OR Efficiency and Throughput: Benchmarking and Process Optimization

Robert Stiefel, MD
Enhance Healthcare
September 20, 2013
Financial Disclosure

No Relevant Financial Relationships to Disclose
Objectives

• Discuss the heightened importance of OR Efficiency under healthcare reform

• Review the sequential processes which constitute the OR continuum

• Discuss key indicators of OR process performance

• Overview Benchmarking options

• Overview prioritization and implementation of process improvement initiatives
HC Reform – from Volume to Value

**Volume-Based First Curve**
- Fee-for-service reimbursement
- High quality not rewarded
- No shared financial risk
- Acute inpatient hospital focus
- IT investment incentives not seen by hospital
- Stand-alone care systems can thrive
- Regulatory actions impede hospital-physician collaboration

**Value-Based Second Curve**
- Payment rewards population value: quality and efficiency
- Quality impacts reimbursement
- Partnerships with shared risk
- Increased patient severity
- IT utilization essential for population health management
- Scale increases in importance
- Realigned incentives, encouraged coordination

THE GAP
OR’s and Healthcare Reform

- A focus on patient safety, efficiency and customer service
- Reimbursement linked to performance
- “Patient friendly” care
- Pressure on reimbursement and margins

Ultimately reimbursement pressure, service pressure and outcome pressure create a Darwinian “survival of the fittest” environment. Efficiency and best practices are a must.
OR Continuum

**PRE-OPERATIVE PROCESSES**

1. Surgeon Calls to Book Case
2. Case Scheduled
3. EOB Day before Surgery
4. Patient ready for OR in Holding

**INTRA OPERATIVE PROCESSES**

4. Patient Ready for OR in Holding
5. Anesthesia Induction Complete
6. Dressing or Cast On
7. Ready for PACU Transport

**POST OPERATIVE PROCESSES**

7. Ready for PACU Transport
8. PACU Report and Acceptance
9. Discharge Criteria Met
10. Transfer Out of PACU
Measuring Efficiency
OR Continuum – Key Metrics

**Pre-Operative**
- Scheduling Accuracy
- Labs/Consults on chart
- Consents/H&P on chart
- % seen in PAT
- % charts complete

**Intra-operative**
- OR Utilization
  - Turnover Time (TOT)
  - Block Utilization
  - OR “Pyramid”
  - Pt. in to Incision
  - % On Time starts
  - % DOS Cancellations
  - % TOT > 1 Hour
  - Excess Staffing Costs

**Post-operative**
- Overnight Stays
- PACU “OR Holds”
- % Reintubation
- % Narcotic reversal
- % Relaxant reversal
Outpatient Chart Completion

• Key indicator of pre-op preparation
• PAT has meaningful impact on cancellations and on time starts

**Definition:**
• All chart work complete by EOB day before surgery
• Required labs on chart
• Required consults on chart
• Anesthesia Review
• H&P on chart
• Consents may be pending

• Results are highly variable
• Varies from 0 to 92% completed
• Most facilities do not track
• A valuable data point but requires some internal resources to track
Day of Surgery Cancellations

- Frequency varies greatly from <1-15% in published studies
- Often higher cancellation rates are in facilities with poor PAT, distant patients, or overbooked OR’s
- Cancellations lead to potentially large gaps in surgical schedules – leaving expensive resources unused
- Expensive – loss of $4,550 per cancelled case to hospital per Tulane ASA study
- Consistently reduced by evaluation in PAT
- Many similar attributes for delayed first case starts
## “Real World” Day of Surgery Cancellations

