ACKNOWLEDGEMENTS

The Providence Health Care Antimicrobial Stewardship Program would not have been possible without the contribution of many groups and individuals.

Thank you to the groups who have made time for us, modified work processes to accommodate us, and engaged in dialogue around antimicrobial use:

• Clinical pharmacists
• Medical microbiology technologists
• Physicians, residents and medical students
• Nurse practitioners
• Infectious diseases physicians
• Medical microbiologists
• Vancouver Coastal Health’s Antimicrobial Stewardship team (ASPIRES)

In addition, we would like to thank the following individuals for their unique contributions to building our program and acting as champions for antimicrobial stewardship:

• Salomeh Shajari
• Michael Mulder
• Felice Kwo
• David Lee
• Sharon Leung
• Ron Wall
• Dr. David Patrick
• Dr. Jock Reid
• BJ Paproski
• Leah Shapera
• Dr. Anna Rahmani
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>2</td>
</tr>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>4</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>6</td>
</tr>
<tr>
<td>CLINICAL ACTIVITIES</td>
<td>9</td>
</tr>
<tr>
<td>EDUCATION</td>
<td>15</td>
</tr>
<tr>
<td>GUIDELINES</td>
<td>20</td>
</tr>
<tr>
<td>RESEARCH</td>
<td>22</td>
</tr>
<tr>
<td>METRICS &amp; FINANCIALS</td>
<td>23</td>
</tr>
<tr>
<td>TEAM</td>
<td>30</td>
</tr>
</tbody>
</table>
In response to the growing public health threats of antimicrobial resistance and antimicrobial overuse, we established the Providence Health Care (PHC) Antimicrobial Stewardship Program (ASP) on April 1, 2013. Our goals were to optimize antimicrobial utilization at PHC and engage prescribers in dialogue around “Bugs and Drugs.”

To accomplish these broad program goals, we successfully implemented the following financially sustainable initiatives:

• Prospective audit of antimicrobial use and feedback to prescribers, with 1386 interventions and an 85 per cent acceptance rate. The majority of recommendations led to discontinuation of antibiotics.
• Collaboration with the Medical Microbiology Division to expedite optimal treatment of bloodstream infections.
• Partnership with Infection Prevention and Control to minimize the use of concurrent antibiotics for patients with Clostridium difficile infection.
• Effective communication with Wound Care Nursing Team to manage complex wounds.
• Broad education and teaching designed to improve antimicrobial therapeutics knowledge and heighten awareness of antimicrobial resistance
• Accessible, locally relevant, concise and evidence-informed treatment guidelines for common infections
• System improvements in selection and delivery of perioperative antimicrobial prophylaxis.
In the first year of our program, we built the foundations for a coordinated and systematic approach to support optimal antimicrobial treatment outcomes. We saved $487,231 in antimicrobial expenditures. We also helped other hospitals in British Columbia to develop similar programs in their institutions.

We are very fortunate to have the engagement and support of many individuals and teams in the PHC community. We would like to thank all prescribers at PHC. Together we can delay the post-antibiotic era by improving prescribing behaviour.

Sincerely,

Antimicrobial Stewardship Program
INTRODUCTION
INTRODUCTION

ASP is a systematic, coordinated and multifaceted approach to improve and measure the use of antimicrobials. Our program focuses on engaging prescribers in dialogue about antimicrobial resistance and therapy. We target inappropriate antimicrobial use by establishing programs to improve education, clinical documentation and care transitions.

In the era of increasing antimicrobial resistance, prescribers need to be well informed when selecting antimicrobials. Treatment needs to be effective and minimize harm from adverse effects such as disruption of human microbiome, development of antimicrobial resistance and superinfections, and drug interactions and toxicities.

We have an opportunity to optimize patient outcomes and potentially delay the post-antibiotic era by improving antimicrobial prescribing.

VISION
Use innovative evidence-informed strategies to transform the way antimicrobials are prescribed.

