Experimenting with New Systems of Care to Improve Patient Safety

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Disclosures

• None
Objectives

• Appreciate the need for new models of care to achieve sustainable improvements in infection prevention and antimicrobial stewardship

• List examples of changes that could be made in your organization to promote safer healthcare

• Identify strategies to address barriers to implementation of organizational changes
Infectious Diseases
Common reasons that Quality Improvement initiatives fail

- Failure to match solution to the problem
- Layers added to existing system of care
- Looking for “buy-in”
- Increased workload of staff
- Lack of iterative refinement
Building sustainability into the system design

- Co-creation with key stakeholders
- Targeted change
- Leverages hierarchy of effectiveness
- Promotes working smarter, not harder
Let’s get to some examples...
Treatment of asymptomatic bacteriuria
Treatment of asymptomatic bacteriuria

- Among most common reasons for unnecessary antimicrobial use – across primary care, acute care and long-term care

- No benefit - 6 randomized controlled trials

- Significant harms
  - Antimicrobial resistance
  - *C. difficile* infection - 8-fold risk in long-term care

Nicolle et al, *Clin Infect Dis* 2005
Which best describes your hospital’s current approach to reducing treatment of asymptomatic bacteriuria?

1. Clinician education
2. Diagnostic and treatment algorithms
3. Audit-and-feedback
4. Modified laboratory reporting/processing
Which best describes your hospital’s current approach to reducing treatment of asymptomatic bacteriuria?

- Clinician education: 29%
- Diagnostic and treatment algorithms: 16%
- Audit-and-feedback: 23%
- Modified laboratory reporting/processing: 32%
Challenging the “Culture of Culturing”

• Treatment of ASB is actually a urine culture problem

• Educational interventions have had limited impact and struggled with sustainability

Urine cultures in the ED: the same old strategies

• Raising awareness
• Staff education/training
• Diagnostic algorithms
• Pop-up messages
Matching the solution to the problem

• Urine cultures are pre-emptively collected in the Emergency Department for non-specific indications, to facilitate subsequent patient management
System re-design at Michael Garron Hospital

Pre-implementation:
- Triage Nurse
- UC Ordered
- Urinalysis
- UC Processed

Post-implementation:
- Triage Nurse
- “Step 1” Ordered
- UC Held in Local Lab
- “Step 2: Process Urine” Ordered by Physician
- UC Processed
- Urinalysis
**Sustained change in practice**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Baseline</th>
<th>Intervention</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly ED Urine Culture (%)</td>
<td>5.97</td>
<td>4.68</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Monthly ED callback (%)</td>
<td>1.84</td>
<td>1.12</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Monthly overall antibiotic treatment (% admitted patients)*</td>
<td>61.0</td>
<td>49.1</td>
<td>.02</td>
</tr>
<tr>
<td>Monthly antibiotic treatment for UTI (% admitted patients)*</td>
<td>20.6</td>
<td>10.9</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

* Chart abstraction of 1-month

## Balancing measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Baseline</th>
<th>Intervention</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeat ED visit within 7-days (%)</td>
<td>10.6</td>
<td>10.6</td>
<td>0.2</td>
</tr>
<tr>
<td>ED Length of Stay (hours)</td>
<td>5.4</td>
<td>5.1</td>
<td>0.07</td>
</tr>
<tr>
<td>False omission rate (%)</td>
<td>2.3-4.7*</td>
<td>1.3 (0.7-2.2)</td>
<td></td>
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</tbody>
</table>

What are the key “ingredients” for implementation?

• Computerized Physician Order Entry (CPOE)

• Urine culture collection replaced by the BD Vacutainer plus urine C&S preservative tubes system© (New Jersey, USA)

• Urinalysis turnaround time ensuring result available when Emergency physician sees the patient
How often are screening urine cultures performed prior to elective joint arthroplasty at your hospital?

1. Routinely
2. Sometimes
3. No orthopedics where I work
4. I don’t know
How often are screening urine cultures performed prior to elective joint arthroplasty at your hospital?

- Routinely: 23%
- Sometimes: 21%
- No orthopedics where I work: 10%
- I don’t know: 47%
Screening urine cultures prior to elective joint arthroplasty

• Screening urine cultures prior to non-urologic surgery remains a common practice
  • Two-thirds of orthopedic surgeons surveyed

• Observational studies suggest that asymptomatic bacteriuria is an independent risk factor for prosthetic joint infection (PJI) but that its treatment does NOT reduce this risk

Cordero-Ampuero et al, *Clin Orthop Relat Res* 2010;
Results

Urine culture order set & routine processing by laboratory

Lamb et al, Clin Infect Dis 2017
Results

Urine culture order set & routine processing by laboratory

Discussion & educational rounds
Matching the solution to the problem

• In some centres, urine culture screening prior to orthopedic surgery is completely engrained in practice
New system of care

• Multidisciplinary team developed change in policy, which was approved by preoperative clinic

✓ Urine culture removed from pre-op order-set
✓ Urine specimens resulted with following message

**Routine preoperative urine cultures are not indicated and not processed.**
**If specimen was submitted for symptomatic urinary tract infection, call microbiology within 24 hours to request culture**
Balancing measures – tracked prospectively

- Telephone log of urine culture requests
- Prosthetic joint infection rates
  - 90-days prospective surveillance using CDC/NSHN criteria
## Results

