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WINDSOR/ESSEX HOSPITALS
ANTIMICROBIAL STEWARDSHIP

Our Experiences and Lessons Learned

Corinna Quan, MD FRCPC

Public Health Ontario Antimicrobial Stewardship Program Workshop
June 10, 2014
LEARNING OBJECTIVES

- Describe the Windsor/Essex Hospitals experience in Antimicrobial Stewardship

- Physician and Senior Leadership Engagement
BEFORE WE STARTED

- Hotel-Dieu Grace Hospital
  - Antimicrobial Subcommittee of P&T
  - fulltime ID pharmacist – Lynn Nadeau (2005)
- Windsor Regional Hospital
  - no Antimicrobial Subcommittee
  - no fulltime ID pharmacist
  - Joe McQueen (2010)
WHY START?

- there were plans for a Regional P&T Committee so a Regional Antimicrobial Committee made sense
- we were fortunate that there was hospital administration support for Antimicrobial Stewardship and I was approached to take charge of this
CURRENT HOSPITALS

- as of October 2013, Windsor Regional Hospital has 2 sites
  - Ouellette site (previously HDGH)
  - Metropolitan site (formerly WRH)
- Leamington District Memorial Hospital (LDMH)
- Hotel-Dieu Grace Healthcare (HDGH)
First meeting
- March 10, 2010

meet 2-3 times/year

HDGH, WRH, LDMH
TERMS OF REFERENCE

- To make recommendations on and formulate hospital policy regarding the safe, effective and cost-effective prescribing and use of antimicrobials in the treatment of hospital patients

- To review antimicrobial usage in the hospital and make recommendations or publish guidance as appropriate
TERMS OF REFERENCE

- To monitor and review prescribing practices within the hospital and provide appropriate guidance or feedback as necessary
- To establish and maintain a “Formulary and Guidelines for the Use of Antimicrobials in Adults and Pediatrics”
- To review antimicrobials for addition/deletion to the formulary
- To report to the P&T Committee
COMMITTEE MEMBERS

- Physicians
  - Hospitalists
  - ICU
  - ER
  - Surgery
  - Internal Medicine
  - Infectious Diseases
  - Microbiology
COMMITTEE MEMBERS

- Pharmacy
  - Clinical Pharmacists – ID, ICU
- Infection Control Practitioners
- Erie-St.Clair Regional Infection Control Network
- Windsor-Essex County Health Unit
- Nursing
COMMITTEE MEMBERS

- Invitees as needed
  - Administration
  - Information Services
  - Other Physicians
  - Other Pharmacists
WHERE TO START?

- ID physician - consultations
- ID pharmacist – follow-up all patients on antimicrobials
  - antibiotic utilization
  - duration of antibiotics
    - surgical prophylaxis
  - urine cultures
    - excessive ordering, treatment of asymptomatic bacteriuria
  - time to first dose of antibiotics
USE OF RESTRICTED ANTIBIOTICS
HDGH 2009

- restricted to ID physician and ICU physicians
- non-ICU patients need ID consult
- guidelines for use of antimicrobials
- Meropenem, Daptomycin, Linezolid, Tigecycline
- retrospective review
Restricted Antibiotics
HDGH 2009

- 6 month review
- Appropriateness of use
- Adherence to guidelines
- Meropenem
- 42 patients
- 79% courses started in ICU
- 79% ICU use inappropriate
  - Based on culture results, or could be changed to an alternative agent based on susceptibility results
ACTION PLAN

• one ICU physician found to be ordering most of courses of restricted antibiotics—$20,500 vs. $2300-4400
• data given to Medical Director, ICU
• meeting to discuss data with Medical Director, ID Pharmacist, ICU Pharmacist, ID Physician
• ICU director met with ICU physician
• routine Pharmacy follow-up when these antibiotics ordered to see if appropriate
RESTRICTED ANTIBIOTIC USE
HDGH  March – Sept 2011

