

Antimicrobial Stewardship

Annual Report 2017 - 2018



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Executive Summary

Best Practices

There is ongoing work to develop and revise clinical tools, protocols and order sets. Items completed and actively being developed/ revised include:

- Pharmacist Managed Pharmacokinetic Monitoring and Dosing of Vancomycin and Aminoglycosides Clinical Practice Standard (APPROVED)
- All-Staff Antimicrobial Stewardship webpage on OurNH
- Pharmacy Resident Research project – IV to PO conversion rate for high bioequivalent antibiotics at UHNBC (final manuscript pending)
- Retrospective Evaluation of *Clostridium Difficile* Infection Risk Factors and Management at a University Teaching Hospital in Northern BC (final manuscript pending)
- Education sessions for prescribers – Friday Grand Rounds
- Urinary Tract Infections - Education Module on Learning Hub
- Regional Outpatient IV Antimicrobial Therapy order set (complete)
- Creation/Regionalization of Chronic Obstructive Pulmonary Disorder Acute Exacerbation (COPDAE) order sets (complete)
- Regional Sepsis protocol revisions/updates (complete)

Antimicrobial Usage Metrics

Antibiotic utilization, measured in defined daily dose (DDD) per 100 patient-days, is calculated to track the utilization trend over time. The DDD is the assumed average adult maintenance dose per day for a drug used for its main indication. The conversion of drug utilization amount to DDD units is performed to standardize utilization of different classes of antibiotics, allowing comparisons to be made across different facilities or patient groups (excluding pediatric populations). For the 2017/18 FY, overall usage of the targeted antimicrobials (carbapenems, 3rd generation cephalosporins cefotaxime and cefTRIAxone, DAPTOmycin, aminoglycosides, micafungin, piperacillin-tazobactam and vancomycin) has decreased in all

HSDAs including UHNBC compared to last fiscal year. This overall decrease can be seen largely in part due to large decreases in ceftriaxone use and to a smaller extent piperacillin-tazobactam use. This positive trend which was first seen in quarter 2 of this year is very promising for the AMS program and we hope to see this trend continue to a point of stabilization over the next 1 - 2 fiscal years. Large decreases in usage of IV fluconazole and moxifloxacin compared to oral use were also seen in the NE and NW respectively.

Comparing the last 4 fiscal years up until period 13 we see an increase in total drug, however we have seen a stabilization of antimicrobial costs per inpatient day despite an increase in overall drug costs per inpatient day. The percentage of increase in cost is much less for the antimicrobials specifically compared to the annual drug cost.

Clinical Service/Audit & Feedback

In quarter 3 and 4 of this fiscal year variations of Prospective Audit and Feedback (A&F) of targeted antimicrobials have continued (with mentorship from the AMS program coordinator at UHNBC) at Bulkley Valley & District Hospital, the Omineca Lakes District facilities and Fort St. John Hospital. Patient case reviews at GR Baker Hospital re-started at the end of quarter 4 and will continue with AMS program coordinator mentorship for quarter 1 and 2 of the next fiscal year.

In the second half of this fiscal year 1950 patient cases were reviewed and 888 drug therapy problems were identified with a 69% resolution rate, which is slightly lower than in quarter 1 & 2. This brings our total drug therapy problems (DTPs) identified this year to approx. 1300 with a resolution rate of 71%. This is still under our goal of 80% however this is still higher than in the previous fiscal year where the resolution rate was only 60%. Looking at the whole fiscal year our rates of unresolved DTPs due to pharmacist workload and patient status change (discharged or deceased) are 24% and 28% respectively compared to 56% and 25% from quarter 4 of last fiscal (this data was not collected for the full year in 2016/17).

Introduction

Northern Health's Antimicrobial Stewardship (AMS) Program is continually striving to meet the needs of our various facilities and patient populations being managed at these facilities. We are working towards improvements in antimicrobial prescribing and ultimately patient care.

Sharing this report with interested stakeholders is important and with the vast geographical size of our health authority comes the constant challenge of finding effective ways to distribute information and other program related communications. We will be utilizing several avenues to distribute this report and apologize for any duplications. If you are interested in providing feedback on distribution methods for this information or on what you read in this report please feel free to contact the program coordinator (see page 5 for contact information).

We are constantly seeking engagement at the site level and encourage anyone interested in Antimicrobial Stewardship and ideas for improvement at their facility to contact the program coordinator. Only when we work together can we truly improve the use of antimicrobials within the Northern Health Authority.

Antimicrobial Stewardship Program Team Members

AMS Program Coordinator
<ul style="list-style-type: none"> Alicia Rahier (Clinical Pharmacy Specialist – Regional)
AMS Medical Lead
<ul style="list-style-type: none"> Abu Hamour (Infectious Disease MD – NI)
AMS Subcommittee Members
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Clinical Pharmacists (who provide data for Audit and Feedback)
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Best Practices

1. Clinical Tools, Standards and Policies

1.1 Pharmacist Managed Pharmacokinetic Monitoring and Dosing of Vancomycin and Aminoglycosides Clinical Practice Standard (APPROVED)

This new regional clinical practice standard authorizes pharmacists across the health authority to provide monitoring and dosing of vancomycin and aminoglycosides (gentamicin, tobramycin and amikacin). In addition to this policy, we have updated the new pharmacist training program to include targeted education on this topic as well as provided an education session for all existing staff to orient pharmacists to the standardized procedure for managing these medications. This clinical practice standard can be found on [OurNH](#).

1.2 All-Staff Antimicrobial Stewardship webpage on OurNH

NH staff are now able to quickly and easily gain access to information about the NH AMS program as well as any relevant clinical tools, clinical practice standards, clinical memos or bulletins and other online resources from the all-staff [Antimicrobial Stewardship Webpage](#).

1.3 Pharmacy Resident Research project – IV to PO conversion rate for high bioequivalent antibiotics at UHNBC

A research project was led by one of the NH pharmacy residents for 2017/18. Intravenous to oral conversion has demonstrated numerous clinical and pharmacoeconomic benefits. As such, it has the potential to positively impact various stakeholders at multiple levels of the healthcare system. The purpose of this study is to evaluate the frequency of appropriate IV to PO conversion of antibiotics with highly bioequivalent oral formulations at UHNBC. No estimate of this conversion frequency currently exists for UHNBC or elsewhere in Northern Health. However, this practice is known to have significant clinical and pharmacoeconomic benefits. Over the 2016/17 fiscal year, the cost of intravenous antibiotics at UHNBC was ~\$450,000. In terms of antibiotic use, intravenous formulations accounted for 21% of all ciprofloxacin use, 75% of all clindamycin use, 59% of all metroNIDAZOLE use, and 33% of all moxifloxacin use. This study will help to characterize the need for interventions in this regard and can be used as a benchmark in the future to estimate the impact of those interventions.

