Implementation of an ED Passive Tracking System Using a Business Process Approach

Business Process Development
Implementation
Effects Analysis

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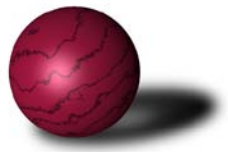
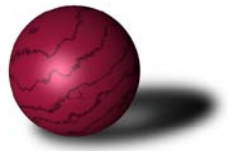


Christiana Hospital

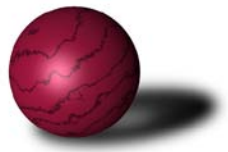
- Large regional referral center in Delaware (ranked 21st among top 25 ED's in U.S. for patient volume)
- Level I Adult & Pediatric Trauma Center
- Multiple residency programs, including EM and surgery
- Licensed for 780 Beds
- ED Census >94,500 visits
- Trauma Census >2,700 admissions



EMERGENCY

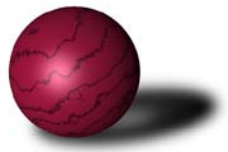
Christiana Hospital Baseline State

- 55 +/- treatment bays in 5 “core” areas in 2004 (now 76 treatment rooms)
- Frequent overcrowding-- at times 40-50 patients at triage and in waiting room
- Patients hard to find (physical location)
- Overall state of the ED very hard to determine, let alone manage



Project Description: EDTracker ™

- Design of business process & installation of a passive input using infrared technology to provide real-time tracking of both patients & ED Staff to enable:
  - Rapid determination of patient status and location
  - Elapsed wait time at various stages in care
  - Historical record of patient/staff contact (safety)
  - Interface with lab and radiology results
  - Enhanced communication with other areas relative to ED activity and need