Restricted Antibiotic Use by Discipline

- ICU
- ID
- CTU
- Surgery
- Renal
- Hospitalist
RESTRICTED ANTIBIOTIC USE
HDGH March – Sept 2011

ICU: Restricted Antimicrobial Use versus Number of Weeks Worked

# patients

weeks worked

0 1 2 3 4 5 6 7 8 9

0 2 4 6 8 10 12 14 16

A B C D E

physician
RESTRICTED ANTIBIOTICS
HDGH

Appropriateness of Antibiotic Therapy

% Courses

meropenem  linezolid  daptomycin  tigecycline

2009  2011
RESTRICTED ANTIMICROBIAL USE
Sept 2013 - Feb 2014

- retrospective review
- Meropenem
- Liposomal Amphotericin B (Ambisome)
- Ertapenem
- Linezolid
- Caspofungin
- Daptomycin
RESTRICTED ANTIMICROBIAL USE
Sept 2013 – Feb 2014

WRH – Ouellette Site

WRH – Metropolitan Site
RESTRICTED ANTIMICROBIAL USE
Sept 2013 – Feb 2014

WRH – Ouellette Site

WRH – Metropolitan Site
RESTRICTED ANTIMICROBIAL USE
Sept 2013 – Feb 2014

WRH – Ouellette Site

WRH – Metropolitan Site
RESTRICTED ANTIMICROBIAL USE
Sept 2013 – Feb 2014

WRH – Ouellette Site

WRH – Metropolitan Site
RESTRICTED ANTIMICROBIAL USE
Sept 2013 – Feb 2014

Overall Antibiotic Use: Appropriate versus Inappropriate Use

WRH – Ouellette Site

WRH – Metropolitan Site
ACTIONS

- Information given to ICU directors
- Meeting with ICU director at Ouellette site
- Prospective review

- 1 or 2 physicians account for the majority of “inappropriate” use
- How to change their practice and sustain changes
- Temporary change in practice, then back to previous prescribing practices
Surgical Prophylaxis

- Optimal use of prophylactic antibiotics
  - Antibiotics within 1 hour before surgical incision
  - Prophylactic antibiotics consistent with national guidelines
  - Discontinuation of prophylactic antibiotics within 24 hours after surgery
GENERAL SURGERY HDGH
April-June 2009

- 79 patients
- 8 surgeons
- cultures in 32/79 patients
- post-op antibiotic use excluding patients with infection
  - average 3.14 days, median 1 (range 0-16)
- only 51% patients had antibiotics stopped within 24 hours of surgery
% Patients Receiving Antibiotics ≤ 24h

Physician

A  B  C  D  E  F  G  H

% 100 90 80 70 60 50 40 30 20 0
VASCULAR SURGERY HDGH Jan-April 2010

- 47 patients
- 3 surgeons
- post-operative antibiotic use excluding patients with infection
  - average 4.7 days, median 3 (range 0-18)
- only 21% patients had antibiotics stopped within 24 hours of surgery
ACTION PLAN
May 2010

- results given to Chiefs of Surgery and General Surgery
- results blinded and unblinded with respect to individual surgeons
- memo on guidelines for surgical prophylaxis
- repeat audit to see if any improvement
ACTION PLAN 2011

- Information given to Chiefs of Surgery and General Surgery
- Dr. Quan attended Department of Surgery meeting to present data
- General Surgery – data discussed with members by Chief and efforts to modify prescribing practice of physicians
## GENERAL SURGERY HDGH