Our research question was as follows: How often are adult inpatients at UHNBC continuing to receive intravenous ciprofloxacin, clindamycin, metroNIDAZOLE, or moxifloxacin for treatment of infection despite eligibility for oral administration?

A summary of the final results are as follows: 71 charts containing orders for any of ciprofloxacin IV, clindamycin IV, metroNIDAZOLE IV and moxifloxacin IV, were evaluated from April 2016 – March 2017. The rate of missed opportunity for oral conversion was found to be 10.5%, which is much lower than the investigators had anticipated. This translated into an average of 2 days of unnecessary IV antibiotic. It was found that 25% of cases were

converted to oral therapy later into the treatment course than deemed clinically appropriate. When looking at length of hospital stay, the mode number of days for those converted appropriately was 3 days versus 6 days for those converted late or not at all. Complications were encountered in 39% of cases with the most frequent being IV site complications, which of course was seen less frequently in the appropriately converted patient groups. This small study shows that conversion to oral results in shorted hospital stay and less complications and therefore should continue to be a goal of AMS targeted assessments. The complete manuscript for this project will be available by September 2018.

1.4 Retrospective Evaluation of *Clostridium Difficile* Infection Risk Factors and Management at a University Teaching Hospital in Northern BC.

The primary objective of this research project is to assess if management of *Clostridium difficile* infection (CDI) at UHNBC complies with provincial and national standards in the absence of Health Authority CDI management support tools. The secondary objectives of this research project are a) to identify the proportion of CDI patients who had modifiable risk factors, such as presence of antibiotics, whether antibiotics were broad spectrum or of prolonged duration, presence of proton-pump inhibitors (PPIs) or histamine-2 antagonists (H2RAs) and b) patient outcomes such as length of hospital stay, mortality rate and recurrence rate.

The retrospective chart reviews were carried out by the AMS program coordinator in collaboration with 2 other clinical pharmacists from the Intensive Care Unit and the Clinical Teaching Unit. A summary of the final results are as follows: 178 patient charts of patients with hospital acquired CDI at UHNBC from April 2010 to March 2016 were reviewed and the compliance rate to provincial and national standards was found to be low at 32%. Modifiable risk factors for CDI were identified in the majority of patient cases. These results will be used to direct development of a CDI specific initiative from the AMS program in the upcoming year.

The complete manuscript for this research will be available by September 2018.

2. Education Initiatives

2.1 Education sessions for prescribers – Friday Grand Rounds

Prescriber education has been shown to benefit AMS outcomes when done in conjunction with other initiatives. Our Medical Lead, Dr. Hamour, provided 3 education sessions this fiscal: 1) Sept 29th on Management of Community Acquired Pneumonia in adults 2) Nov 10th on Management of Urinary Tract Infections in adults and 3) Feb 9th on Management of Catheter-associated Urinary Tract infections. Quarter 1 of the 2018/19 fiscal year (April 2018) started off with 2 CME education sessions in Smithers, BC (Updates on management of Skin and Soft Tissue Infection and Hepatitis C). Prescribers (at all sites) are encouraged to provide requests for topics and future education opportunities to the AMS Program Coordinator who will work with sites to set up these opportunities.

2.2 Education Module – Learning Hub

Urinary tract infections are a commonly treated condition both in hospital and in the community. UTI management education was identified by the AMS subcommittee as a priority. Learning modules (3) have been designed for pharmacists, nurses and physicians. These online modules are housed on the [learning hub platform](#) and participants will receive a certificate of completion once all 3 modules plus quizzes and feedback evaluations are completed. The first module covers asymptomatic bacteriuria and uncomplicated UTI; the second module covers complicated UTI and pyelonephritis; the third module discusses catheter associated UTIs. Each module should take about 20 - 30 min to complete (including the quiz). Once logged into the learning hub, the course is searchable by name: NHA – AMS – Urinary Tract Infections.

3. Order Set Development

3.1 Regional Outpatient IV Antimicrobial Therapy order set

The current state of Outpatient parenteral antimicrobial therapy (OPAT) practice within Northern Health varies considerably with respect to place of administration, documentation, and pharmacist involvement. It has been identified by several sites that a standardized order set will improve patient care with regards to IV antimicrobial therapy in the ambulatory care setting. A regional order set was created and available for use in November 2017. After 5 months of use, feedback was received from end users and some format adjustments were made. The latest revisions have been approved and the [updated order set](#) is now available for use.

3.2 Creation/Regionalization of Chronic Obstructive Pulmonary Disorder Acute Exacerbation (COPDAE) order sets

The new order set for COPDAE led by the Respiratory Therapy group contains [Admission orders](#), [Orders for 48 hours after Admission](#) as well as [Discharge orders](#) which can be sent to a patient's community pharmacy. To accompany these order sets, a Regional Chart Package including patient education items and a discharge checklist has been created and is available for ordering through Document Source (item number: 21017).

3.3 Regional Sepsis protocol revisions/updates

The AMS program coordinator has participated on a regional working group led by the Critical Care Program. Extensive revisions were done to the previously existing Regional Order Set with hopes of shortening the form and updating the content to align with the 2016 Surviving Sepsis guidelines. This revised [Order Set](#) and [Triage Screen](#) tool have been approved and are now available for use.

Clinical Service (Prospective Audit & Feedback)

Audit and Feedback (A&F) is an evidence-based practice of reviewing a patient's medical chart and diagnostic test results and engaging with prescribers to collaboratively optimize antimicrobial therapies. This practice involves the selection of the most appropriate, narrowest spectrum agent based on clinical status, indication, allergies, culture results, potential drug interactions and adverse effects, taking into account current clinical practice guidelines.

The A&F clinical service and evaluation efforts are focused on:

- optimizing empiric therapies
- targeting therapy based on additional diagnostic information
- optimizing antimicrobial dosing and treatment durations
- converting intravenous (IV) antimicrobials to oral formulations when appropriate to prevent the complications associated with IV agents
- providing education to prescribers on the clinical practice guidelines for the treatment of infections
- promoting consultation of infectious disease specialist when necessary

Audit and Feedback Recommendations and Acceptance rates

In quarter 3 and 4 of this fiscal year variations of Prospective Audit and Feedback (A&F) of targeted antimicrobials have continued (with mentorship from the AMS program coordinator at UHNBC) at Bulkley Valley & District Hospital, the Omineca Lakes District facilities and Fort St. John Hospital. Patient case reviews at GR Baker Hospital re-started at the end of quarter 4 and will continue with AMS program coordinator mentorship for quarter 1 and 2 of the next fiscal year.

