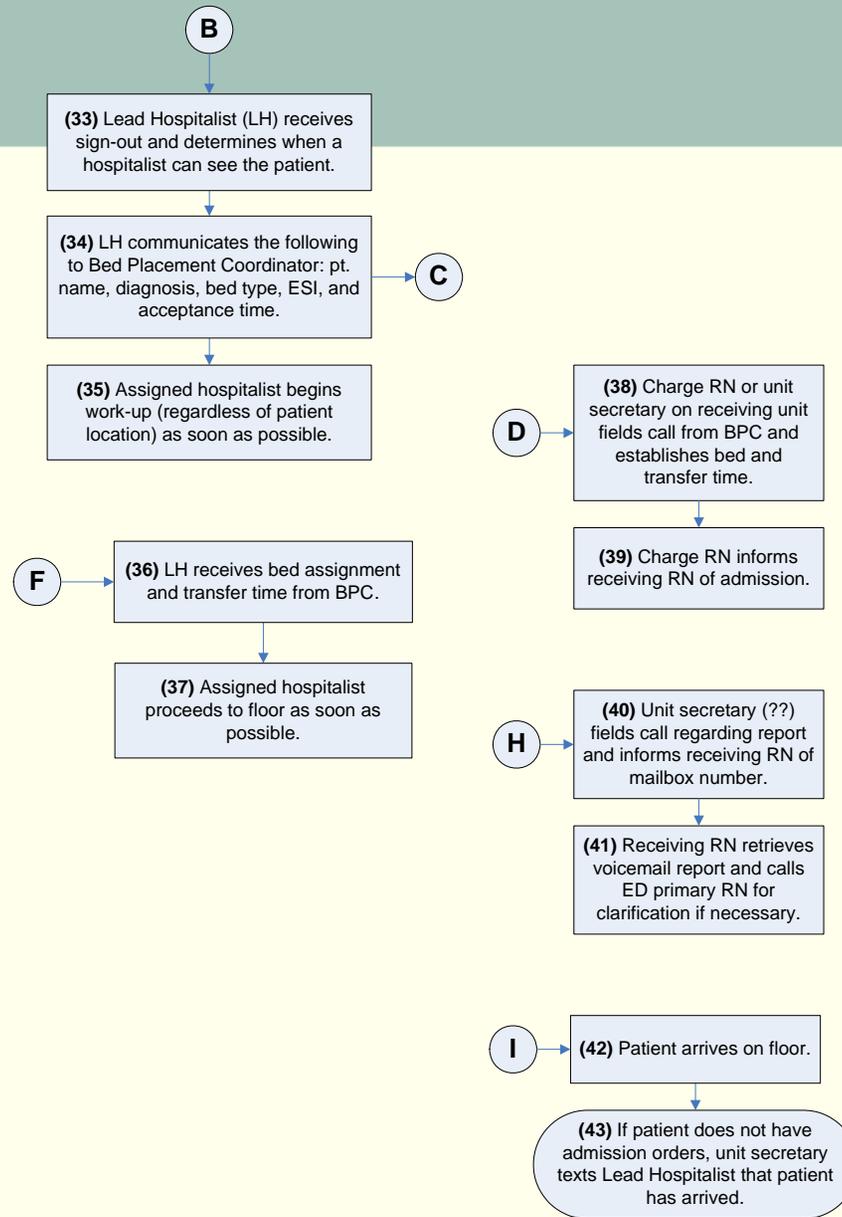
Some other constraints

- **No transporter**: included transport in synchronization and added transport capacity
- **No nurse to staff an inpatient bed**: stopped staffing to monthly historic mean; create prediction software based on historic natural variability and today's census for tomorrow