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Cancel same day</th>
<th>Total Cancels</th>
<th>Actual Cases</th>
<th>Total resched</th>
<th>% resched</th>
<th>Cancelled DOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18</td>
<td>61</td>
<td>428</td>
<td>13</td>
<td>21%</td>
<td>4.21</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>15</td>
<td>177</td>
<td>10</td>
<td>67%</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>105</td>
<td>592</td>
<td>39</td>
<td>37%</td>
<td>4.39</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>21</td>
<td>359</td>
<td>6</td>
<td>29%</td>
<td>1.67</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>31</td>
<td>323</td>
<td>9</td>
<td>29%</td>
<td>1.24</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>40</td>
<td>230</td>
<td>13</td>
<td>33%</td>
<td>5.22</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>134</td>
<td>1011</td>
<td>43</td>
<td>32%</td>
<td>0.99</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>49</td>
<td>383</td>
<td>12</td>
<td>24%</td>
<td>1.31</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>32</td>
<td>178</td>
<td>8</td>
<td>25%</td>
<td>4.49</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>39</td>
<td>427</td>
<td>11</td>
<td>28%</td>
<td>0.94</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>26</td>
<td>186</td>
<td>8</td>
<td>31%</td>
<td>0.54</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>45</td>
<td>300</td>
<td>10</td>
<td>22%</td>
<td>4.00</td>
</tr>
<tr>
<td>13</td>
<td>55</td>
<td>110</td>
<td>929</td>
<td>51</td>
<td>46%</td>
<td>5.92</td>
</tr>
<tr>
<td>14</td>
<td>11</td>
<td>58</td>
<td>417</td>
<td>8</td>
<td>14%</td>
<td>2.64</td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td>37</td>
<td>333</td>
<td>6</td>
<td>16%</td>
<td>4.20</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>63</td>
<td>462</td>
<td>17</td>
<td>27%</td>
<td>0.43</td>
</tr>
<tr>
<td>TOTALS</td>
<td>188</td>
<td>866</td>
<td>6735</td>
<td>264</td>
<td>30%</td>
<td>2.79</td>
</tr>
</tbody>
</table>
Many ways to measure
Need “Apples to Apples”
EH uses Actual minutes in OR
EH uses staffed locations
Mixing utilization calculations is misleading
Properly measured, utilization is the “bottom line” of efficiency analysis
"Real World" Utilization Data

EH Database OR Utilization 7A-3P

\[ \bar{X} = 45.86 \]
Utilization Bell Curve

OR Utilization 7A-3P

Mean 45.86
StDev 9.646
N 55
Turnover Time

- Key surgeon satisfier
- Multiple inter-related processes
- Impact increases with more cases per OR
- In order to understand TOT, need to standardize the definition
  - Close to cut
  - Wheels out to wheels in
  - Close to wheels in
  - Are flip rooms counted?
- Expected TOT varies greatly by specialty
Orthopedic Surgery: Turnover Data MD TAT following same surgeon

Orthopedic Surgery
Closure to Next Incision
(In Minutes)

- Baseline
- Q1 2006
- Q2 2006
- Q3 2006
- Q4 2006
- Q1 2007
- Q2 2007
- Q3 2007
- Q4 2007
- Q1 2008
- Q2 2008
- Aug 08
- Sep 08

Industry Average = 61 minutes

Orthopedic Surgery
Patient Exit to Next Entrance
(In Minutes)

- Baseline
- Q1 2006
- Q2 2006
- Q3 2006
- Q4 2006
- Q1 2007
- Q2 2007
- Q3 2007
- Q4 2007
- Q1 2008
- Q2 2008
- Jul 08
- Aug 08
- Sep 08

Industry Average = 26 minutes

Patient In → Cut → Close → Patient Out

- Patient In: 34.1 min
- Cut: 7.4 min
- Close: 3.2 min
- Patient Out: 44.8 min

44.8 min
ENT: Turnover Time  MD TAT following same surgeon

**ENT Cases**

Closure to Next Incision  
(In Minutes)

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Qt2 2006</th>
<th>Qt3 2006</th>
<th>Qt4 2006</th>
<th>Qt1 2007</th>
<th>Qt2 2007</th>
<th>Qt3 2007</th>
<th>Qt4 2007</th>
<th>Qt1 2008</th>
<th>Qt2 2008</th>
<th>Jul 08</th>
<th>Aug 08</th>
<th>Sep 08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve</td>
<td>56</td>
<td>63</td>
<td>64</td>
<td>54</td>
<td>58</td>
<td>54</td>
<td>47</td>
<td>47</td>
<td>55</td>
<td>65</td>
<td>50</td>
<td>49</td>
<td>69</td>
</tr>
</tbody>
</table>

Industry Average = 42 minutes

**ENT Cases**

Patient Exit to Next Entrance  
(In Minutes)

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Qt2 2006</th>
<th>Qt3 2006</th>
<th>Qt4 2006</th>
<th>Qt1 2007</th>
<th>Qt2 2007</th>
<th>Qt3 2007</th>
<th>Qt4 2007</th>
<th>Qt1 2008</th>
<th>Qt2 2008</th>
<th>Jul 08</th>
<th>Aug 08</th>
<th>Sep 08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve</td>
<td>27</td>
<td>19</td>
<td>44</td>
<td>23</td>
<td>28</td>
<td>26</td>
<td>26</td>
<td>25</td>
<td>29</td>
<td>42</td>
<td>31</td>
<td>24</td>
<td>32</td>
</tr>
</tbody>
</table>