In the second half of this fiscal year 1950 patient cases were reviewed and 888 drug therapy problems were identified with a 69% resolution rate, which is slightly lower than in quarter 1 & 2. This brings our total drug therapy problems (DTPs) identified this year to approx. 1300 with a resolution rate of 71%. Although this is still short of our goal of 80% it is still higher than in the previous fiscal year where the resolution rate was only 60%, indicating progress is being made. Looking at the whole fiscal year our rates of unresolved DTPs due to pharmacist workload and patient status change (discharged or deceased) are 24% and 28% respectively compared to 56% and 25% from quarter 4 of last fiscal (this data was not collected for the full year in 2016/17).

Analysis of the cases reviewed, drug therapy problems identified and resolved was done collectively for all sites active at any point during 2017/18 (see Table 1).

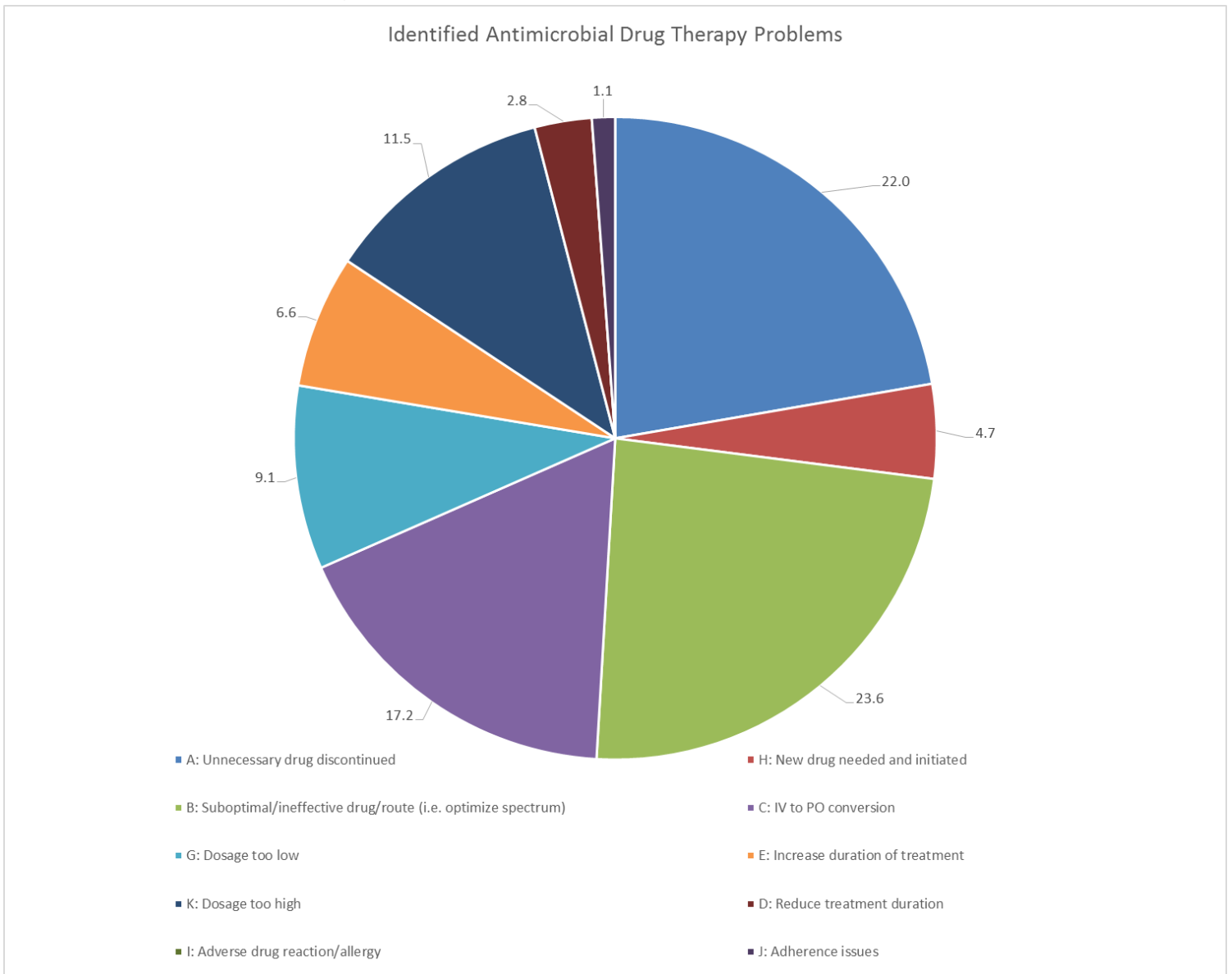
Table 1 - Audit and Feedback antimicrobial drug therapy problem resolutions

Measure	Number of Patients
Results for Q3 & 4	
Patient Chart Reviewed	1950
Antimicrobial therapy problems identified	888
Antimicrobial therapy recommendations resolved	616
Antimicrobial therapy problem resolution rate	69%
Unresolved antimicrobial therapy problems	272
Unresolved drug therapy problems due to pharmacist workload demands	65 (24%)
Unresolved drug therapy problems due to patient discharge	84 (31%)
Results for all quarters	
Patient Chart Reviewed	2856
Antimicrobial therapy problems identified	1308
Antimicrobial therapy recommendations resolved	925
Antimicrobial therapy problem resolution rate	71%
Unresolved antimicrobial therapy problems	383
Unresolved drug therapy problems due to pharmacist workload demands	90 (23.5%)
Unresolved drug therapy problems due to patient discharge	108 (28%)

Tracking of these drug therapy problems thus far have been done by way of manual methods requiring individual pharmacists to notify the AMS program coordinator of these items. The AMS coordinator has tried to encourage this tracking however it is not unreasonable that workload has restricted this data collection, especially at UHNBC. July 2018 has seen release of an online DTP tracking system which still requires individual pharmacist data entry but should in theory make this tracking process more comprehensive and convenient. The AMS program coordinator anticipates the use of this online system will show an increase in antimicrobial DTP identification and hopefully resolution rate as well.

There are a variety of types of antimicrobial therapy problems; Figure 1 displays various types of drug therapy problems **identified**. The top 3 drug therapy problems are consistent from previous years and include: #1 Unnecessary Antimicrobial Discontinued, #2 Suboptimal or ineffective therapy and #3. Converting IV antimicrobial to an oral agent.

Figure 1 - Antimicrobial Drug Therapy Problem Types



Data source: Manual tracking spreadsheet maintained by AMS program coordinator with input from clinical pharmacists
Graph prepared by: AMS program coordinator

Outcome and Process Measures

Antibiotic Utilization across NH

Antibiotic utilization, measured in defined daily dose (DDD) per 100 patient-days, is calculated to track the utilization trend over time. The DDD is the assumed average adult maintenance dose per day for a drug used for its main indication. The conversion of drug utilization to this standardized measurement allows for comparisons to be made across different antibiotic classes and facilities. The following tables are summaries of targeted antibiotic usage trends in each HSDA for the last two quarters of the fiscal year. The decrease in usage seen across the entire health authority in quarter 2 was sustained in both quarter 3 (Table 2a) and quarter 4 (Table 2b). These are promising results as they lend more value on actual impact of AMS initiatives versus being due simply to chance.