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># Patients</strong></td>
<td>79</td>
<td>57</td>
<td>54</td>
<td>47</td>
</tr>
<tr>
<td><strong># Surgeons</strong></td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td><strong>Average Duration of Post-op Antibiotic Prophylaxis</strong></td>
<td>3.14 days (0-16)</td>
<td>1.7 days (0-7)</td>
<td>2.8 days (0-20)</td>
<td>0.98 days (0-3)</td>
</tr>
<tr>
<td><strong>Antibiotics stopped within 24 hr</strong></td>
<td>64%</td>
<td></td>
<td>91%</td>
<td>90% (100 % in 4 surgeons)</td>
</tr>
<tr>
<td><strong># Patients with Cultures Done</strong></td>
<td>32 (41%)</td>
<td>19 (33%)</td>
<td>26 (48%)</td>
<td>7 (15%)</td>
</tr>
</tbody>
</table>
# Vascular Surgery HDGH

<table>
<thead>
<tr>
<th></th>
<th>Jan-April 2010</th>
<th>Sept-Nov 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># Patients</strong></td>
<td>47</td>
<td>39</td>
</tr>
<tr>
<td><strong># Surgeons</strong></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Average Duration of Post-op Antibiotic Prophylaxis</td>
<td>4.7 days (0-18)</td>
<td>2.9 days (0-14)</td>
</tr>
<tr>
<td><strong># Patients with Cultures Done</strong></td>
<td>10 (22%)</td>
<td>14 (36%)</td>
</tr>
</tbody>
</table>
31 patients
7 surgeons
average duration of post-operative antibiotic use excluding those with infection
- 11.7 days (0-25 days, median 9)
only 1 patient had cultures done
only 1 patient received antibiotics ≤ 24 hrs
# UROLOGY 2011

<table>
<thead>
<tr>
<th></th>
<th>WRH  Mar-Apr 2011</th>
<th>HDGH Jul-Sept 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td># Patients</td>
<td>31</td>
<td>46</td>
</tr>
<tr>
<td># Surgeons</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Average Duration of Antibiotics after Surgery</td>
<td>11.7 days (0-25)</td>
<td>8.9 days (0-14)</td>
</tr>
<tr>
<td>Antibiotics stopped within 24 hr</td>
<td>1 (3%)</td>
<td>2 (0.4%)</td>
</tr>
<tr>
<td># Patients with cultures done</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
ACTION PLAN

- information given to Chief of Urology for dissemination to department members

- post-op order set for urology – limit duration of antibiotic prophylaxis to 24 hours
86 patients, 4 surgeons

duration of post-operative antibiotics in patients without infection
  - average 1 day, median 1 day (range 0-1)

90% patients had antibiotics discontinued within 24 hours
nurses in OR noticed “high use” of iv Vancomycin for surgical prophylaxis

241 surgeries, 8 surgeons

205 patients (85%) received Cefazolin pre-operatively

36 patients (15%) received Vancomycin pre-operatively

- 20 patients (56%) should have received Cefazolin

reinforced the importance of verification of allergic reactions to Penicillin
URINE CULTURES

- areas of concern identified
  - urine cultures being sent by nurses without doctor’s order for “cloudy” or “foul-smelling” urine, especially in patient’s with Foley catheters
  - treatment of asymptomatic bacteriuria
  - frequency of urine cultures
999 urine cultures received by Micro lab
187 (19%) positive cultures
10% (18/187) with positive cultures had repeat urine culture sent within 1 week
antibiotics prescribed to 66% with positive urine cultures
ACTION PLAN

1 week chart review
- indication for sending urine cultures
- person ordering culture
- number of patients that are symptomatic when culture sent

information given to Microbiology Lab regarding duplicate urine cultures
- do not process repeat specimens
- however Micro Lab is unable to detect when repeat specimens sent
240 urine specimens received by Micro lab for culture
51 (21%) positive cultures

Indication for urine culture
- rule out infection, fever, urinary symptoms, foul-smelling/cloudy urine

Who ordered urine culture
- 76% ordered by physician (but often after urine already taken by nurse)
- no nursing policy for obtaining urine culture without doctor’s order
URINE CULTURES – HDGH
Nov 6-13, 2010

