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
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 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

March
- Time waiting out front: 1.13
- Time waiting in Room: 0.48
- Physician workup: 2.3
- Dispo to Left ED: 0.25

June
- Time waiting out front: 0.69
- Time waiting in Room: 0.5
- Physician workup: 2.09
- Dispo to Left ED: 0.25

Legend:
- Green: Time waiting out front
- Blue: Time waiting in Room
- Purple: Physician workup
- Red: Dispo to Left ED
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.
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<th>Admit Percent</th>
<th>ED LOS (Hours)</th>
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<tr>
<td>1</td>
<td>71</td>
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<tr>
<td>2</td>
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<td>4</td>
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<td>3.1</td>
</tr>
<tr>
<td>5</td>
<td>&lt;2</td>
<td>2.3</td>
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Median Composite Visit, Admitted Patient, Pre-Implementation vs March and June 2005

<table>
<thead>
<tr>
<th></th>
<th>Time waiting out front</th>
<th>Time waiting in Room</th>
<th>Physician workup</th>
<th>Bed Request to Assign</th>
<th>Bed Assn to Left ED</th>
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Christiana Hospital
ED Patient Satisfaction

FY05

Jul
Aug
Sep
Oct
Nov
Dec
Jan
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