Table 2a

Targeted Antimicrobial Utilization Trends (DDD/100 patient-days) (Comparison of Q3 2016/17 to Q3 2017/18)	
(Carbapenem (Ertapenem, Imipenem-Cilastatin, Meropenem), Cefotaxime, Ceftriaxone, Daptomycin, Gentamicin, Miconazole, Piperacillin-Tazobactam, Tobramycin, Vancomycin)	
HSDA	Antimicrobial Usage
North East	↓
Northern Interior (excludes UHNBC)	↓
University Hospital of Northern BC	↓
North West	↓
Northern Health (includes UHNBC)	↓
Increase of more than 10 % compared to previous YTD	↑
Increase of less than or equal to 10 % compared to previous YTD	↗
No Change	→
Decrease compared to previous YTD	↓

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/April 6, 2018

Table prepared by: Planning and Performance Improvement July 5, 2018

Table 2b

Targeted Antimicrobial Utilization Trends (DDD/100 patient-days) (Comparison of Q4 2016/17 to Q4 2017/18)	
(Carbapenem (Ertapenem, Imipenem-Cilastatin, Meropenem), Cefotaxime, Ceftriaxone, Daptomycin, Gentamicin, Miconazole, Piperacillin-Tazobactam, Tobramycin, Vancomycin)	
HSDA	Antimicrobial Usage
North East	↓
Northern Interior (excludes UHNBC)	↓
University Hospital of Northern BC	↓
North West	↓
Northern Health (includes UHNBC)	↓
Increase of more than 10 % compared to previous YTD	↑
Increase of less than or equal to 10 % compared to previous YTD	↗
No Change	→
Decrease compared to previous YTD	↓

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Apr 6, 2018

Table prepared by: Planning and Performance Improvement July 5, 2018

Comparing the entire fiscal year to the previous fiscal year we see that overall the decrease in usage of these targeted antimicrobials is stable across all regions. This is the first time we have seen a sustained overall decrease in all areas.

Table 2c

Targeted Antimicrobial Utilization Trends (DDD/100 patient-days) (Comparison of FY 2016/17 to FY 2017/18)	
(Carbepenem (Ertapenem, Imipenem-Cilastatin, Meropenem), Cefotaxime, Ceftriaxone, Daptomycin, Gentamicin, Miconazole, Piperacillin-Tazobactam, Tobramycin, Vancomycin)	
HSDA	Antimicrobial Usage
North East	↓
Northern Interior (excludes UHNBC)	↓
University Hospital of Northern BC	↓
North West	↓
Northern Health (includes UHNBC)	↓

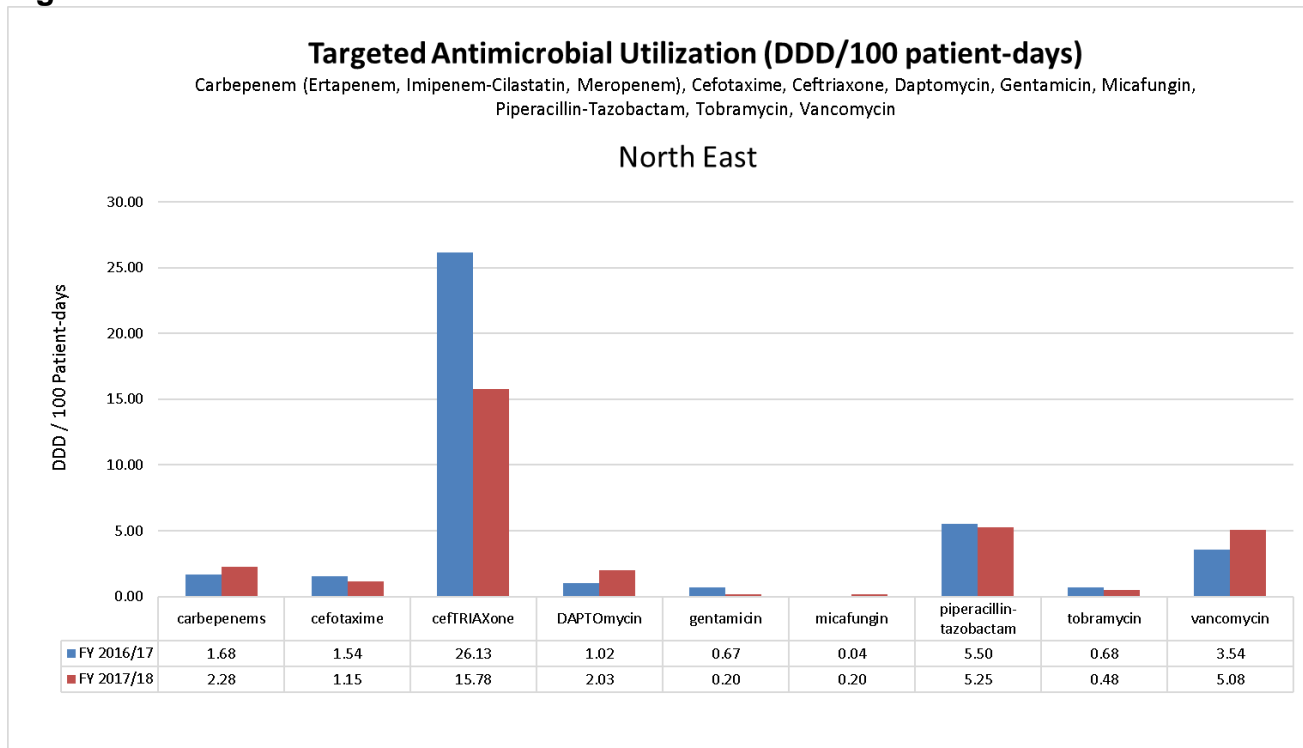
Increase of more than 10 % compared to previous YTD	↑
Increase of less than or equal to 10 % compared to previous YTD	↑
No Change	→
Decrease compared to previous YTD	↓

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017; Apr 6, 2018

Table prepared by: Planning and Performance Improvement, July 20, 2018

In order to illustrate what drugs are showing significant decreases and increases across the health authority over the past year, we have divided the information from the above tables further to show individual drug usage in each HSDA, see Figures 2 – 5. The largest decrease in all areas overall was seen with cefTRIAxone which in previous years has been the most frequently used targeted antimicrobial. We also see that there was a decrease in usage of piperacillin-tazobactam in all areas; this is promising to see that our previous top 2 broad-spectrum agents are showing a decrease in usage. Looking at carbepenem usage which overall is not large in comparison to cefTRIAxone and piperacillin-tazobactam, we see a decrease in the NW, NI and at UHNBC but a small increase in the NE; at this point the magnitude of increase is nothing to be concerned with. We also see a mix of decreased and increased usage of DAPTOmycin and vancomycin with them being both decreased at UHNBC but increases in each in the NE. Interestingly in the NW and NI we see a decrease in vancomycin usage in contrast to an increase in DAPTOmycin which may indicate a change in practice of MRSA management (typically in the outpatient setting) from primarily vancomycin to the more convenient DAPTOmycin. One can perhaps guess the simultaneous decrease or increase of these agents in the other areas is simply due to fluctuations in incidence of infections with suspected or confirmed MRSA.