MISSION
Ensure that every patient and resident at Providence Health Care receives timely, safe and effective antimicrobial therapy.
Interventions by the ASP audit and feedback program

- Savings in antimicrobial expenditures: $487,371
- Year PHC Antimicrobial Stewardship Program established: 2013
- Acceptance rate of ASP recommendations: 85%

ANNUAL REPORT 2013/14
CLINICAL ACTIVITIES
2.1 AUDIT AND FEEDBACK

Ongoing audit and feedback are core clinical activities of our ASP. All patients receiving targeted antimicrobials are assessed for potential interventions including:

- Changing antimicrobials to target a syndrome or known pathogen
- Discontinuing antimicrobials
- Transitioning to oral antimicrobials
- Establishing duration of therapy

We make recommendations based on review of medical and nursing notes, diagnostic test results, published guidelines and local epidemiology. In complicated cases, we recommend consultation with the Infectious Diseases service.

We always attempt to contact the physician team to discuss our recommendations. Our goal is to provide timely, accessible and clinically relevant recommendations. All suggestions are left in the interdisciplinary notes and tracked in our database.

We understand that departures from clinical guidelines are necessary. Ultimately, the decision to accept or reject our recommendations rests with the most responsible physician. We never write orders without explicit approval by the most responsible medical or surgical team.

This year, we made 1326 audit and feedback interventions with an acceptance rate of 85%.
We implemented an ongoing collaborative process with the Medical Microbiology laboratory where the ASP physician or pharmacist participates in blood culture rounds. This ensures patients with positive blood cultures (bacteremia/fungemia) receive the most timely and appropriate treatment.

We have been using the new rapid identification system (MALDI-TOF) directly from blood cultures in conjunction with direct antimicrobial susceptibility testing. The PHC Medical Microbiology laboratory is leading the implementation of this innovative technology. We are fortunate to have this collaboration.
CLOSTRIDIUM DIFFICILE MANAGEMENT

_Clostridium difficile_ infection (CDI) is the most common form of infectious diarrhea in hospitalized patients. Antimicrobial use is a key driver of CDI and we know that patients diagnosed with CDI recover more slowly if they are on antimicrobials for other possible infections.

In collaboration with Infection Prevention and Control, we implemented a process where the ASP physician and pharmacist receive real time phone alerts of all new _C. difficile_ cases (“War on the Spore” program). The goal is to assess whether concurrent antimicrobials can be stopped.

In fiscal year 2014/15, ASP will start reviewing all inpatient cases of _C. difficile_ infection. In addition to assessing the need for concurrent antimicrobials, the ASP team will be assessing adherence to regional CDI management guidelines.
ASP collaborated with Infection Prevention and Control and St. Vincent’s Langara to implement a pilot prospective audit and review of urine cultures submitted from residents at Langara. The goal was to reduce inappropriate collection of urine cultures and unnecessary antibiotic treatment for asymptomatic bacteriuria. The project was successful in reducing overall antibiotic prescriptions for presumed urinary tract infections and the number of urine cultures collected from patients. In fiscal 2014/15, we will explore opportunities to implement this prototype in other residential care facilities at PHC.
2.5 WOUND CARE COLLABORATION

Patients with complicated wounds are often prescribed antibiotics for presumed infection. However, wounds which are appropriately cleaned by wound care nurse specialists will frequently show no residual signs of infection. In collaboration with the Wound Care Team, we implemented a process where ASP is alerted when antibiotics are prescribed for wounds with no clear signs of infection. The goal of the program is to avoid unnecessary antibiotics.

Educational dialogue between ASP pharmacist and wound care nurse specialist

Inappropriate wound culture collection is a primary driver of unnecessary antibiotic use. The next time you want to obtain a wound culture, consult the Wound Care Nursing Team for advice.
3.0 EDUCATION
We have held many interdisciplinary education sessions to enhance dialogue around antimicrobial stewardship at Providence Health Care.

ROUNDS
We implemented monthly ASP teaching for residents and medical students at St. Paul’s Hospital. ASP noon rounds were also held bimonthly for the Clinical Teaching Unit.

In the next fiscal year, we will be expanding clinical rounds to the General Surgery service and the Intensive Care Unit at St. Paul’s Hospital.
3.2 JOURNAL CLUBS

EVENING JOURNAL CLUBS

To promote physician, pharmacist and specialized nursing engagement, ASP organized six evening journal clubs this year.

Topics included febrile neutropenia, intra-abdominal infections, cardiac surgical site infections and implantable cardiac device infections, cellulitis and chronic venous insufficiency, and diabetic foot infections.