Industry Average = 17 minutes

**Timeline:**

- Patient In 23 min
- Cut 14.3 min
- Close 31.7 min
- Patient Out 69 min
“Real World” Turnover Time Examples

MD Turnaround Time (Minutes)

12 Hospitals in a single system in the Northeast

May | Goal
Benchmarking Efficiency
## OR Benchmarking from McKesson

### ORBC Demo Site OR Benchmarks Collaborative

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Actual</th>
<th>Mean</th>
<th>Achievement 1</th>
<th>STAC Weighted</th>
<th>Achievement 2</th>
<th>ASC Mean</th>
<th>Achievement 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>% First Case On-Time or Early +/- 5</td>
<td>96.0%</td>
<td>65.3%</td>
<td>147.00% ✓</td>
<td>82.3% ✓</td>
<td>116.72% ✓</td>
<td>64.7% ✓</td>
<td>148.47% ✓</td>
</tr>
<tr>
<td>% Subsequent Case On-Time or Early</td>
<td>79.1%</td>
<td>55.0%</td>
<td>143.77% ✓</td>
<td>58.1% ✓</td>
<td>138.16% ✓</td>
<td>59.4% ✓</td>
<td>133.24% ✓</td>
</tr>
<tr>
<td><strong>Start Time Accuracy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient In to Patient Out</td>
<td>62.6%</td>
<td>92.0%</td>
<td>146.99% ✓</td>
<td>99.4% ✓</td>
<td>158.89% ✓</td>
<td>64.0% ✓</td>
<td>102.25% ✓</td>
</tr>
<tr>
<td>Patient In to Anesthesia Ready</td>
<td>11.6%</td>
<td>10.0%</td>
<td>85.94% ✓ ✓</td>
<td>11.9% ✓</td>
<td>102.65% ✓</td>
<td>6.0% ✓</td>
<td>51.57% ✓ ✓</td>
</tr>
<tr>
<td>Patient In to Incision</td>
<td>15.0%</td>
<td>22.0%</td>
<td>146.65% ✓ ✓</td>
<td>25.2% ✓</td>
<td>168.12% ✓</td>
<td>15.0% ✓</td>
<td>99.99% ✓ ✓</td>
</tr>
<tr>
<td>Incision to Close</td>
<td>42.4%</td>
<td>61.0%</td>
<td>143.76% ✓ ✓</td>
<td>63.8% ✓</td>
<td>150.43% ✓</td>
<td>42.0% ✓</td>
<td>98.98% ✓ ✓</td>
</tr>
<tr>
<td>Close to Patient Out</td>
<td>5.2%</td>
<td>8.0%</td>
<td>155.11% ✓ ✓</td>
<td>9.5% ✓</td>
<td>184.87% ✓</td>
<td>6.0% ✓</td>
<td>116.33% ✓ ✓</td>
</tr>
<tr>
<td>Average Turnover Minutes</td>
<td>11.4%</td>
<td>21.0%</td>
<td>183.73% ✓ ✓</td>
<td>28.7% ✓</td>
<td>251.50% ✓</td>
<td>18.0% ✓</td>
<td>157.48% ✓ ✓</td>
</tr>
<tr>
<td>% Scheduling Accuracy</td>
<td>64.3%</td>
<td>49.8%</td>
<td>120.23% ✓ ✓</td>
<td>40.8% ✓</td>
<td>157.56% ✓</td>
<td>59.7% ✓</td>
<td>107.75% ✓ ✓</td>
</tr>
<tr>
<td><strong>Case Time Effectiveness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Utilized 7am-3pm</td>
<td>97%</td>
<td>78.2%</td>
<td>123.54% ✓ ✓</td>
<td>71.8% ✓</td>
<td>134.60% ✓ ✓</td>
<td>72.3% ✓</td>
<td>133.68% ✓ ✓</td>
</tr>
<tr>
<td>% Utilized 3pm-5pm</td>
<td>76%</td>
<td>76.3%</td>
<td>99.62% ✓ ✓</td>
<td>72.8% ✓</td>
<td>104.42% ✓ ✓</td>
<td>54.4% ✓</td>
<td>139.79% ✓ ✓</td>
</tr>
<tr>
<td>% Utilized 5pm-7pm</td>
<td>60%</td>
<td>72.1%</td>
<td>95.76% ✓ ✓</td>
<td>69.4% ✓</td>
<td>99.58% ✓ ✓</td>
<td>194.3% ✓</td>
<td>35.56% ✓ ✓</td>
</tr>
<tr>
<td>% Utilized 7pm-11pm</td>
<td>†</td>
<td>57.6%</td>
<td>†</td>
<td>53.1% ✓</td>
<td>†</td>
<td>†</td>
<td>†</td>
</tr>
<tr>
<td>% Same Day Add-On Weekdays</td>
<td>4.1%</td>
<td>11.9%</td>
<td>280.06% ✓ ✓</td>
<td>6.7% ✓</td>
<td>162.97% ✓</td>
<td>1.0%</td>
<td>24.63% ✓ ✓</td>
</tr>
<tr>
<td>% Block Utilization</td>
<td>92.2%</td>
<td>77.6%</td>
<td>118.76% ✓ ✓</td>
<td>58.1% ✓</td>
<td>158.61% ✓ ✓</td>
<td>59.4% ✓</td>
<td>155.31% ✓ ✓</td>
</tr>
<tr>
<td>% of Schedule Blocked</td>
<td>24.6%</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
</tr>
<tr>
<td>% Same Day Cancelled / Postponed</td>
<td>0.6%</td>
<td>3.4%</td>
<td>520.48% ✓ ✓</td>
<td>99.9% ✓</td>
<td>15,406.06% ✓ ✓</td>
<td>†</td>
<td>†</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Patients Screened Prior to Surgery</td>
<td>85.1%</td>
<td>69.7%</td>
<td>121.99% ✓ ✓</td>
<td>44.1% ✓</td>
<td>192.73% ✓ ✓</td>
<td>1.1%</td>
<td>7,837.31% ✓ ✓</td>
</tr>
<tr>
<td>% Surgical Pause Compliance</td>
<td>100.0%</td>
<td>97.4%</td>
<td>102.68% ✓ ✓</td>
<td>99.9% ✓</td>
<td>100.05% ✓ ✓</td>
<td>99.6% ✓</td>
<td>100.44% ✓ ✓</td>
</tr>
<tr>
<td>% Returns to Surgery w/ 24 hrs</td>
<td>0.3%</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
</tr>
</tbody>
</table>