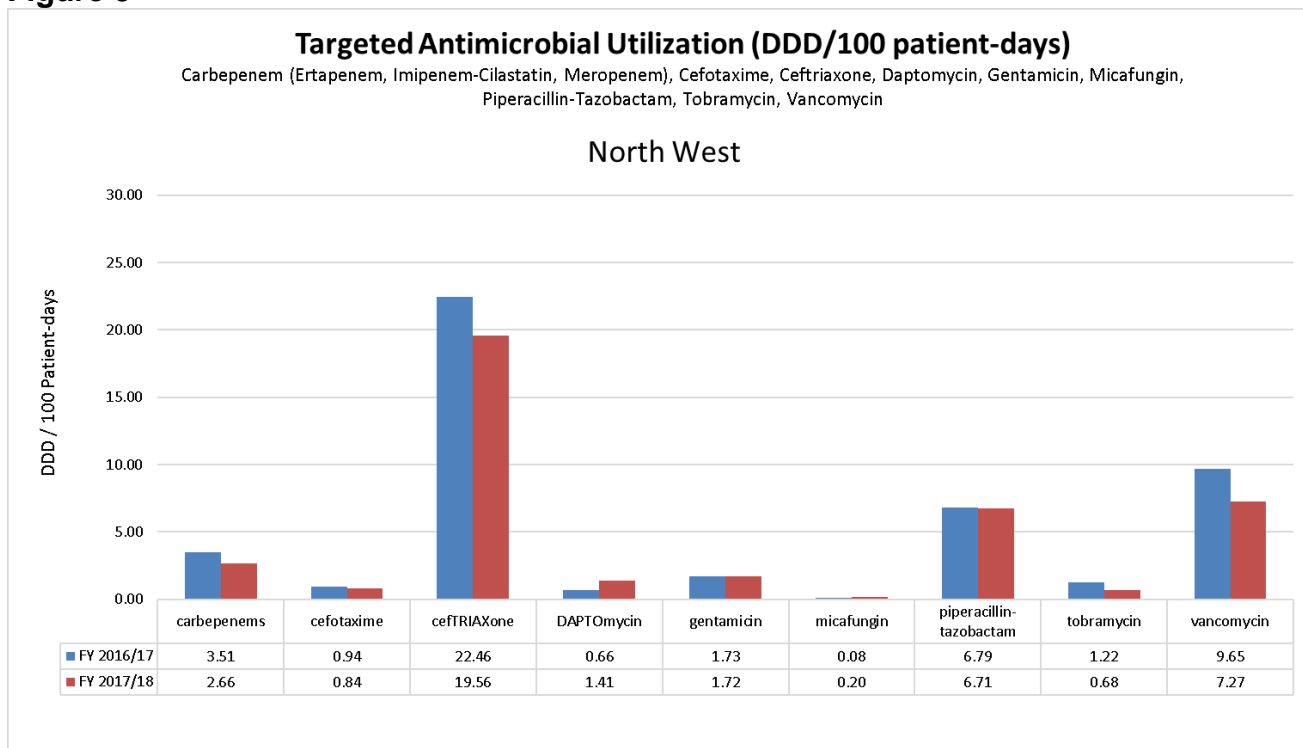
Figure 2



Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/ Sept 25, 2017; Apr 6, 2018

Graph prepared by: Planning and Performance Improvement Aug 7, 2018

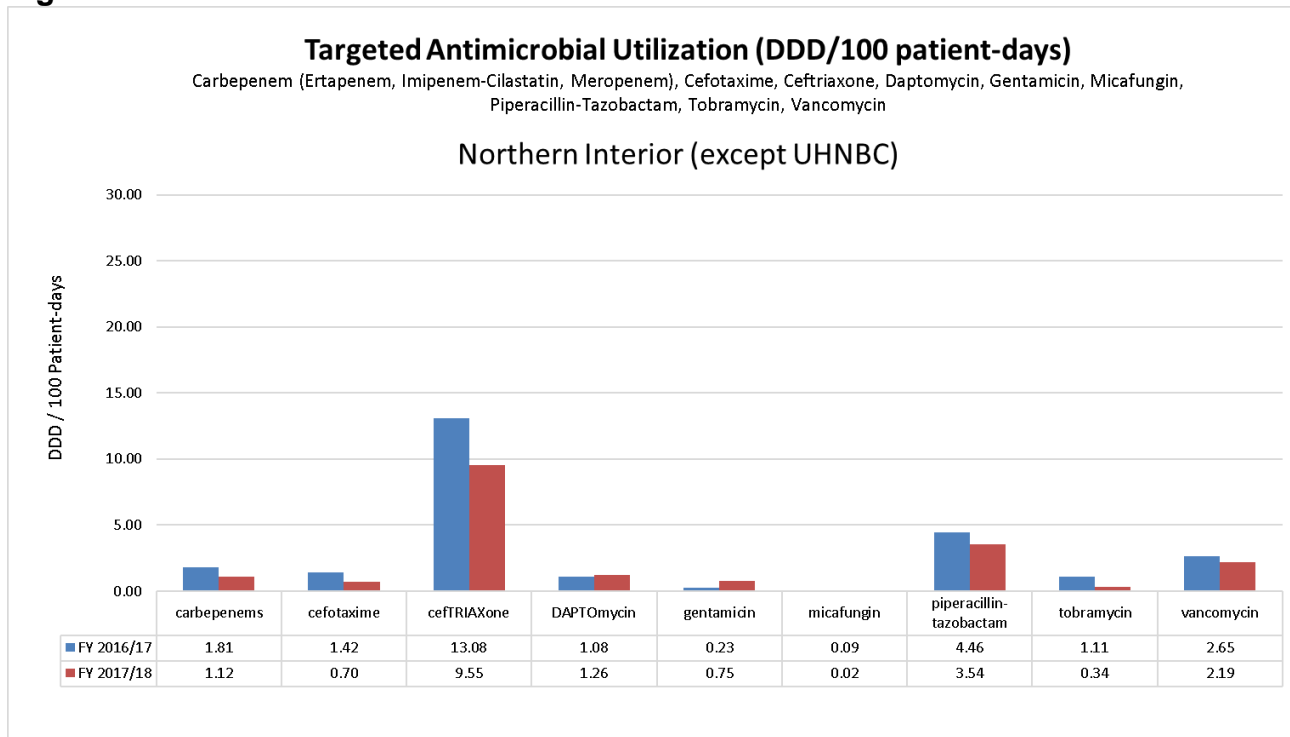
Figure 3



Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/ Sept 25, 2017; Apr 6, 2018