With the support of unrestricted educational grants from pharmaceutical companies, we engaged approximately 150 physicians, pharmacists and nurse specialists at Providence Health Care through evidence-informed education and dialogue.

In a Piperacillin-tazobactam (PZ) use evaluation, PZ was prescribed inappropriately in 41% of skin/soft tissue infections and 38% of lower respiratory tract infections.

Physician performs appropriate hand hygiene while considering the optimal antimicrobial to prescribe.

Did you know?
EDUCATION

POINT OF CARE EDUCATION

The ASP physician and pharmacist were available to discuss and provide advice on antimicrobial treatment choices. These discussions often occurred on the hospital wards during clinical rounds. Dialogue helps provide learning opportunities for prescribers and our team.

ROTATIONS FOR TRAINEES

We have provided supervision to trainees in the University of British Columbia Pharmacy, Infectious Diseases and Medical Microbiology residency programs. We will continue to offer rotations for trainees in the UBC Infectious Diseases and Medical Microbiology residency programs. Shorter rotations will be offered to PharmD candidates. Eventually, we hope to provide this rotation to other trainees.
3.3 KNOWLEDGE DISSEMINATION

We accepted invitations to speak at two forums sponsored by the BC Patient Safety and Quality Council. We shared our experience in developing a leading Antimicrobial Stewardship Program with other health organizations in British Columbia.
GUIDELINES & RESEARCH

Empiric treatment should be started immediately after basic investigations

Cefepime 2g IV Q8H

Evaluate for response to therapy

• If fever persists at day 3, consider consultation with clinicians familiar with managing febrile patients.

A further work-up for the cause of fever is indicated.

In most cases, vancomycin therapy may be stopped at 48 hours if it was empirically started.

Negative for organisms requiring vancomycin.

Consider stopping antibiotics after 2 days of normal temperature and neutrophils > 0.5 x 10^9/L.

Consider antifungal therapy in those with persistent fevers at 4-7 days despite broad spectrum therapy.

NOTES on Antimicrobials

* Allergies: For patients with severe allergy/ anaphylaxis to penicillins/cephalosporins, the empiric regimen

Vancomycin
25 mg/kg IV loading dose followed by 15 mg/kg IV Q12H should be considered in:

• hemodynamic instability

clinically suspected central line infection

Gram positive soft tissue infection

Antimicrobial Stewardship Program Annual Report 2013/14
4.1 GUIDELINES AND PATHWAYS

The Antimicrobial Stewardship Subcommittee is actively involved in developing and revising clinically relevant treatment guidelines for common infections seen at PHC. We produced six new guidelines, which were posted on our website. These guidelines are reviewed and endorsed by our sub-specialty colleagues at PHC and treatment recommendations consider local epidemiology.

PERIOPERATIVE ANTIMICROBIAL PROPHYLAXIS AND ORDER SETS

In collaboration with physicians in the Department of Surgery, we have been revising antimicrobials on pre-printed perioperative orders. Revisions are submitted to the local Pharmacy and Therapeutics Committee for approval. We have also been working closely with our antimicrobial stewardship colleagues at Vancouver Coastal Health to develop a regional document for perioperative antimicrobial prophylaxis. Next fiscal year, ASP will be working closely with order sets for the Clinical Systems Transformation project.
RESEARCH

DRUG UTILIZATION

We believe that our program will significantly decrease overall antimicrobial utilization at Providence Health Care. However, our antiquated pharmacy information system limits simple data extraction. We anticipate that with information system upgrades coming in the next fiscal year, the study of drug utilization will be much easier. The drug utilization analysis will be done in collaboration with the provincial “Do Bugs Need Drugs?” program.

RESEARCH FELLOWSHIPS

ASP will be involved in co-supervising an infectious diseases fellow for the AMMI Canada (Association of Medical Microbiology and Infectious Disease Canada) Post-Residency Research Fellowship.

The project will start next fiscal year. The objective is to examine the clinical impacts of rapidly identifying pathogens causing bacteremia in hospitalized patients followed by prospective audit and feedback.
METRICS & FINANCIALS
INTERVENTIONS

The standard for clinical outcome metrics for antimicrobial stewardship programs is an ongoing area of research. In the first year of our program, we were able to track the number and types of interventions we made through our prospective audit and feedback based on targeted antimicrobials. Process measures will be further refined in the next few years to better understand where audit and feedback has the most impact.