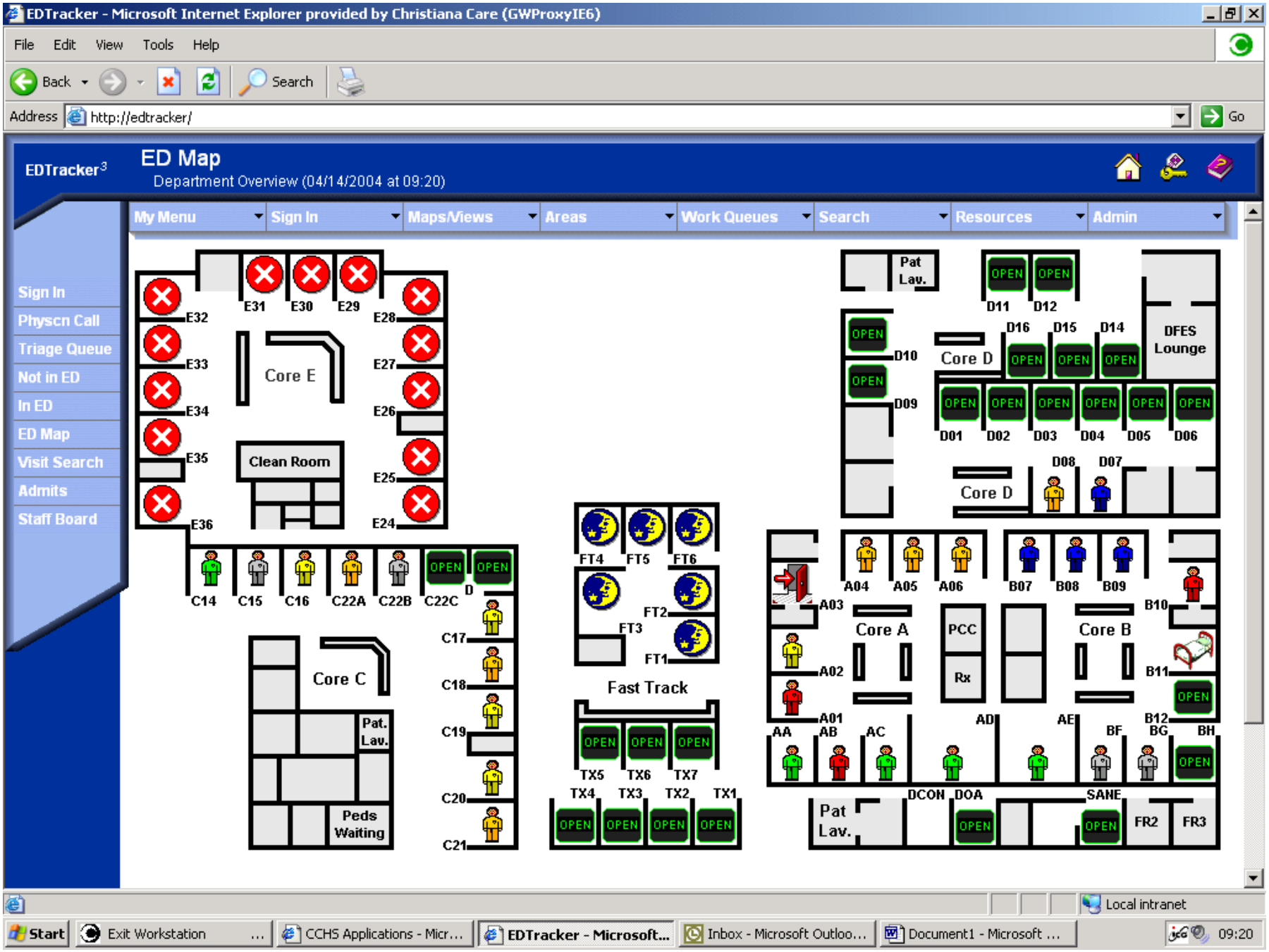
EDTracker ™ – Product Overview

- Patients & staff assigned an infrared badge; Critical equipment also tagged & tracked.
- Infrared readers installed in the ED ceiling ***only*** in clinical areas; patient movement is tracked as the patient moves under the sensors.
- Staff interaction with patients is captured.
- System visually maps ED to show patient location.
- Interfaces with lab & radiology allow results tracking

EDTracker Patient Badge with Plastic Backing

EDTracker Staff Badge

EDTracker Infrared Sensor


EDTracker - Microsoft Internet Explorer provided by Christiana Care (GWProxyIE6)
File Edit View Tools Help
Back Search
Address http://edtracker/
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EDTracker3
ED Map
Department Overview (04/14/2004 at 09:20)
My Menu
Sign In
Maps/Views
Areas
Work Queues
Search
Resources
Admin
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Triage Queue
Not in ED
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ED Map
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Staff Board
E31 E30 E29 E32 E33 E34 E35 E36 E28 E27 E26 E25 E24
Core E
Clean Room
C14 C15 C16 C22A C22B C22C D C17 C18 C19 C20 C21
Core C
Pat. Lav.
Peds Waiting
FT4 FT5 FT6 FT2 FT3 FT1
Fast Track
TX5 TX6 TX7 TX4 TX3 TX2 TX1
Pat Lav.
D11 D12 D10 D09 D16 D15 D14 D01 D02 D03 D04 D05 D06 D08 D07
Core D
DFES Lounge
A04 A05 A06 B07 B08 B09 A03 A02 A01 AA AB AC AD AE BF BG BH B10 B11 B12
Core A
PCC
Rx
Core B
DCON DOA SANE FR2 FR3
OPEN
Local intranet
Start
Exit Workstation
CCHS Applications - Micr...
EDTracker - Microsoft...
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EDTracker Spreadsheet View

Business Drivers

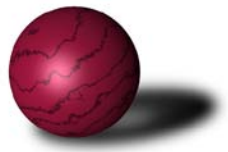
Where is the patient?

- During peak periods, volume exceeds capacity
- Patient tracking via the HIS bed assignment system was manual and error prone (only accurate 70-80% max)

Who needs to know where the patient is?

- ED staff: doctors, nurses, clerical and tech's.
- Hospital staff: clinical, ancillary and escort.
- Outside: family/friends, physicians, clergy, law enforcement.

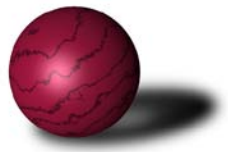
Patients can become "lost" in the ED!



Business Drivers (continued)

Emergency Department Readiness

- Overall ED acuity level was very difficult to determine.
- Overview of current ED capacity & demand on that capacity was hard to assess.
- Accurate projection of required inpatient beds difficult.
- The capability to react to external emergency or disaster situations can be slowed by gaps in the above information.



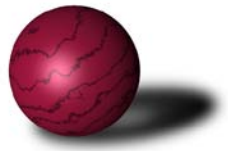
Business Drivers (continued)

Departmental Length of Stay

- Overall LOS was well above norms (4-6 hours).
  - Reduced LOS improves ED throughput.
  - Excessive LOS contributes to suboptimal patient satisfaction & increased risk of adverse events.

Leave Without Being Treated

- Lost opportunity of ~ 3500 visits and $630,000 in revenue/year due to LWOT patients (FY 2004)



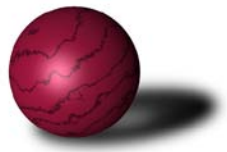
Business Drivers (continued)

Patient/Staff Interactions

- Risk to staff safety from infectious disease, lethal agents or a bioterrorism event – unable to identify all care providers who may have had contact.
- Unable to accurately respond to complaints about clinical service (who saw the patient, when, for how long).