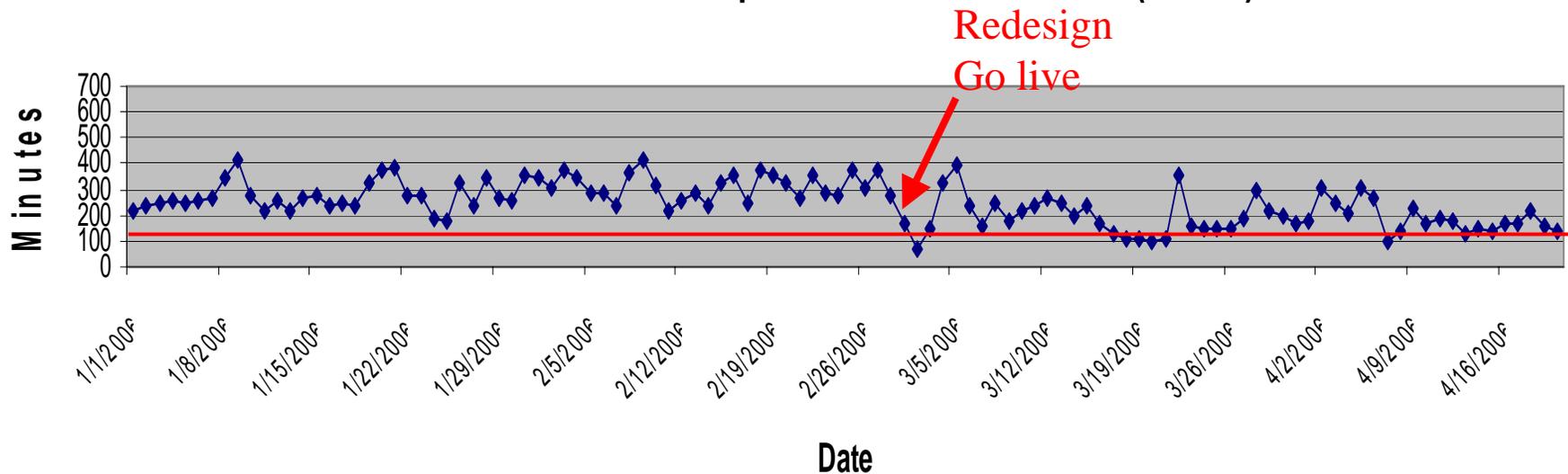


ED Medical Admissions Process: THE BED PLACEMENT COORDINATOR



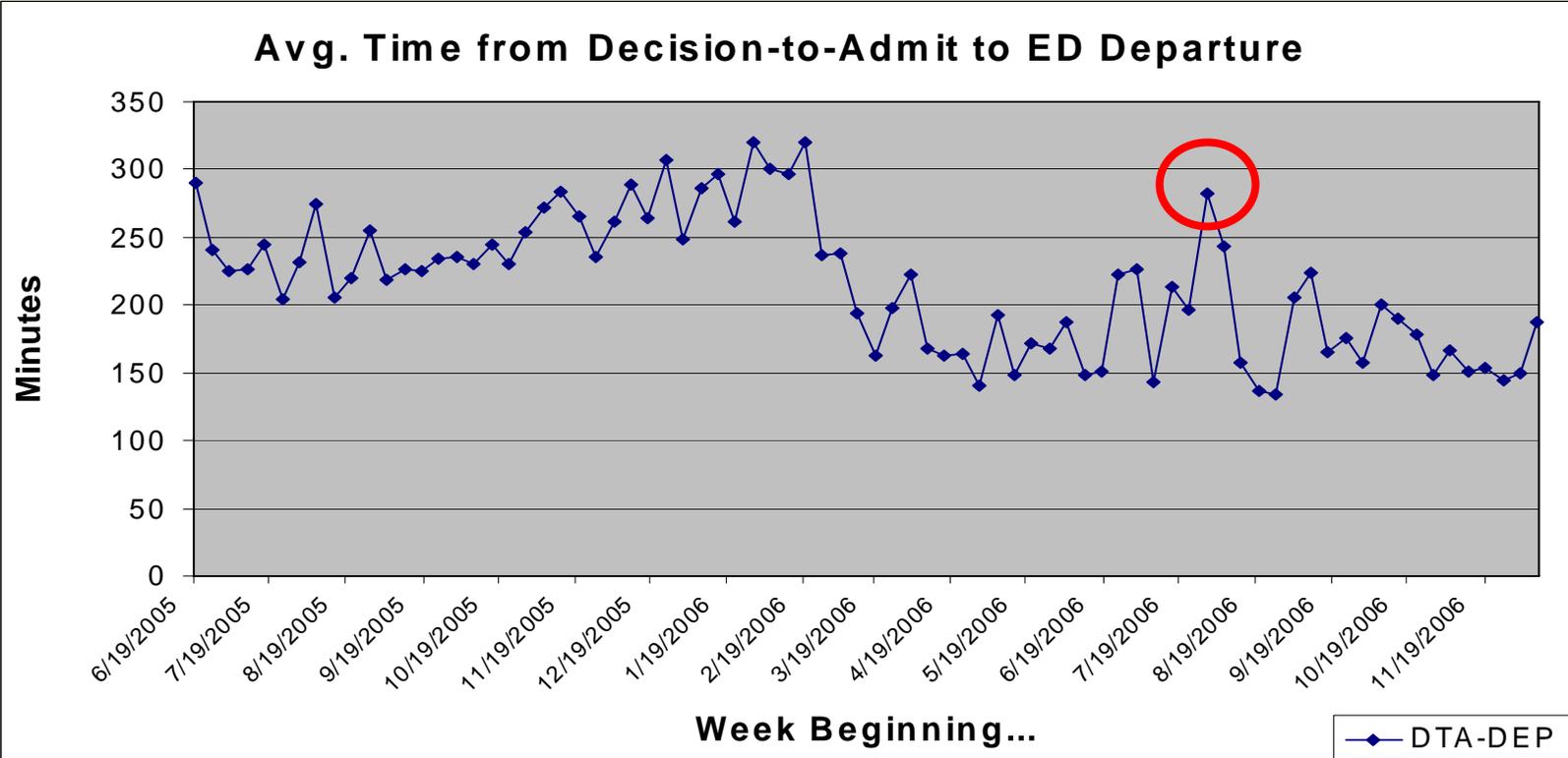


ED Time from Decision to Departure and Total ED LOS (admits)