- 56% positive urine cultures were from Foley catheter or in/out catheter
- 33% with positive urine culture had repeat urine culture within one week
- 60% with positive urine culture and 37.5% with asymptomatic bacteriuria received antibiotics
**ACTION PLAN**

- Reinforce to Nursing that doctor’s order needed before urine culture is sent.
- Recommended that physician cancels urine culture if inappropriate.
- Education that asymptomatic bacteriuria should not be treated in most situations.
- Do not repeat urine cultures within 48 hours for negative cultures, and within 1 week for positive cultures.
- Newsletter to medical staff addressing the above issues.
Indication for Urine Culture

- Sepsis
- Urine Characteristics
- Urinary Symptoms
- Abdominal Pain
- Change in Mental Status
- Order Set

Urine Cultures – Indication 2011
# Urine Cultures at HDGH

<table>
<thead>
<tr>
<th></th>
<th>March 2010 n=999</th>
<th>Nov6-13, 2010 n=240</th>
<th>Feb-March 2011 n=430</th>
</tr>
</thead>
<tbody>
<tr>
<td># positive urine cultures (%)</td>
<td>187 (19)</td>
<td>51 (21)</td>
<td>105 (24)</td>
</tr>
<tr>
<td>10% had repeat culture in 1 week</td>
<td></td>
<td>33% had repeat culture in 1 week</td>
<td>29% had repeat culture in 1 week; 6.9% had 2 repeat cultures in 1 week</td>
</tr>
<tr>
<td>% of positive cultures treated</td>
<td>66</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>% of asymptomatic bacteriuria treated</td>
<td></td>
<td>37.5</td>
<td>47</td>
</tr>
<tr>
<td>% cultures ordered by M.D.</td>
<td></td>
<td>76</td>
<td>89.5</td>
</tr>
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</table>
ACTION PLAN

• nursing directives for obtaining urine cultures
  – fever or other symptoms of urinary tract infection
  – **not** for cloudy or foul-smelling urine alone
  – **not** for Foley catheter without symptoms
  – education to nurses

• reduce Foley catheter use for prevention of UTIs
ACTION PLAN

- Medicine Grand Rounds given by Dr. Quan on asymptomatic bacteriuria and catheter-associated UTIs
- Pharmacy newsletter
## Urine Cultures at HDGH

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<th>March 2010 n=999</th>
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<td>2% had repeat culture within 1 week</td>
</tr>
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<td>69</td>
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TIME TO 1<sup>st</sup> ANTIBIOTIC DOSE
HDGH 2012

- concern that there is a significant delay in receiving 1<sup>st</sup> dose of antibiotic
- February 27-March 2, 2012 (5 days)
- determine the duration of time from writing the order to administration of antibiotic
TIME TO 1ST ANTIBIOTIC DOSE HDGH 2012

<table>
<thead>
<tr>
<th>61 orders 11 wards</th>
<th>Time Written to Faxed</th>
<th>Time Faxed to Verified (Pharmacy)</th>
<th>Time Written to Administered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>59 min</td>
<td>1 h</td>
<td>5 h 45 min</td>
</tr>
<tr>
<td>2N</td>
<td>18 min</td>
<td>52 min</td>
<td>3 h 59 min</td>
</tr>
<tr>
<td>CCU</td>
<td>n/a</td>
<td>44 min</td>
<td>3 h 49 min</td>
</tr>
<tr>
<td>7W</td>
<td>n/a</td>
<td>44 min</td>
<td>9 h 23 min</td>
</tr>
<tr>
<td>8E</td>
<td>44 min</td>
<td>57 min</td>
<td>6 h 15 min</td>
</tr>
<tr>
<td>A&amp;R</td>
<td>8 h 32 min</td>
<td>1 h 16 min</td>
<td>13 h 44 min</td>
</tr>
</tbody>
</table>
ACTION PLAN

- information provided to each unit
- Pharmacy will screen faxed orders for antibiotics and process in priority sequence
- discuss with Nursing how to administer antibiotics in a timely manner
- prescribers to write “STAT” or “NOW”
# Time to 1st Antibiotic Dose HDGH