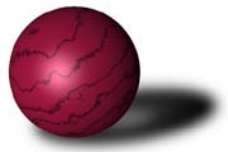
Lab and Rad Results

- Delays in determining order status and results.
- Process inefficiencies due to printing results.



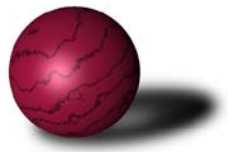
Process and Capability

- Opportunities offered through use of EDTracker:
  - Staff safety (staff encounter tracking for infectious agent / contaminant prophylaxis and follow-up as needed)
  - Visual clues that drive work flow efficiencies to increase ***patient throughput***
  - Inter-departmental communication and work flow (bed management, patient transport, ancillary services) to improve care / patient safety



Scope

- Tracking for all emergency patients and ED staff
- Interfaced with registration (HIS then Cerner)
- Interfaced with laboratory and radiology
- Improved communication with bed access personnel with **EDAdmit** and patient escort staff to facilitate transport



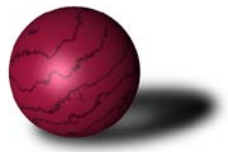
Project Implementation Overview

Business process analysis: Define current and future state flow, integrating EDTracker™

Involve both front-line staff and high-level project decision makers in brainstorming sessions to plan process changes

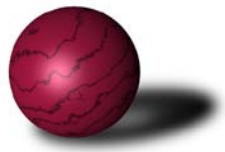
Decide what you want your world to look like with the capabilities of the new technology (very time consuming – 30 hours)

Be willing to champion *change* & fix dysfunctional systems!