The types of interventions and the indications for the interventions are summarized in Tables 1-2 and Figure 1.

TABLE 1. TOTAL NUMBER OF INTERVENTIONS BY THE ANTIMICROBIAL STEWARDSHIP TEAM

<table>
<thead>
<tr>
<th>NUMBER OF INTERVENTIONS</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCEPTANCE PROPORTION NUMBER (PERCENTAGE)</td>
<td></td>
</tr>
<tr>
<td>ACCEPTED</td>
<td>780 (85.4%)</td>
</tr>
<tr>
<td>NOT ACCEPTED</td>
<td>133 (14.6%)</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>413 (100%)</td>
</tr>
</tbody>
</table>
6.1 INTERVENTIONS

TABLE 2. TOTAL NUMBER OF INTERVENTIONS BY THE ASP TEAM BY SITE

<table>
<thead>
<tr>
<th>SITE</th>
<th>NUMBER OF INTERVENTIONS</th>
<th>ACCEPTED (%)</th>
<th>NOT ACCEPTED (%)</th>
<th>UNKNOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPH</td>
<td>1,249</td>
<td>742 (86.8%)</td>
<td>113 (13.2%)</td>
<td>394</td>
</tr>
<tr>
<td>MSJ</td>
<td>77</td>
<td>38 (65.5%)</td>
<td>20 (34.5%)</td>
<td>19</td>
</tr>
</tbody>
</table>

FIGURE 1A. TYPES OF INTERVENTION SUGGESTIONS BY ANTIMICROBIAL STEWARDSHIP PROGRAM

- **DISCONTINUE**: 980
- **MODIFY ANTIMICROBIAL**: 517
- **MODIFY ROUTE**: 81
- **MODIFY DURATION**: 52
- **MODIFY DOSE**: 23
DRUG UTILIZATION

The pharmacy information system has been undergoing upgrades to permit more efficient extraction of drug utilization data. During the first year of our program, resources were not available to examine the changes in antimicrobial utilization after our antimicrobial stewardship program was implemented. After the information system upgrades, our plan is to review drug utilization for targeted antimicrobials. The metric used for each antimicrobial will be Daily Defined Dose/10,000 patient days.

FIGURE 1B. ANTIMICROBIALS MOST OFTEN DISCONTINUED

- Piperacillin-Tazobactam IV: 325
- Ceftriaxone IV: 162
- Vancomycin: 140
- Metronidazole IV: 53
- Ciprofloxacin IV: 43
6.3

FINANCIALS

ANTIMICROBIAL EXPENDITURES

Although financial savings are not the primary objectives of our antimicrobial stewardship program, we know that implementation of ASP can decrease antimicrobial expenditures. This occurs through more judicious use of antimicrobials when they are needed, better determination of antimicrobial therapy duration and improved selection of pathogen directed antimicrobials and routes of administration. This year expenditures decreased by $487,371.

ANNUAL ANTIMICROBIAL EXPENDITURES

![Graph showing annual antimicrobial expenditures from 2009-10 to 2014-15]*

FY 13 - 14 antibiotic budget ↓ $174K
FY 14 - 15 antibiotic budget ↓ $208K

* FY 13 - 14 and FY 14 - 15 expenditures are marked with downward arrows.
6.4

ANTIMICROBIAL EXPENDITURE SAVINGS

CUMULATIVE ANTIMICROBIAL EXPENDITURES 2013-2014

FISCAL PERIODS

EXPENDITURES ($)