Graph prepared by: Planning and Performance Improvement Aug 7, 2018

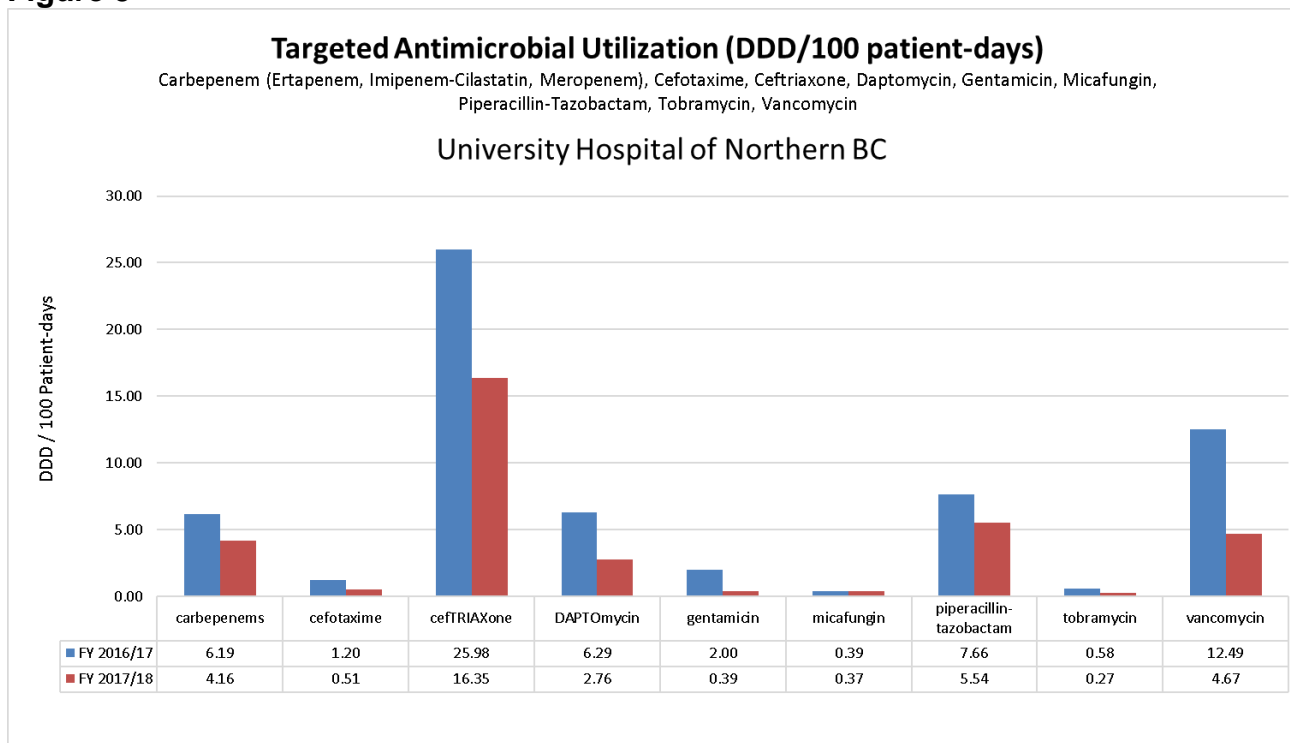
Figure 4



Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/ Sept 25, 2017; Apr 6, 2018

Graph prepared by: Planning and Performance Improvement Aug 7, 2018

Figure 5



Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/ Sept 25, 2017; Apr 6, 2018

Graph prepared by: Planning and Performance Improvement Aug 7, 2018

High Bioequivalent Antimicrobials

Timely conversion from intravenous (IV) to oral (PO) antimicrobial therapy is effective for a variety of infections, especially for agents with high bioavailability (the fraction of unchanged drug that is absorbed and reaches the systemic circulation). Conversion from IV to PO antimicrobials in select patients results in cost savings for the facility as well as positive clinical outcomes such as shortened hospital stay, reduced risk of line-related infections and adverse events and no IV related mobility restrictions for patients. There is a group of antimicrobials where the oral formulation is equally potent compared to the IV formulation; this group is referred to as high bioequivalent antimicrobials.

A selection of these high bioequivalent targeted antimicrobials are compared per HSDA using the DDD per 100 patient-days, see Tables 3-6 below.

Table 3
High Bioequivalence Drugs (IV versus Oral) (DDD / 100 patient-days)

HSDA North East

Medication	2016/17		2017/18	
	IV	PO	IV	PO
ciprofloxacin	21%	79%	24%	76%
clindamycin	75%	25%	83%	17%
fluconazole	64%	36%	7%	93%
linezolid	99%	1%	100%	0%
metroNIDAZOLE	64%	36%	74%	26%
moxifloxacin	40%	60%	35%	65%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/ Sept 25, 2017; Apr 6, 2018

Table prepared by: Planning and Performance Improvement, Aug 7, 2018

Table 4
High Bioequivalence Drugs (IV versus Oral) (DDD / 100 patient-days)

HSDA North West

Medication	2016/17		2017/18	
	IV	PO	IV	PO
ciprofloxacin	38%	62%	16%	84%
clindamycin	68%	32%	67%	33%
fluconazole	39%	61%	22%	78%
linezolid	22%	78%	10%	90%
metroNIDAZOLE	51%	49%	54%	46%
moxifloxacin	87%	13%	30%	70%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/ Sept 25, 2017; Apr 6, 2018

Table prepared by: Planning and Performance Improvement, Aug 7, 2018

When looking at the proportions of IV versus PO in the NE we see a large decrease of 57% in IV fluconazole usage compared to oral usage, with small increases of 8 and 10% in clindamycin and metroNIDAZOLE respectively. Proportions of IV to PO remain relatively the same of all other agents examined. The NW shows an impressive 57% decrease in IV moxifloxacin use compared to oral and a 22% decrease of IV ciprofloxacin. Modest decreases of 17 and 12% in fluconazole and linezolid respectively, are also seen with relative stabilized proportions in all other agents.