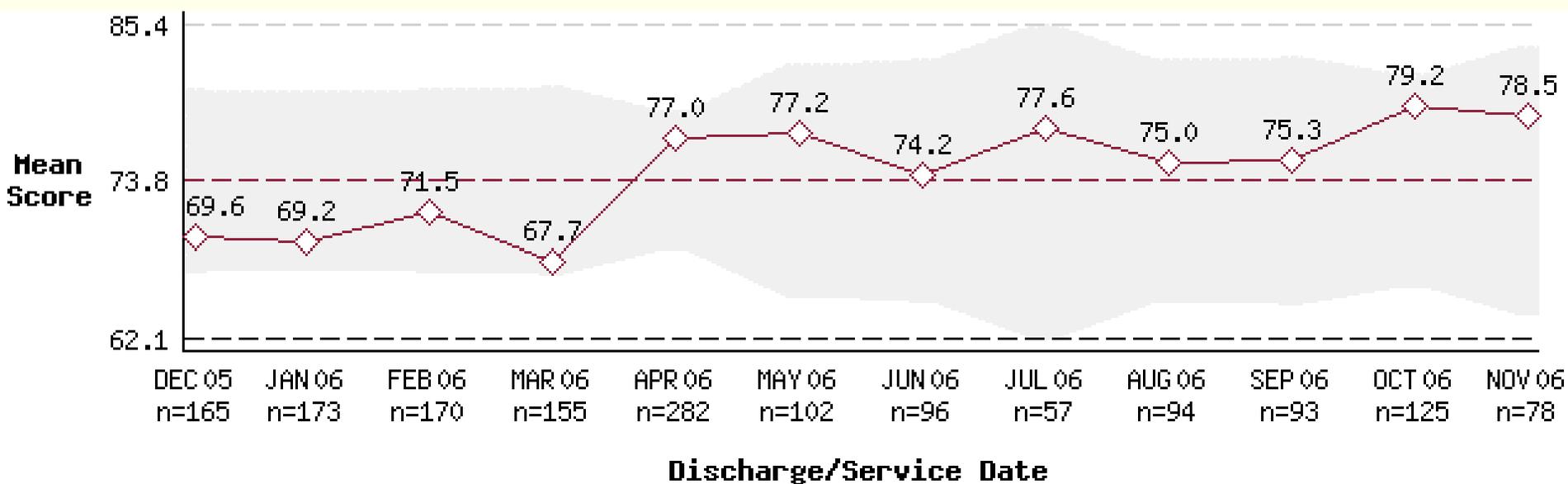


SERVICE

Reduce the average time from ED admission decision to departure to inpatient unit to 120 minutes calculated monthly.



Question Mean Score: Speed of Admission



Key change concepts of the Design

- **Do tasks in parallel**: move the patient to the floor while the workup continues
- **Synchronize**: assign a transfer to floor time (creates pull) after communication with charge nurses and hospitalist
- **Central command**: all beds are assigned by the nursing supervisor/bed facilitator
- **Direct Communication**: ED physician hands-off to Hospitalist
- **Predict Demand**: Use data on natural variability to get ready for staffing changes

Summary

- There is much artificial variability in healthcare. We can no longer afford this waste.
- We must redesign our systems to maximize flow which will make our patients safer, improve volume, staff and patient satisfaction and reduce the waste.
- Separating the flow of urgent surgery from scheduled surgery reduces waste and rework.
- No-Block scheduling is a good way to help the surgeons, patients, and staff.
- All hospitals should map inpatient flow and test changes to improve it.

References

- **The Goal; by Eliyahu Goldratt**
- **Leading Change; by John P. Kotter**
- **The Improvement Guide; by Langley et al**
- **<http://management.bu.edu/research/hcmrc/mvp/index.asp>**
- **Rathlev NK, Chessare J, Olshaker J, Obendorfer D, Mehta SD, Rothenhaus T, Crespo SG, Magauran B, Davidson K, Shemin R, Lewis K, Becker JM, Fisher L, Guy L, Cooper A, Litvak E. Time Series Analysis of Daily Emergency Department Length of Stay. Ann Emerg Med 2007; 49:265-271**