Summary:
A novel process redesign methodology that uses data to inform solutions, reduces variability, eliminates waste and non-value add activities, optimizes revenue and focuses on metrics.

Hospital: University of Colorado Hospital
Location: Aurora, CO
Contact: Jennifer L. Wiler, MD, MBA, FACEP
Jennifer.wiler@ucdenver.edu

Category:
- A: Arrival
- B: Bed Placement
- C: Clinician Initial Evaluation & Throughput
- D: Disposition
- E: Exit from the ED

Key Words:
- Communications
- Consults
- Continuity of Care
- Patient Satisfaction
- Wait Times

Hospital Metrics:
- Annual ED Volume: 75,000
- Hospital Beds: 550
- Ownership: University of Colorado Health
- Trauma Level: 2
- Teaching Status: Yes

Tools Provided:
- Rapid Process Optimization Methodology
- New ED Process
- Post-Redesign Implementation Metrics
- Heart Failure Treatment Pathway

Clinical Areas Affected:
- Ancillary Departments
- Consult Services
- Emergency Department
- Inpatient Units

Clinical Areas Affected:
- Administrators
- Case Management
- Clerks
- ED Staff
- IT Staff
- Nurses
- Pharmacists
- Physicians
- Registration Staff
Innovation
Just prior to the implementation of our new ED patient flow, our ED had 150 hours of ambulance diversion, over 10,000 hours of ED boarding, an average ED total length of stay 355 minutes, average door to doctor time of 67 minutes, and poor staff and faculty morale. Before the implementation of the ED process redesign project, to address capacity issues and boarding, we had expanded ED treatment spaces to include 21 hallway beds and 11 beds in a closed clinic adjacent to the ED. A new and significantly larger ED was planned for and there was a desire to use this opportunity to redesign the care process.

Innovation Implementation
Dr. Richard Zane, Chair, University of Colorado, charged our physician and nursing leadership to completely redesign the way that emergency care was delivered, coincident with our planned move into a new Emergency Department (ED) space in June 2013. The rules of engagement were that all decisions about process innovations were to be patient-centered, data-driven, and utilize a novel methodology for process improvement; the Rapid Process Optimization (RPO) Methodology, specifically designed for this engagement.

The Process Improvement Steering Committee was created to lead this ED flow redesign. The team was comprised of process improvement, nursing and physician leadership. All team members contributed meaningfully to this endeavor. Co-Chairs: Derek Birznieks, MBA, Director of Process Improvement University of Colorado Hospital Jennifer Wiler, MD, MBA, FACEP, Vice Chair, Quality, Safety & Process Improvement; Assistant Professor, Department of Emergency Medicine Rob Leeret, RN Director of Emergency Services and Capacity Management Committee: April Koehler, RN, Clinical Nurse Manager, Emergency Services Kelly Bookman, MD, FACEP, Associate Medical Director, Emergency Services, Associate Professor, Department of Emergency Medicine Justin Emerick, Process Improvement Consultant Robin Scott, RN, Clinical Nurse Specialist, Emergency Services Stephanie Prevost, RN, Associate Nurse Manager, Emergency Services Brandi Schimpf, RN, Clinical Nurse Educator, Emergency Services.

Background: Many healthcare institutions have utilized various methods to engage faculty and staff in process redesign including LEAN and 6-sigma. These methodologies require extensive training (on-boarding) and non-stakeholder staff support to maintain as well as significant time to develop and implement. Due to the timeline of our already planned move to a new ED space, we needed to redesign care in 6-8 months, whereas, LEAN or 6-sigma would have taken at least 3 years to execute all of the modules and processes.

Objectives: To create a novel process redesign methodology that uses data to inform solutions, reduces variability, eliminates waste and non-value add activities, optimizes revenue and focuses on metrics, but requires limited formal training (on boarding) and limited non-stakeholder staff support to maintain.

Methods: We devised the RPO methodology which relies on five distinct guiding principles or pillars; the "5 E's"

- Evaluate, detailed assessment of current state processes and productivity;
- Engage, task and role analysis including human resource pairing and matching;
- Establish, rigorous and comprehensive pre-work with structured analytics;
- Evolve ("rapid process modules" [RPM]) to design ideal and future state); and
- Execute (proof of concept using progressive high-fidelity simulations, reassessment, and execution of redesigned future state).

The foundation of the methodology is based on the tenets of change management, central discipline but local control, integrated rational and economic use of appropriate process optimization tools, focused and paired collaboration of process optimization and content experts, structured conceptual evaluation with quantifiable and actionable remediation, franchise replication of RPO with customization to service line and/or function, system wide electronic health record optimization and central governance. The primary aim is for the process to be patient centered and data driven.
These included adding a provider in triage (physician assistant) during peak arrival hours, providing observation care in ED beds, expanding our clinical space by using hall beds and ad hoc use of other clinical care areas including other clinics’ space. “Using the RPM methodology we convened multidisciplinary frontline staff (stakeholder) groups to:

- Review current best practice literature as RPM pre-work.
- Review and validate current state process maps developed by the Process Improvement teams’ observations.
- Develop future state recommendations based on parameters (eg. budget neutral).
- Present recommendations to senior leadership multidisciplinary stakeholders for approval to move to testing.
- Testing (table top and simulation) of recommended process.
- Process modifications based on testing, when appropriate.