Table 5
High Bioequivalence Drugs (IV versus Oral) (DDD / 100 patient-days)

HSDA Northern Interior (except UHNBC)

Medication	2016/17		2017/18	
	IV	PO	IV	PO
ciprofloxacin	28%	72%	23%	77%
clindamycin	64%	36%	55%	45%
fluconazole	13%	87%	25%	75%
linezolid	0%	100%	0%	100%
metroNIDAZOLE	58%	42%	57%	43%
moxifloxacin	42%	58%	33%	67%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/ Sept 25, 2017; Apr 6, 2018

Table prepared by: Planning and Performance Improvement, Aug 7, 2018

Table 6
High Bioequivalence Drugs (IV versus Oral) (DDD / 100 patient-days)

HSDA UHNBC

Medication	2016/17		2017/18	
	IV	PO	IV	PO
ciprofloxacin	21%	79%	21%	79%
clindamycin	75%	25%	56%	44%
fluconazole	27%	73%	26%	74%
linezolid	50%	50%	26%	74%
metroNIDAZOLE	59%	41%	59%	41%
moxifloxacin	33%	67%	24%	76%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/ Sept 25, 2017; Apr 6, 2018

Table prepared by: Planning and Performance Improvement, Aug 7, 2018

The NI and UHNBC show less impressive decreases in IV usage of moxifloxacin (9%), clindamycin (9 & 19%) and linezolid (24%). The NI demonstrated a 12% increase in IV fluconazole usage.

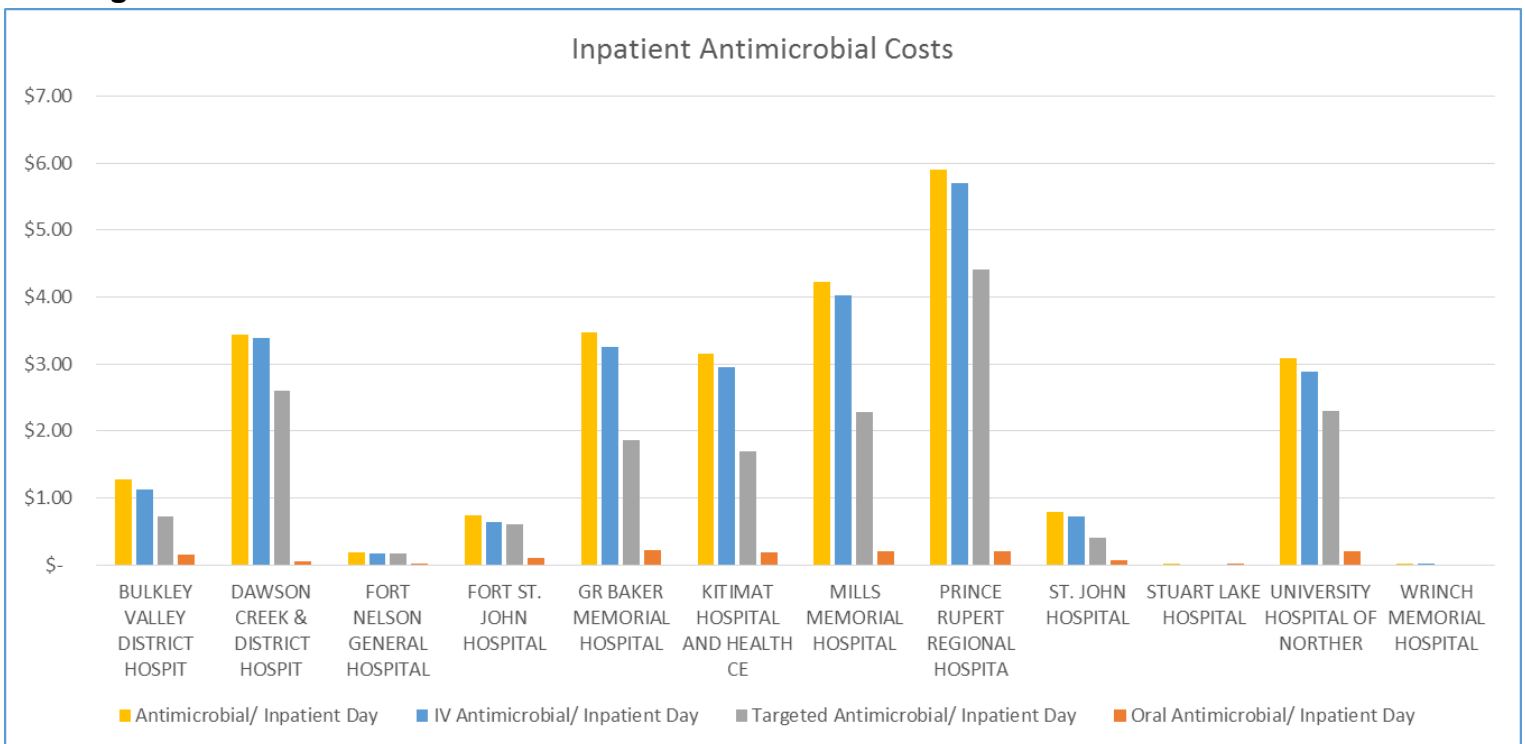
Antimicrobial Costs

In the 2016/17 fiscal year, NH spent just over a half million dollars (~\$528,000) in drug costs alone for antimicrobial therapies for inpatients. This expenditure was slightly increased in 2017/18 fiscal year at approx. \$577,000, however the cost per inpatient day was slightly lower at \$2.75/inpatient day (compared to \$2.8/inpatient day last year). As seen before the majority of the drug cost is due to intravenous agents (Figure 6a, blue bar).

Figure 6a shows the break down per facility for money spent on antimicrobials per inpatient day, divided as all agents, IV agents, oral agents and target agents (i.e. broad spectrum IV agents). Sites with the highest cost per inpatient day include Prince Rupert Regional Hospital, Mills Memorial Hospital and GR Baker Memorial Hospital, Dawson Creek Hospital and Kitimat Hospital and UHNBC, which is much similar to the distribution last fiscal year. It is clear that despite pharmacist interventions these sites are still experiencing a high use of IV antibiotics and may require some site specific education/initiatives to impact their drug expenses.