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
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</thead>
<tbody>
<tr>
<td>Overall</td>
<td>5 h 41 min</td>
<td>2 h 58 min</td>
</tr>
<tr>
<td>2N</td>
<td>3 h 59 min</td>
<td>2 h 3 min</td>
</tr>
<tr>
<td>CCU</td>
<td>3 h 49 min</td>
<td>4 h 44 min</td>
</tr>
<tr>
<td>7W</td>
<td>9 h 23 min</td>
<td>2 h 31 min</td>
</tr>
<tr>
<td>8E</td>
<td>6 h 15 min</td>
<td>2 h 12 min</td>
</tr>
<tr>
<td>A&amp;R</td>
<td>13 h 44 min</td>
<td>1 h 55 min</td>
</tr>
</tbody>
</table>
OTHER

- ID Pharmacist follow-ups on all patients prescribed antibiotics
- Vancomycin and aminoglycoside dosing
- Formulary & Guidelines for the use of Antimicrobials 2010-2011
- Yearly antibiogram (Microbiology Lab)
- Pharmacy newsletter
IV to oral stepdown of antimicrobials
order sets
outpatient monitoring of Vancomycin therapy through ER
- Vancomycin trough levels
Post-Splenectomy Vaccine Kit
Antibiotic dosing in hemodialysis patients
Antibiotic use in hemodialysis
OTHER

- Antibiotic Order Form was rejected by MAC
  - “another form to fill out”
  - physicians requested to state the indication and duration of antimicrobial when ordering
SENIOR LEADERSHIP ENGAGEMENT

- hospital administration wanted Antimicrobial Stewardship Program
- Regional P&T was being implemented

- 8 Patient Safety Indicators reportable to the Ministry of which 7 are infection related
  - *Clostridium difficile*  September 2008
  - MRSA bacteremia and VRE bacteremia December  2008
  - SSI prevention in hip and knee joint replacement April 2009
  - VAP and CLABSI in ICU April 2009
  - Hand Hygiene compliance April 2009
fulltime ID Pharmacist since 2005 at HDGH (now Ouellette site)

Metropolitan site has 2 pharmacists covering ID
  but also have routine Pharmacy duties
allocated time and financial reimbursement for physician
PHYSICIAN ENGAGEMENT

- all physicians diagnose and treat infections and therefore use antimicrobials
- effective Antimicrobial Stewardship Program needs buy-in from non-ID physicians
- involve physicians in setting up guidelines and policies
- provide feedback on their prescribing practices
- most physicians are amenable to recommendations from ID Pharmacist
however we have found that in each physician group there are one or two physicians that are more resistant to advice/recommendations

one-on-one discussions have not always been successful

physicians know and agree with value of antimicrobial stewardship but don’t practise it

how to change behaviour in these outliers and to maintain changes?
PHYSICIAN ENGAGEMENT

- other health practitioners need to be involved
  - Nurse Practitioners
  - Physician assistants
  - Clinical Pharmacists
  - Medical students/residents – start education early
  - Nurses
    - call us when they notice inappropriate antibiotic use
LESSONS LEARNED

- it’s a lot of work!
- dedicated Pharmacist and Physician required but it’s a multidisciplinary team approach
- need other champions
  - physicians, nurses, pharmacy
- start small, focus on 1 or 2 issues at a time
LESSONS LEARNED

- physicians respond to change better when they are compared to their peers, and are given information on their clinical practice
  - but it is difficult to change behaviour
  - physicians are aware of dangers of overuse of antibiotics, but still do it
  - constant reinforcement
LESSONS LEARNED

- education only goes so far
  - follow up with active interventions

- health care information technology is critical
  - access patient information
  - cultures, antimicrobial resistance, surveillance, trends

- hospital administration support and medical staff leadership are essential