Finally, large scale training of staff on new process occurred by multidisciplinary teams and PI champions. Staff engagement included nurses, techs, registrars, EMS, respiratory, ECG techs, housekeeping, transport, radiology, laboratory, case management, social work, behavioral health, and numerous medical services (eg. neurology, stroke, hospitalists, trauma, general surgery, orthopedics, radiology, pathology, etc).

New processes implemented utilizing the RPM methodology included:

- Elimination of triage, and implementation of a Pivot Team;
- Launch of a physician in Intake to initiate testing, to make decisions about placement in ED (acute vs. Supertrack) or to discharge after full assessment; and to eliminate ad hoc triage out system
- Expansion of fast track to Supertrack with utilization of internal waiting room area;
- Expansion of scribe program;
- Implementation of evidence-based care pathways in order to standardize care and improve outcomes
- Implementation of a point of care testing program
- Establishment of a 16 bed Clinical Decision Unit (CDU) and observation care service line;
- Establishment of an ED Call Center;
- Launch of a 24 hour retail pharmacy in the ED with default e-prescribing
- Refinement of Epic electronic health system; and
- Job righting, Assuring that specific tasks are assigned to the appropriate level of healthcare provider or employee (i.e., transporters moving patients instead of ED technicians).

Timeline/ Results
It was clear that we needed a complete process redesign. Specifically, we needed frontline staff re-engagement and a new vision of care delivery that placed the patient at the center of our clinical operations. We had attempted limited, disjointed and unsuccessful changes in the past, which further fragmented department care delivery.

We have performed eight RPMs (front-end, core, back-end, case management, radiology, laboratory, transport/ancillary services, pharmacy) as part of our process redesign coincident with moving into a new emergency department. This process redesign methodology is currently being utilized to train units across the hospital beyond emergency medicine.

From the initiation of planning to the implementation date it was approximately 8 months. The training and education of staff and physicians took place over 2 months prior to implementation in addition to participation in the RPM’s. Go live was done in a "big bang" fashion on the day we moved into a new ED space.

- Decreased door-to-physician time from average 67 minutes to an average of 15 minutes.
- Increased patient satisfaction scores from 79.3 to 85.9 (raising UCH, from the 17th percentile Press Ganey ranking to 72nd percentile %).
- Decreased LWBS from 4% to 0.5%.
- Decreased discharged patient LOS by 53 minutes (from 244 minutes to 191 minutes).
- Decreased admitted patient LOS by 36 minutes (from 246 minutes to 201 minutes).
- Decreased overall LOS by 2.25 hours (from 355 minutes to 220 minutes).
- Physician intake discharge rate is 36% on average.
- Supertrack manages 16% of overall volume during peak hours.

**Cost/Benefit Analysis**
The entire project was required to be budget neutral for the hospital. Utilizing activity based cost accounting principles; we defined the ideal standard work description (including work effort) for the major staff entities vs. current state job functions. This reallocation of resources allowed us to address mismatches of tasks being performed by higher cost positions. For example, we noted that most transports were being performed by ED nurses and technicians, only 500 transports/month being done by ED transporters. With "job righting" as part of the process redesign, we eliminated the task of transport from nursing staff, allowing them to increase their focus on nursing activities which necessarily increased nursing productivity without an increased need for hiring. Due to the increased nursing productivity, we were able to shift FTE (full time equivalent) positions to increase the number of ED transporters. Post implementation of this change, our nursing rations expanded from 1:4 to 1:4.5 with over 4000 transports/month being done only by ED transport. Activity based cost accounting principles including cost savings related to improved throughput were also leveraged for the establishment of other new ED programs (i.e., CDU, point of care testing, scribe program expansion).

**Advice and Lessons Learned**
1. Create a burning platform as to why change is necessary.
2. Garner support from frontline staff leaders / culture-makers, and identify and embrace early adopters.
3. Over-communicate planned changes with frontline staff and celebrate early successes.

**Sustainability**
This journey is the beginning, not the end, for our department. Our Process Improvement Steering Committee is committed to ongoing practice assessment and re-evaluation. The resources needed for sustainability are constant engagement of frontline staff in local environment assessment, the creation of a "just culture" that supports highlighting of errors and potential errors allowing for systems corrections, continuing education of the staff to prevent mission creep, steady direct messaging with "boots on the ground" to address issues real time and to identify inappropriate process modifications, and the identification of future RPM's to tackle new and ongoing process issues in order to optimize our healthcare delivery model. We have embedded process improvement specialists into the ED operations infrastructure.