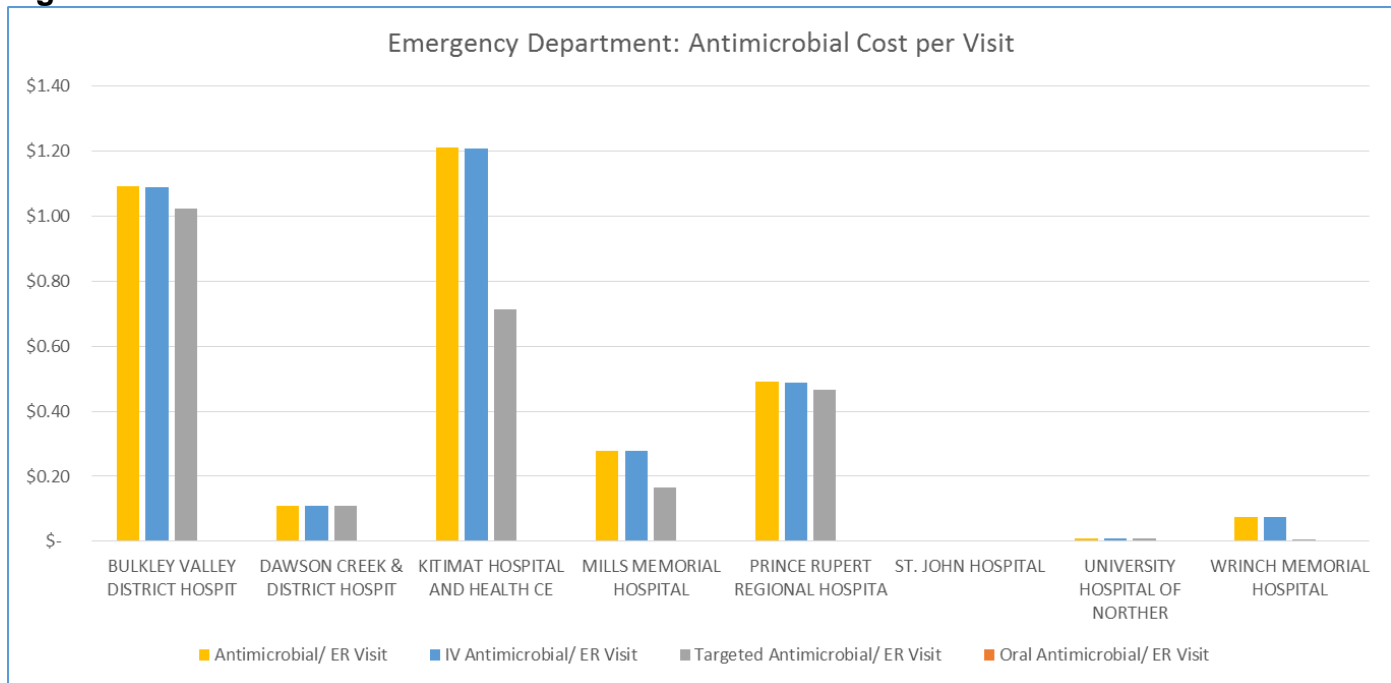
If we look at costs of antimicrobials administered in emergency departments only we see a slight increase in total cost of about \$10,000 compared to last fiscal year (Figure 6b.). The sites with the highest expenditure out of this department include Bulkley Valley, Kitimat, Prince Rupert and UHNBC. At this time, we are unable to comment on the proportion of this cost that is contributed by outpatient therapies versus patients admitted to these departments.

Figure 6a.



Data source: Cerner database/Accessed April 2018
 Graph prepared by: Business Analyst for Pharmacy Group

Figure 6b.

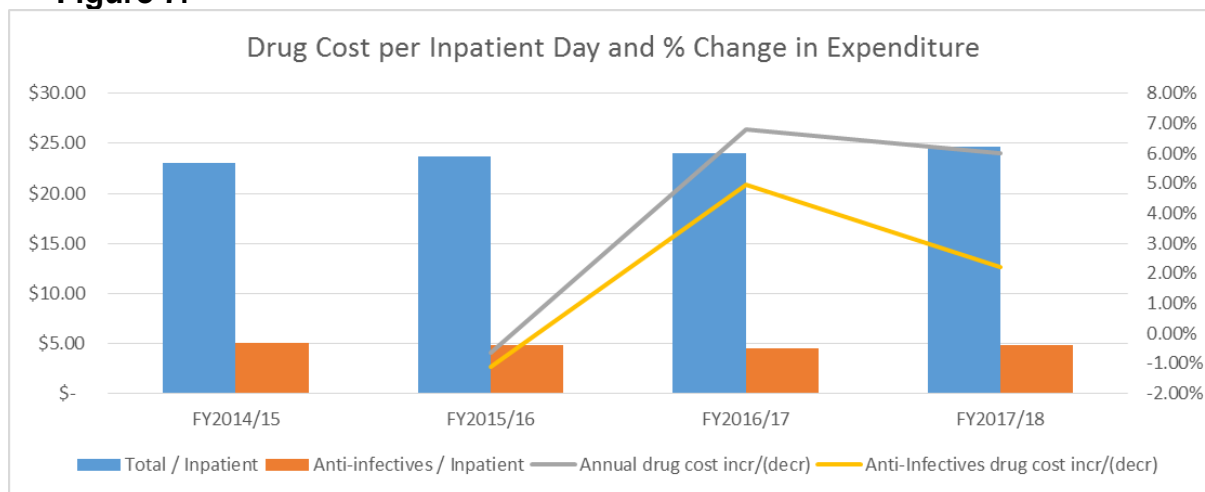


Data source: Cerner database/Accessed April 2018
 Graph prepared by: Business Analyst for Pharmacy Group

Due to this increase in antimicrobial (IV) costs in emergency departments, these areas will be a monitored this fiscal year for potential need to target these departments for area specific interventions to investigate the patient population this is affected by (admitted versus outpatient) and if there are particular practices that could be improved upon.

Comparing the last 4 fiscal years up until period 13 we see an increase in total drug costs including antimicrobials, however we have seen a stabilization of antimicrobial costs per inpatient day (Figure 7 - orange bar) despite an increase in overall drug costs per inpatient day (blue bar). We also see a decrease in total cost both for antimicrobials (yellow line) and the annual total drug cost (grey line) but the percentage of change is greater for the antimicrobials (yellow line).

Figure 7.



Data source: Cerner database/Accessed April 2018
 Graph prepared by: Business Analyst for Pharmacy Group

Accreditation & Resources

The site surveys for Accreditation took place in June 2018. In order to ensure we were meeting standards to provide safer care to our patients, and to prepare for these visits, the antimicrobial stewardship (AMS) program distributed a short self-assessment questionnaire in the fall of 2017 to several different disciplines at several different facilities in addition to an audit checklist which was distributed to site leadership. The intention was to use responses from participants to help determine how best to support clinicians in accreditation preparation and ongoing program development work. The results from the self-assessment showed that majority of respondents did not know anything about the AMS program, including its existence by name. Providing staff with education around AMS and access to more information relating to AMS and program initiatives has been a priority this year. Live and recorded presentations have been offered to nursing staff at sites across the health authority. It was hoped that these sessions will be valuable in promoting the AMS program and educating staff on how they can incorporate AMS initiatives into their daily practice. The Accreditation group also had pre-planned webinars around ROP education for all staff. The full report and final results of this survey can be found on OurNH [Accreditation info for NH](#). The overall rating for the required organizational practice (ROP) of Antimicrobial Stewardship was considered 'met' for all tests of compliance and no further evidence submission required for this year's survey.

NH staff including physicians have ongoing access to online resources for AMS via the NH [physicians' website](#) as well as [OurNH](#). Both platforms have a dedicated page for Antimicrobial Stewardship information, guidelines and tools as well as access to current and previous reports. The aim is for staff to be able to educate and update themselves on the work being done by the AMS program.