EnhanceHC.com
## OR Efficiency Scoring System

<table>
<thead>
<tr>
<th>Measurements</th>
<th>poor performance</th>
<th>medium performance</th>
<th>high performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excess Staffing Costs</strong></td>
<td>&gt;10%</td>
<td>5-10%</td>
<td>&lt;5%</td>
</tr>
<tr>
<td><strong>Start-time tardiness</strong> (mean tardiness for elective cases/day)</td>
<td>&gt;60 min</td>
<td>45-60 min</td>
<td>&lt;45 min</td>
</tr>
<tr>
<td><strong>Case cancellation rate</strong></td>
<td>&gt;10%</td>
<td>5-10%</td>
<td>&lt;5%</td>
</tr>
<tr>
<td><strong>Post Anesthesia Care Unit (PACU) admission delays</strong> (% workdays with at least one delay in PACU admission)</td>
<td>&gt;20%</td>
<td>10-20%</td>
<td>&lt;10%</td>
</tr>
<tr>
<td><strong>Contribution Margin</strong> (mean) per operating room hour</td>
<td>&lt;$1,000/hr</td>
<td>$1–2,000/hr</td>
<td>&gt;$2,000/hr</td>
</tr>
<tr>
<td><strong>Turnover Time</strong> (for all cases mean time from previous patient out of the OR to next patient in the OR including setup and cleanup)</td>
<td>&gt;40 min</td>
<td>25-40 min</td>
<td>&lt;25 min</td>
</tr>
<tr>
<td><strong>Prediction Bias</strong> (bias in case duration estimates per 8 hours of operating room time)</td>
<td>&gt;15 min</td>
<td>5-15 min</td>
<td>&lt;5 min</td>
</tr>
<tr>
<td><strong>Prolonged turnovers</strong> (% turnovers lasting more than 60 minutes)</td>
<td>&gt;25%</td>
<td>10-25%</td>
<td>&lt;10%</td>
</tr>
</tbody>
</table>

From Macario, A. Are your hospital operating rooms efficient? Anesthesiology. 2006; 105:237-240
Vendor Internal Benchmarks

- Anesthesia Groups
- Anesthesia Billing Companies
- OR Information Systems
- Consultant Databases
Process Improvement
Initial Steps

• Establish an OR improvement committee
  − Surgeons
  − Anesthesia
  − Nursing
  − Administration
  − Other support areas as indicated (PAT, PACU, Central Sterile etc)

• Dashboard or similar – where are the biggest opportunities (furthest deviation from target)?