**Tools to Download**
- Rapid Process Optimization Methodology
- New ED Process
- Post-Redesign Implementation Metrics
- Heart Failure Treatment Pathway
Rapid Process Optimization (RPO) Methodology

**Patient Centered, Data Driven**

1. **Evaluate**
   - Detailed assessment of current state processes and productivity

2. **Engage**
   - Task and role analysis including human resource pairing and matching

3. **Establish**
   - Rigorous and comprehensive pre-work with structured analytics

4. **Evolve**
   - RPMs Rapid Process Modules to design ideal future state

5. **Execute**
   - Proof of concept using progressive high-fidelity simulations, reassessment, and execution of redesigned future state

**Operational / Clinical Area of Concentration**

**Change Management**
- Central Discipline, Local Control

**Integrated rational and economic use of appropriate process optimization tools**

**Focused & paired collaboration of process optimization and content experts**

**Structured, conceptual evaluation with quantifiable & actionable remediation, including table-top to live exercises utilizing substantive data**

**Franchise replication of RPO with customization to service line and/or function**

**System-Wide EMR optimization**

**Governance, command & control**
<table>
<thead>
<tr>
<th>Metric</th>
<th>Post-Implementation (Average)</th>
<th>Pre vs post 6mn variance</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Census</td>
<td>239</td>
<td>195</td>
<td>22%</td>
</tr>
<tr>
<td>Overall Length of Stay (minutes)</td>
<td>220.5</td>
<td>354.6</td>
<td>-38%</td>
</tr>
<tr>
<td>Discharge Length of Stay (minutes)*</td>
<td>191.6</td>
<td>244.2</td>
<td>-22%</td>
</tr>
<tr>
<td>Admit Length of Stay (minutes)*</td>
<td>201.1</td>
<td>246.0</td>
<td>-18%</td>
</tr>
<tr>
<td>Door to Provider Time</td>
<td>14.5</td>
<td>67</td>
<td>-78%</td>
</tr>
<tr>
<td>Left Without Being Seen</td>
<td>0.52%</td>
<td>4%</td>
<td>-87%</td>
</tr>
</tbody>
</table>
Heart Failure (HF): Treatment Pathway

Diagnose of HF Made: Symptoms consistent with Heart Failure

Has patient been hospitalized at any hospital for HF within the last 30 days?

Yes

Call Amanda Nenaber RN, CNS HF Program (8-7367) (She will track 30-day readmits)

No

Does patient have new onset heart failure?

Yes

Moderate / Severe HF Exacerbation?

Any of the following:
- BNP >500 / 1.5x baseline
- Pulmonary edema, hypoxia
- Relative hypotension (SBP<100 OR lower than patient’s usual in Flowsheet Vitals)
- New elevated Cr/BUN, LFTs
- New ECG changes or troponin >0.5
- Requires inotrope or IV vasodilator
- History of end stage renal disease
- High risk condition, including:
  - LVAD
  - Heart transplant

No

Mild HF Exacerbation?

No moderate or severe risk factors

Admit to ED CDU

- Use “CDU HF ORDERSET” to give:
  - Oxygen
  - Furosemide IV (with evidence of volume overload)
    - Double dose of oral diuretics OR
      - If diuretic naive, 20 mg IV, unless CR >2.5 then give 40 mg IV
        - Consider ordering home PO meds (if not already taken)
    - Call Amanda Nenaber 8-7367 (if not notified per above)

Admit

IF does NOT require ICU or Stepdown Admission, then admit to:
- Heart Failure/Heart Transplant Service: On transplant list, or LVAD patient, or seen in clinic by a HF attending (Allen, Ambardekar, Brieke, Lindenfeld, Shakar, Wolfel)
- Admit Cardiology: New onset HF (regardless of age), or followed in cards clinic, or history of heart disease
- Admit ACE: >70 years of age
- Admit Medicine/HTT/HMS: All other patients

Order:
- Oxygen
- Furosemide IV
  - Double dose of oral diuretics or, if diuretic naive, 20 mg IV, unless CR >2.5, then give 40 mg IV

Reassess in 1-2 hours

Have presenting symptoms improved?

Yes

Consider Discharge

PLEASE USE HF DISCHARGE ORDER SETS

- Redose IV diuretics – DOUBLE DOSE of IV furosemide previously given

No

Reassess in 1-2 hours

Have presenting symptoms improved?

Yes

No

Approved: Heart Failure Service; L Allen MD, P Buttrick MD, G Wolfel MD 2/26/2013
EDCQI Committee 3/8/2013
Hospitalist QI and DOMQI Reviewed 2/26/2013

“This quality improvement document is to be maintained solely within the institution and may not be released to any third party without written permission from the department, hospital, and university legal counsel.”