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Baseline Period</th>
<th>Intervention Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 3523)</td>
<td>(n = 1891)</td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, y, median</td>
<td>66</td>
<td>67</td>
</tr>
<tr>
<td>Female sex, No. (%)</td>
<td>2253 (64)</td>
<td>1191 (63)</td>
</tr>
<tr>
<td><strong>Arthroplasty, No. (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip</td>
<td>1332 (38)</td>
<td>786 (42)</td>
</tr>
<tr>
<td>Knee</td>
<td>2004 (57)</td>
<td>1020 (54)</td>
</tr>
<tr>
<td>Shoulder</td>
<td>135 (4)</td>
<td>55 (3)</td>
</tr>
<tr>
<td>Other lower limb</td>
<td>8 (0.2)</td>
<td>2 (0.1)</td>
</tr>
<tr>
<td>Other upper limb</td>
<td>44 (1)</td>
<td>28 (1)</td>
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Lamb et al, *Clin Infect Dis* 2017
Results

Urine culture order set & routine processing by laboratory

Removal from order sets & lab implementation

Discussion & educational rounds
## Results

<table>
<thead>
<tr>
<th>Screening UC</th>
<th></th>
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<tbody>
<tr>
<td>No. ordered per 100 EJAs</td>
<td>87 (3069/3523)</td>
<td>7 (126/1891)</td>
</tr>
<tr>
<td>No. processed per 100 EJAs</td>
<td>87 (3069/3523)</td>
<td>1 (10/1891)</td>
</tr>
<tr>
<td>No. positive per 100 EJAs</td>
<td>12 (352/3069)</td>
<td>0 (0/10)</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Clinical outcomes</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient antibiotics per 100 EJAs</td>
<td>1.2 (43/3523)</td>
<td>0 (0/1891)</td>
</tr>
<tr>
<td>PJIs per 100 EJAs</td>
<td>0.03 (1/3523)</td>
<td>0.2 (3/1891)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Microbiology of PJIs, No.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus aureus</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Sustained change in practice

• Laboratory system change was highly effective in changing practice while respecting individual clinician autonomy

• Improved antimicrobial stewardship without any significant increase in prosthetic joint infections
What are the key “ingredients” for implementation?

• Laboratory identification of urine cultures by location (e.g. pre-operative clinic)

• Consensus from multidisciplinary team
Limiting urinary catheter insertions without indication
Limiting urinary catheter insertions without indication

- Approximately 80% of healthcare-associated UTIs are catheter related

- Between 15-25% of patients are catheterized during their hospital stay

- At least 50% of catheter days lack an appropriate indication

What is your hospital’s current approach to urinary catheter insertions in the Operating Room?

1. Left to individual surgeon’s discretion

2. Hospital guidelines for appropriateness exist

3. Standardized protocol implemented
What is your hospital’s current approach to urinary catheter insertions in the Operating Room?

- **74%** Left to individual surgeon’s discretion
- **8%** Hospital guidelines for appropriateness exist
- **18%** Standardized protocol implemented

*Infectious Diseases*
When to insert a UC in the OR?

**HICPAC guidelines for peri-operative UC use**

Undergoing urologic or other surgery on contiguous structures of genitourinary tract

Anticipated prolonged surgery duration; catheters inserted for this reason should be removed in post-anesthesia care unit

Anticipated to receive large-volume infusions or diuretics during surgery

Need for intraoperative monitoring of urinary output

Matching the solution to the problem

- Lack of clarity and consensus regarding indications for perioperative urinary catheter use leads to variation in practice
Achieving consensus

• Large tertiary care trauma centre in Toronto (104 surgeons)

• Five surgical services
  – General surgery
  – Trauma
  – Obstetrics and Gynecology
  – Cardiac and Vascular
  – Orthopedic surgery
<table>
<thead>
<tr>
<th>Indications for inserting urinary catheter</th>
<th>Indications for maintaining a urinary catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Anticipated fluid shifts/blood loss</td>
<td>1. pre-admission urinary catheter</td>
</tr>
<tr>
<td>2. Surgery involving genitourinary tract</td>
<td>2. urology involved in care</td>
</tr>
<tr>
<td>3. Surgery anticipated to last greater than 4 hours</td>
<td>3. continuous bladder irrigation</td>
</tr>
<tr>
<td>4. If one of these indications is met, can the urinary catheter be removed at the end of the case?</td>
<td>4. stage 3 or 4 sacral ulcer in incontinent female patient</td>
</tr>
<tr>
<td></td>
<td>5. comfort care at end of life as per patient wishes</td>
</tr>
<tr>
<td></td>
<td>6. admitted with spinal cord injury</td>
</tr>
<tr>
<td></td>
<td>7. underwent radical pelvic surgery involving bladder (cystectomy), uterus (hysterectomy), cervix (trachelectomy), or vulva (vulvectomy)</td>
</tr>
</tbody>
</table>
Incidence of Urinary Tract Infection among surgical patients

Proportion of surgical patients who developed

Baseline

Intervention

Data from NSQIP
What are the key “ingredients” for implementation?

• Standardization based on consensus criteria co-created with surgical staff

• Iterative change – start with removal at end of case
Closing thought: Culture is not the culprit

Culture isn’t something you “fix”...
Cultural change is what you get after you’ve put new processes or structures in place...
The Culture evolves after you have done this important work.
Questions?

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