• Quantify financial and operational impact

• Create a list of initial target opportunities

• Focus resources on a short list (1 to 3) of the highest priorities
## Dashboard Example

### Operating Room Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Target</th>
<th>March 2013</th>
<th>YTD March</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Room Utilization (Prime Time)</td>
<td>0.75</td>
<td>0.63</td>
<td>0.61</td>
</tr>
<tr>
<td>Average Turnover Time (Prime Time)</td>
<td>22 Minutes</td>
<td>36</td>
<td>38</td>
</tr>
<tr>
<td>PAT Charts Complete</td>
<td>95%</td>
<td>85</td>
<td>73</td>
</tr>
<tr>
<td>Excess Staffing Costs</td>
<td>&lt;6%</td>
<td>4%</td>
<td>3.40%</td>
</tr>
<tr>
<td>Add-On Cases</td>
<td>N/A</td>
<td>200</td>
<td>210</td>
</tr>
<tr>
<td>Total Cases Scheduled &lt; or &gt; 20 Minutes</td>
<td>80</td>
<td>82%</td>
<td>80%</td>
</tr>
<tr>
<td>Total Surgical Cases/Location</td>
<td>1,000</td>
<td>1,045</td>
<td>1,070</td>
</tr>
<tr>
<td>Call Cases</td>
<td>N/A</td>
<td>140</td>
<td>150</td>
</tr>
<tr>
<td>PACU Delays</td>
<td>&lt;8%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Timely First Case Start Percentage</td>
<td>0.85</td>
<td>0.8</td>
<td>0.78</td>
</tr>
<tr>
<td>Same Day Case Cancellation Percentage</td>
<td>&lt;1%</td>
<td>0.74%</td>
<td>0.83%</td>
</tr>
</tbody>
</table>
Process Improvement

- Create a process map
- Observe and measure component processes
- Parallel processing where practical
- Engage operational teams to improve processes
- Test and measure results
- Document improved process steps
- Ongoing measurement of performance
Process Map Wheels out to In – Observe and Measure Components

Patient leaves OR

Operating Room Circulating
- Transfer post-op Pt to PACU
- Provide report to PACU Nurse
- Return to OR to assist in clean-up and set-up. Confirm room is ready

Circulating
- Needs to check next patient chart
- Confirm planned procedure

PACU Nurse
- Open new pt charge file
- With patient

Clean room
- Dispose of biohazardous and non-biohazardous materials

Remove soiled non-disposable patient care equipment for cleaning

Housekeeping
- Room is ready to be cleaned

OR Techs
- Receive notification room is ready to be cleaned
- Clean room
- Dispose of biohazardous and non-biohazardous materials

Set-up equipment for next surgical procedure

Move unneeded equipment and supplies out, move needed equipment and supplies in

Sterile Supply Technician
- Receive notification that room is cleaned and ready for next surgery
- Case cart for next surgery

Scrub nurse
- Deliver case cart for next surgery
- Open/set up instruments and equipment

Anesthesiologist
- Transfer post-op Pt to PACU
- Provide report to PACU Nurse
- Pick up supplies for next surgical case

Perform pre-op assessment on next patient (if not done previously)

Obtain consents if not previously done

Place invasive monitors if required

Perform pre-op visit and mark surgery site

Review pre-op test results and vitals, document as needed.

Surgeon
- Receive notification that room is clean and next patient in holding area

Transport next patient from holding area into OR
TOT Process Initial – Observe and Measure Components

Surgeon TOT 60 Minutes
TOT Process Improved – Parallel Processing

Surgeon TOT 45 Minutes
Take Home Points:

• Healthcare reform will likely result in “survival of the fittest”
• View the OR as a continuum of inter-related processes
• Measure Key Process Indicators
• If benchmarking, make sure you are comparing “apples to apples”
• Approach process improvement analytically, prioritize efforts and focus your resources
QUESTIONS?

rstiefel@enhancehc.com
www.EnhanceHC.com