$2,500,000

$2,000,000

$1,500,000

$1,000,000

$500,000

0

1 2 3 4 5 6 7 8 9 10 11 12 13

ACTUAL EXPENDITURES

BUDGET
## FINANCIAL STATEMENT 2013-2014

<table>
<thead>
<tr>
<th></th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VARIANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LABOUR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASP PHYSICIAN (0.5 FTE)</td>
<td>$163,292</td>
<td>$163,292</td>
<td>$ =</td>
</tr>
<tr>
<td>ASP PHARMACIST (1.0 FTE)</td>
<td>$94,396</td>
<td>$122,715</td>
<td>$28,319</td>
</tr>
<tr>
<td>ANALYST</td>
<td>$ -</td>
<td>$41,768</td>
<td>$41,768</td>
</tr>
<tr>
<td>CLERK</td>
<td>$ -</td>
<td>$4,849</td>
<td>$4,849</td>
</tr>
<tr>
<td><strong>TOTAL LABOUR</strong></td>
<td>$257,688</td>
<td>$332,624</td>
<td>$74,936</td>
</tr>
<tr>
<td><strong>NON LABOUR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDA</td>
<td>$571</td>
<td>$300</td>
<td>($271)</td>
</tr>
<tr>
<td>CONFERENCE</td>
<td>$712</td>
<td>$ -</td>
<td>($712)</td>
</tr>
<tr>
<td>CONSULTANTS</td>
<td>$1,020</td>
<td>$ -</td>
<td>($1,020)</td>
</tr>
<tr>
<td>MEMBERSHIP FEES</td>
<td>$201</td>
<td>$ -</td>
<td>($201)</td>
</tr>
<tr>
<td>SUNDRY</td>
<td>$10,000</td>
<td>$6,500</td>
<td>($3,500)</td>
</tr>
<tr>
<td>COMPUTER FEES</td>
<td>$2,095</td>
<td>$ -</td>
<td>($2,095)</td>
</tr>
<tr>
<td><strong>TOTAL NON-LABOUR</strong></td>
<td>$14,599</td>
<td>$6,800</td>
<td>($7,799)</td>
</tr>
<tr>
<td><strong>TOTAL EXPENSES</strong></td>
<td>$272,286</td>
<td>$339,424</td>
<td>$67,137</td>
</tr>
</tbody>
</table>

*The 2013/14 budget was reduced by $173,558 to fund the program*
THE TEAM
CLINICAL TEAM

The clinical team consists of the ASP physician (Dr. Victor Leung) and pharmacists (Allison Kirkwood, Dr. Daljit Ghag). We work closely with clinical pharmacists, physicians and nurses at Providence Health Care to conduct the daily activities of the program. The clinical team is responsible for engaging prescribers and are the champions for the project by ensuring appropriate visibility of the project across the organization and to other organizations as appropriate.

Dr. Victor Leung
ASP Physician lead

Allison Kirkwood
ASP Pharmacist

Dr. Daljit Ghag
Interim ASP Pharmacist
The operational team consists of our Vice President Executive Sponsor (David Thompson) and Project Sponsor (Luciana Frighetto). They provide overall direction and senior level decisions required by the project including confirmation and approval of project scope, timeline and budget. They provide support to ensure that the required resources are available and are accountable for ensuring the Senior Leadership Team and Providence Health Care board committees and external stakeholders are updated on the overall status of the project.

David Thompson
Vice President, Seniors Care and Clinical Support Services

Luciana Frighetto
Pharmacy Director, PHC Acute Care & Medication Use Evaluation
The subcommittee is chaired by Dr. Glen Brown and reports to the Pharmacy and Therapeutics Committee. Members provide direct input into key decisions and resolution of critical issues throughout the project. The subcommittee meets monthly.

Dr. Glen Brown
Clinical Pharmacist, Intensive Care

Dr. Marc Romney
Physician and Head, Division of Medical Microbiology. Medical Director, Infection Prevention and Control

Dr. Sylvie Champagne
Physician, Division of Medical Microbiology

Dr. Peter Phillips
Physician and Head, UBC Division of Infectious Diseases
ANTIMICROBIAL STEWARDSHIP SUBCOMMITTEE

Dr. Mark Hull
Physician, Division of AIDS and Infectious Diseases

Dr. Chantal Leger
Physician, Division of Hematology

Right to left: Dr. Marc Romney, Allison Kirkwood, Dr. Victor Leung, Dr. Chantal Leger, Dr. Glen Brown.
(Missing: Dr. Peter Phillips, David Thompson, Luciana Frighetto, Dr. Sylvie Champagne, Dr. Mark Hull, Dr. TC Yang, Dr. Rob Stenstrom, Dr. Daljit Ghag)