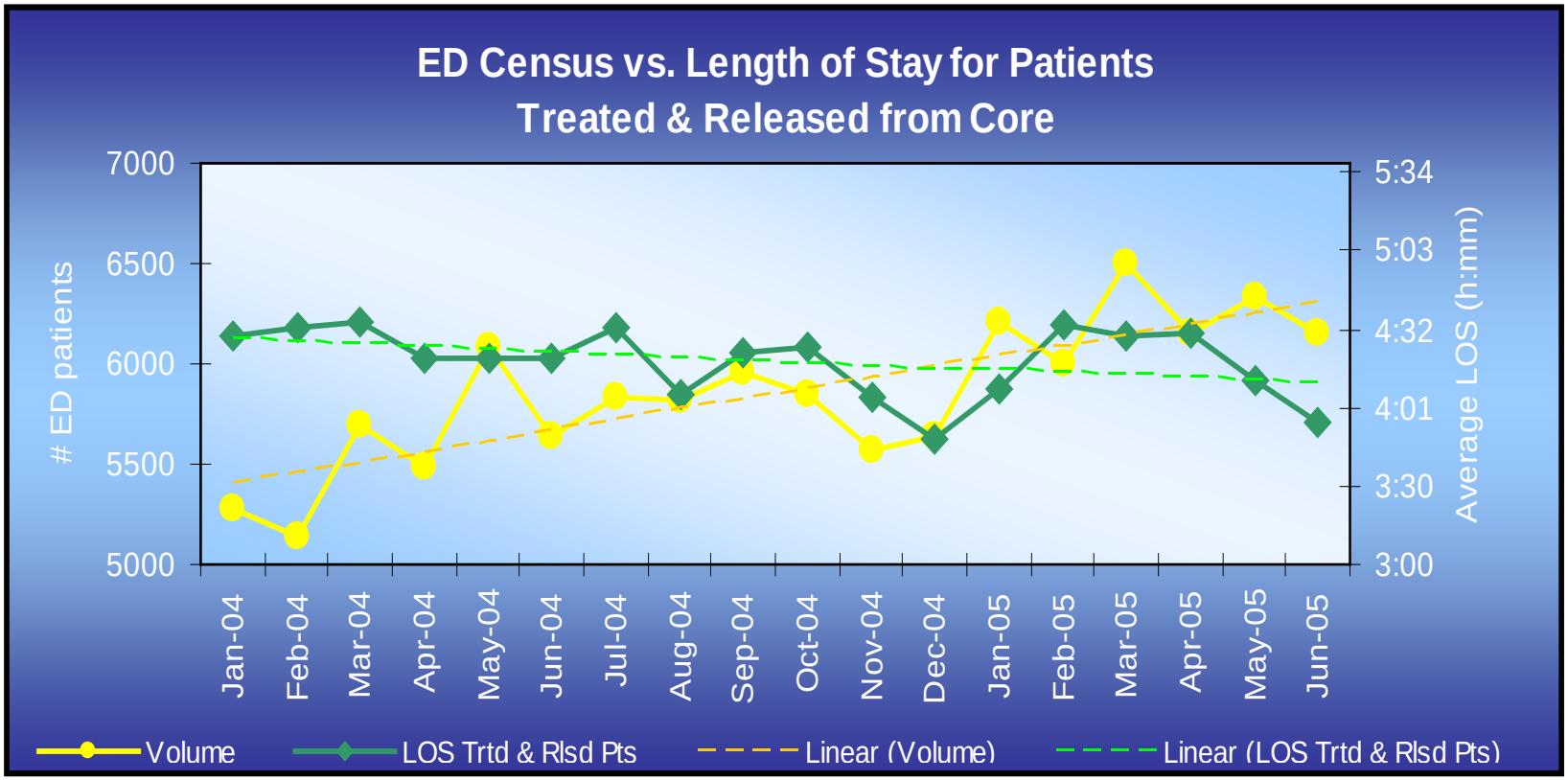


Project Timeline

- Federal bioterrorism grant proposal to support purchase 11/03; secured 2/04
- Executive approval: 4/04
- Steering committee formed: 6/04
- Business processes defined: 7/04 – 9/04
- Hardware installation: 08/04
- Software and interface testing: 10/04
- ED Staff education (4 hours/session – all MD / RN / clerical & tech staff): 10/04
- Christiana Hospital ED Go-Live: 11/9/04

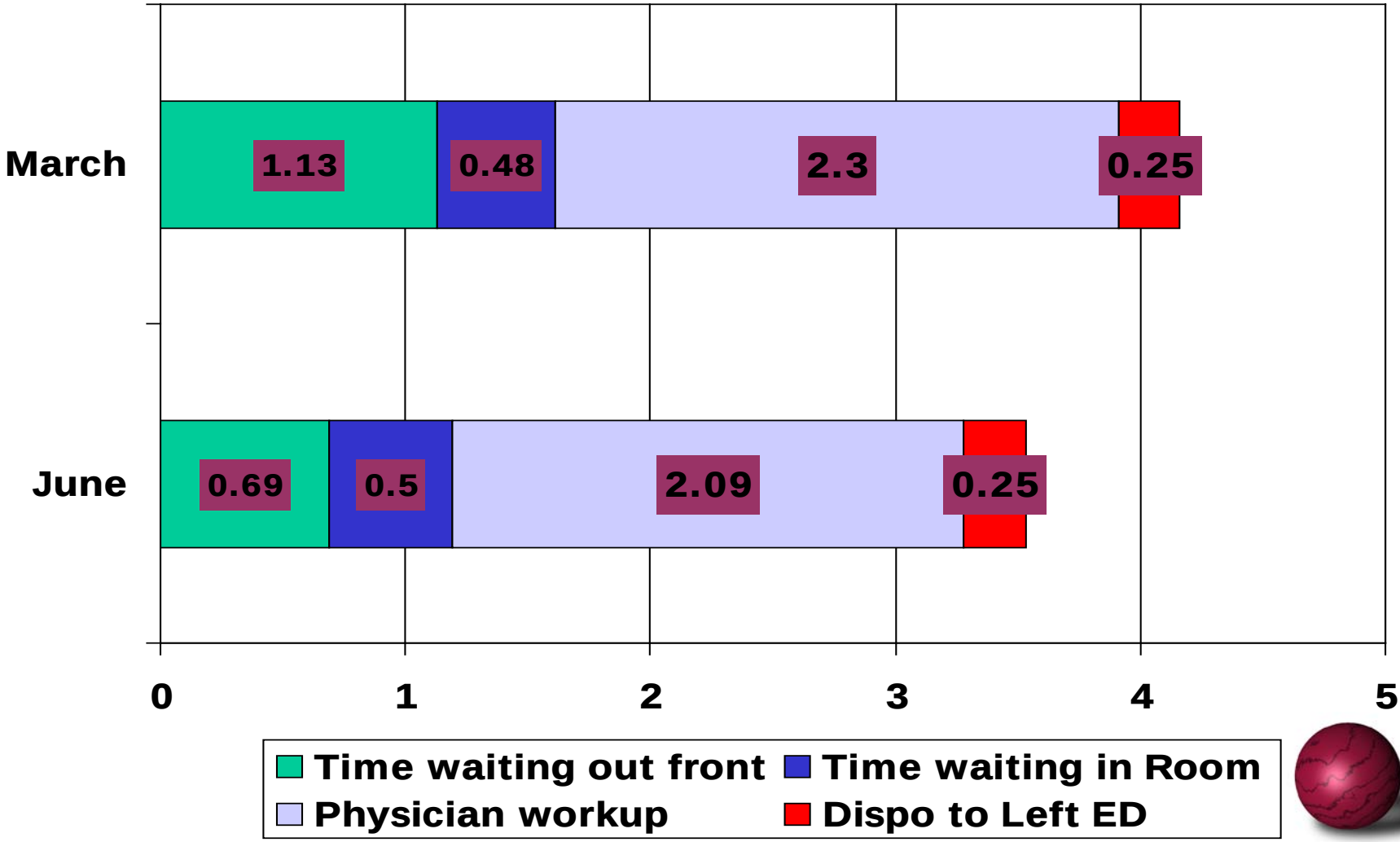


Results

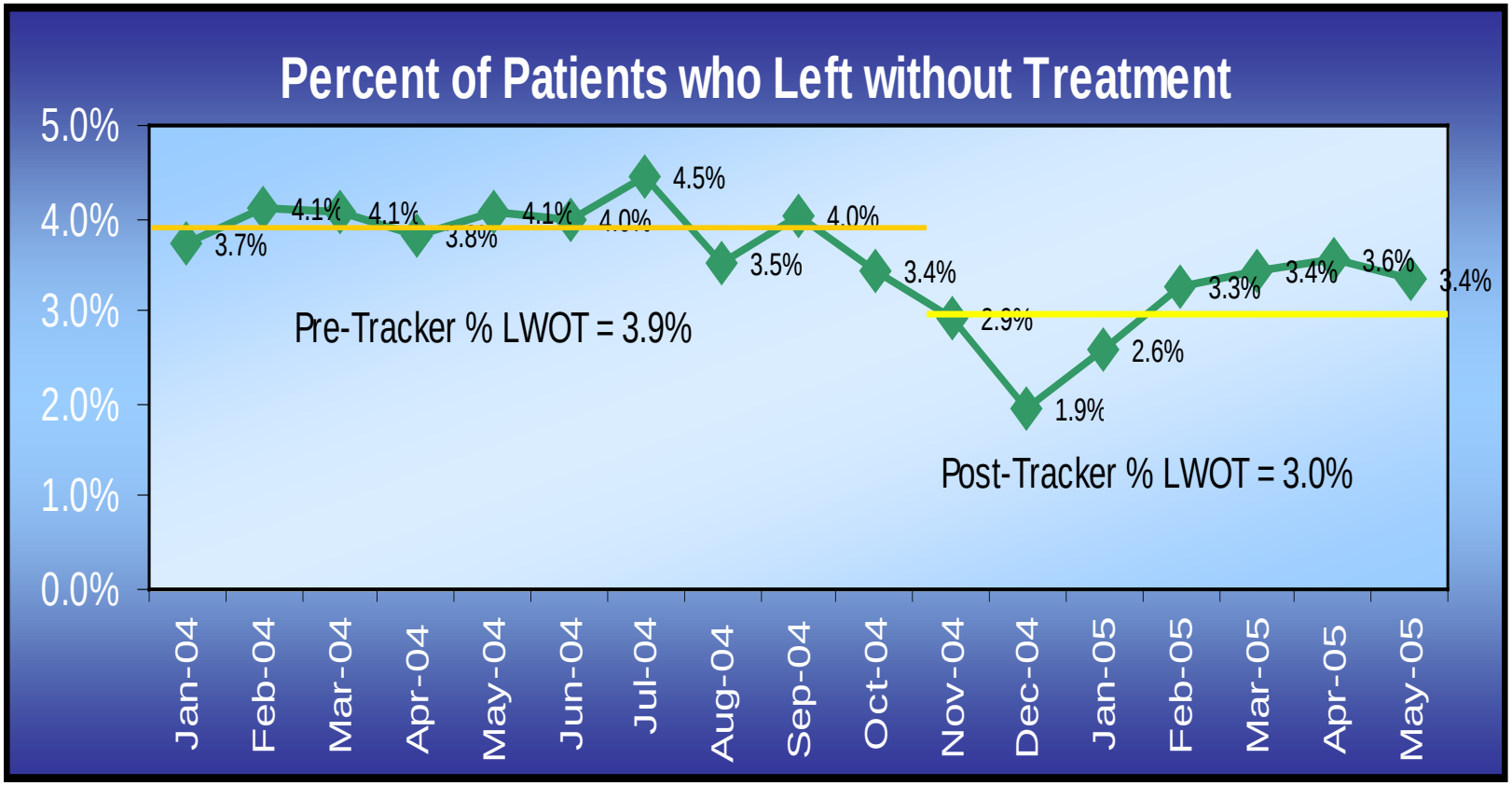


- **ED average LOS (time from triage to exit ED) decreased by 14 minutes post-implementation. During that same period, the volume of patients treated & released from the ED Core increased by > 7%**

Median Composite Visit, Discharged Patient, March vs June 2005

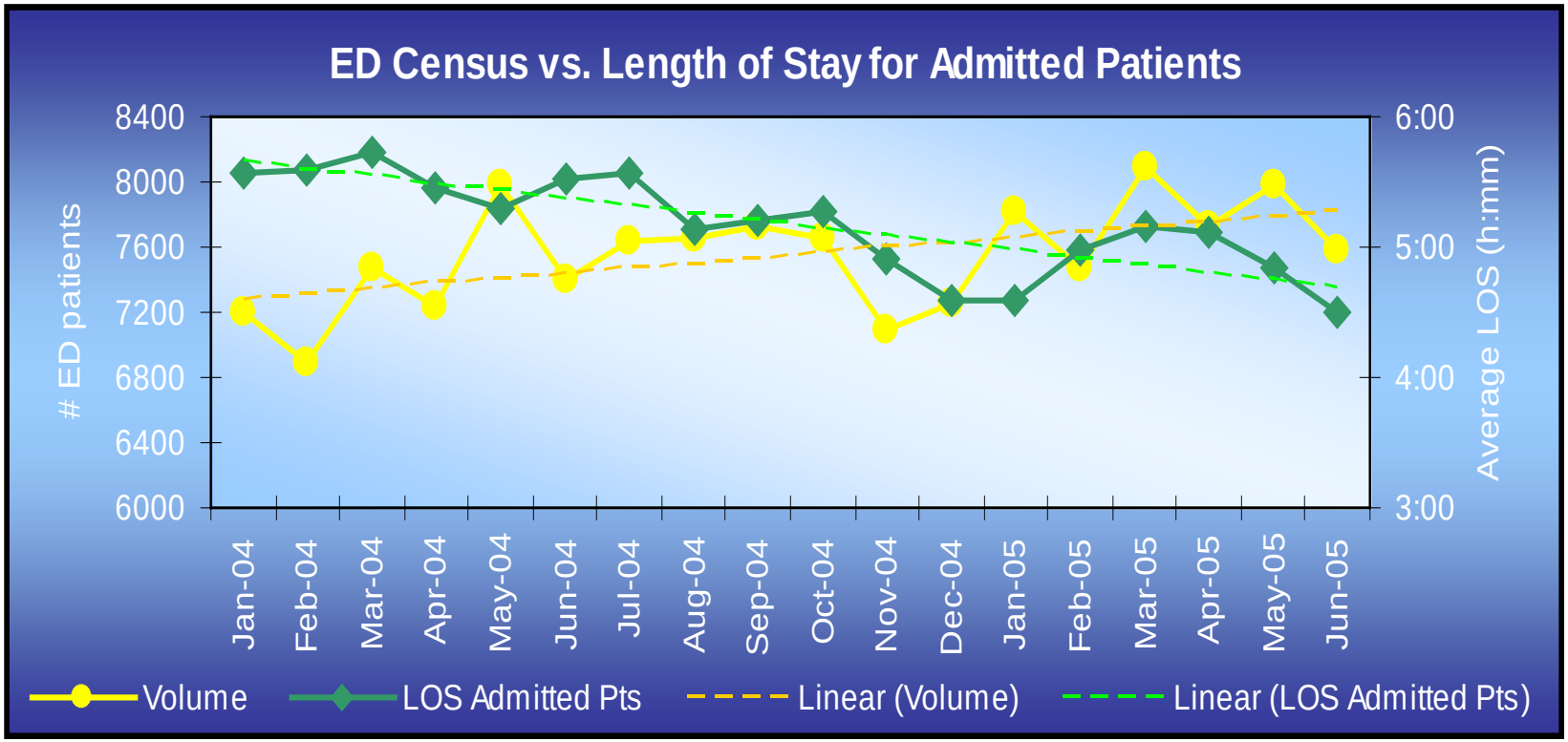


Results



- **24% decrease in percent of patients who LWOT**
- **LWOT rate is monitored to help promote access to treatment and enhance patient safety**

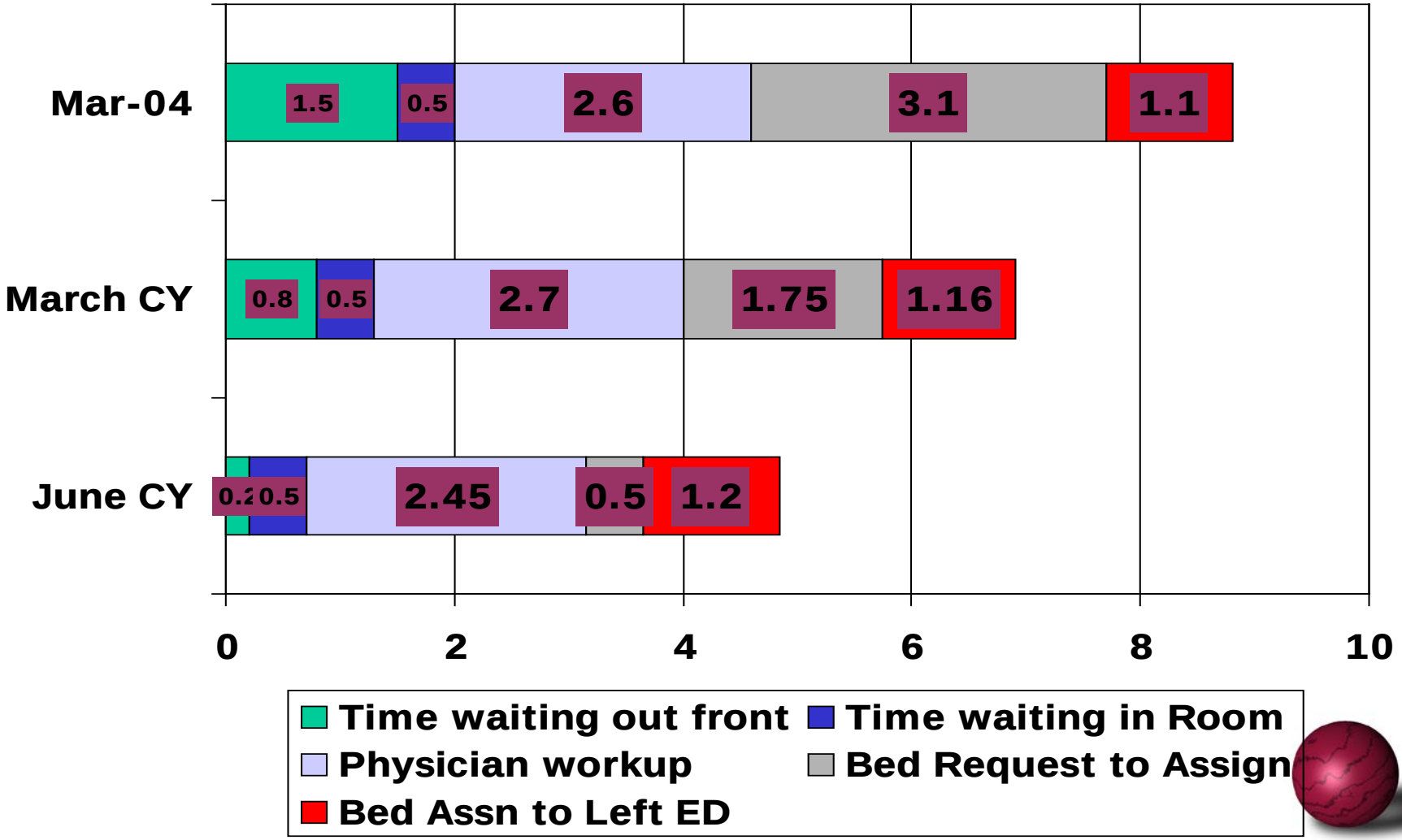
Results



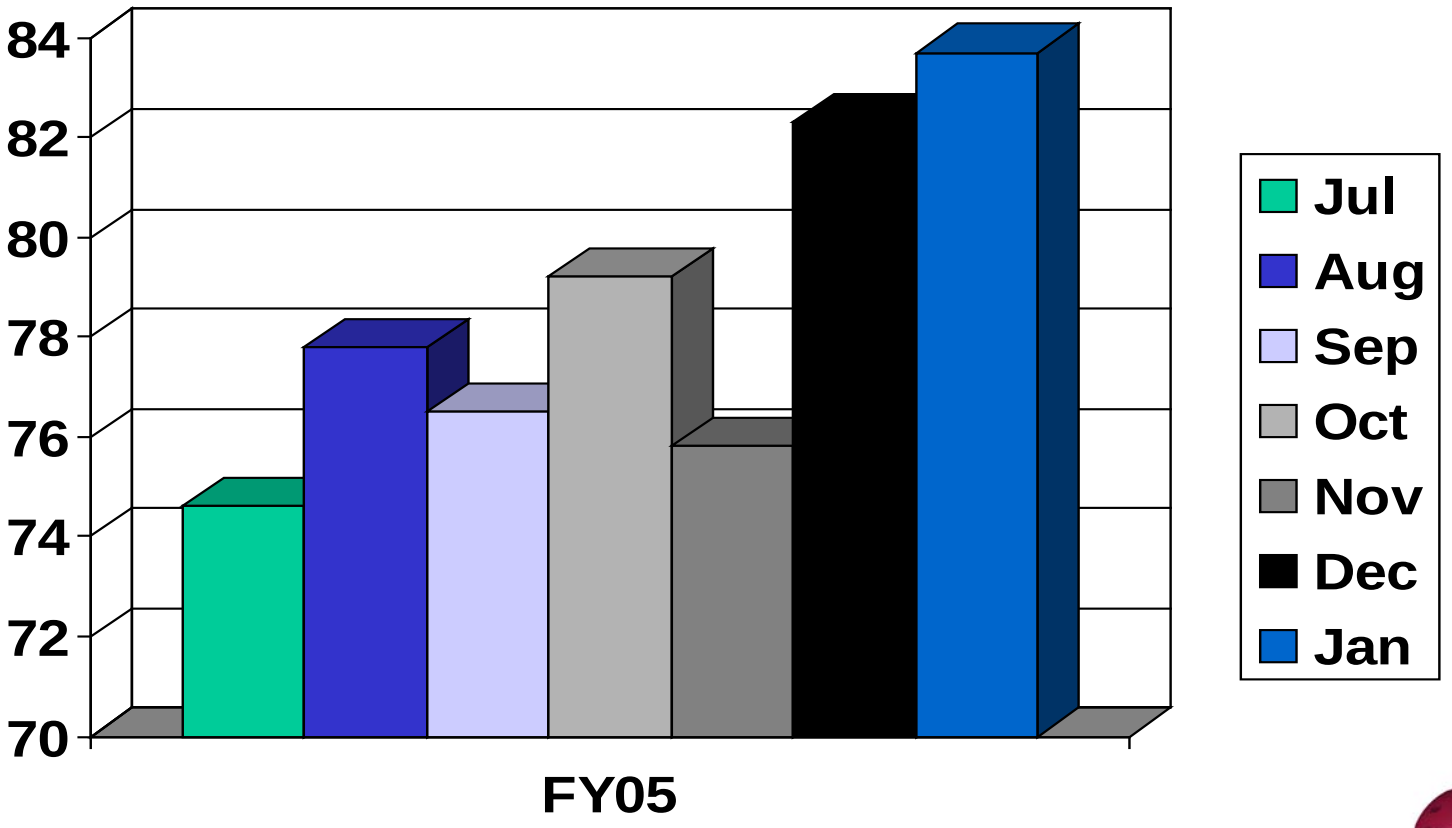
- **ED length of stay (time from triage to exit ED) decreased by 36 minutes post-implementation, although the volume of patients in the ED increased**

ESI Level	Admit Percent	ED LOS (Hours)
1	71	1.4
2	62	4.1
3	34	4.6
4	8	3.1
5	<2	2.3

Median Composite Visit, Admitted Patient, Pre-Implementation vs March and June 2005

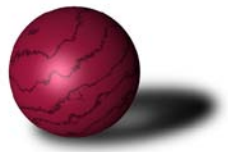


Christiana Hospital
ED Patient Satisfaction



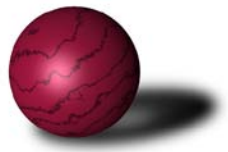
Other Operating Goals Achieved

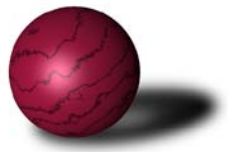
- Enhanced communication with Bed Board, Admitting, Patient Escort, Radiology
- Improved communication: patients, physicians, & families re: patient location & process of care
- Eliminated clinical & operational risk due to “lost” patients.
- Objective ability to know acuity level & resource demand in ED at any given time
- Ability to anticipate inpatient bed demand via predictive capabilities of ESI triage acuity
- New data for PI & research



Other Operating Goals Achieved

- **Regulatory:** Achieve a state of preparedness to deal with all emergency situations
  - Decision Support Tool:
    - Staff encounter summary for contamination/ infectious agents available
    - Quick sort by acuity in emergency & mass casualty events (ESI triage acuity levels displayed in EDTracker™)
- ED Staff satisfaction high: No nursing vacancies!



Next Steps

- Optimize reporting capability
- Real Time Dashboard
  - React Quickly if the System gets out of control
    - Modest “upstream” interventions may well prevent downstream chaos
  - Develop Decision Support Rules
    - Automatic is better than human/voluntary
    - e.g. call for radiology support automatically if control rules are violated