Antimicrobial Stewardship

Mid-Year Report (Q1 & Q2) 2017 - 2018

Table of Contents

Executive Summary

The NH AMS Program was pleased to have our ID specialist join the program this year in an official capacity as Medical Lead. We are working towards improvements in antimicrobial prescribing and ultimately patient care in the North.

Best Practices

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

- Revision of Outpatient IV Antimicrobial Therapy options; re-instatement of ceFAZolin + Probenacid (order set approval projected Oct. 2017)
- Regional Sepsis protocol revisions/updates (projected approval Nov. 2017)
- Research project – IV to PO conversion rate for high bio-equivalent antibiotics (planned proposal submission – Nov. 2017)
- COPD exacerbation order set package – Submitted for NHMAC endorsement Sept 20, 2017)
- Pharmacist Managed Pharmacokinetic Monitoring and Dosing of Vancomycin and Aminoglycosides clinical practice standard (awaiting final approval – Oct. 2017)
- AMS webpage on NH Physician website
- Education sessions for physicians from Dr. Hamour (Sept 29th and Nov 10th – Friday Grand Rounds)
- Retrospective review of C. Diff Management at UHNBC (data analysis phase)
- Education module for Urinary Tract Infections (including catheter associated and asymptomatic bacteriuria) (projected release – Nov. 2017)

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 to this standardized measurement allows for comparisons to be made across different antibiotic classes and facilities. Table 2a and 2b are summaries of the change in usage of certain targeted antimicrobials (carbepenems, 3rd generation cephalosporins: cefotaxime and cefTRIAXone, DAPTOmycin, aminoglycosides, micafungin, piperacillin-tazobactam and vancomycin) compared to Q1 and Q2 last fiscal year. Table 2a shows that overall usage has decreased, likely influenced by the decrease seen at UHNBC. The Northern Interior (excluding UHNBC) showed a less than 10% increase and the North West showed no change compared to Q1 last FY. We see that in Q1 there was still an increase in use in the NE which was seen in our annual report for 16/17. However if you look at the summary provided in Table 2b we see a decrease in usage across the entire health authority. Being that this is the second year of measuring these metrics, we will be monitoring for stabilization of changes or are these differences simply due to seasonal fluctuations.

Clinical Service/Audit & Feedback

Over the first 2 quarters of this fiscal year variations of Prospective Audit and Feedback (A&F) of targeted antimicrobials have been continued (with mentorship from the AMS program coordinator at UHNBC) at Kitimat General Hospital, Prince Rupert Regional Hospital, Bulkley Valley & District Hospital and Wrinch Memorial Hospital and the Omineca Lakes District facilities. Mills Memorial Hospital graduated to a more independent model for identifying and resolving drug therapy problems related to antimicrobials. Approx. 900 patient cases were reviewed and 422 drug therapy problems were identified with a 73% resolution rate. The top 3 drug therapy problems were consistent from last fiscal year and include: #1. Unnecessary Antimicrobial Discontinued, #2. Suboptimal or ineffective therapy and #3. Converting IV antimicrobial to an oral agent.
Patient case reviews at Fort St. John and GR Baker Hospitals have been put on hold pending pharmacist clinical development and are planned to commence Nov 2017 and Jan 2018, respectively.

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.

In order to adapt processes to acknowledging the reality of our limited resources and consider the use of evaluative information, the AMS program subcommittee has decided to change our reporting frequency from quarterly updates to a semi-annual structure. Therefore this report marks the first AMS Mid-Year report.

Sharing the 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 Sub-committee Members
• Alicia (Ridgewell) Rahier (Clinical Pharmacy Specialist – Regional)
• Abu Hamour (Infectious Disease MD – NI)
• Amy Nunley (Clinical Pharmacy Specialist - NI)
• Andrew Lowe (clinical pharmacist - NE)
• Barb Falkner (Profession Practice lead pharmacist)
• Carey-Anne Lawson (IT-CIS pharmacist)
• Carly Rosger (Clinical pharmacist - NW)
• Carol Pruner (Clinical pharmacist - NI)
• Deanna Danskin (Quality Resource Technologist Microbiology)
• Debora Giese (CIC-Certified Infection Control, NW)
• Fareen Din (Intensivist, Nephrologist/Internist - NI)
• Inban Reddy (Family Practice MD - NI)
• Judy Klein (IPC practitioner - NE)
• Kyla Bertschi (clinical pharmacy Specialist - NI)
• Kyla Redlon (Clinical Nurse Educator - NI)
• Nancy Dyck (Medication use Management pharmacist)
• Sharri Leslie(Microbiology Technologist - NI)
Clinical Pharmacists (who provide data for Audit and Feedback)
• Rebecca Arsenault – MMH • Manuela Krisinger – MMH • Aron Nenninger - MMH
• Samantha Holland – Omineca Lakes District
• Tracy Moraes – PRRH • Michael Gentleman - PRRH
• Eyad Abu Sabiha – KGH
• Leah Smith – Remote Relief coverage
• Oseyi Oseghale - FSJ

Contact Information

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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 (awaiting final approval October 2017)

This new regional clinical practice standard will authorize pharmacists to provide monitoring and dosing of vancomycin and aminoglycosides (gentamicin, tobramycin and amikacin). In addition to this policy, there will be updates made to new pharmacists training as well as clinical update sessions for all existing staff to orient pharmacists to the standardized procedure for managing these medications. The policy has been reviewed by the pharmacy group and is awaiting approval from the Director of Pharmacy and VP of Medicine.

1.2 Antimicrobial Stewardship webpage on NH Physician website

NH prescribers are now able to quickly and easily gain access to information about the NH AMS program as well as any relevant clinical tools, order sets, clinical practice standards, clinical memos or bulletins and other online resources from the NH physician's website. Under Physicians' Resources, prescribers will find the Antimicrobial Stewardship webpage at the top of the list.

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

A research project will be led by the NH pharmacy resident 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 past 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 is 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?

Ethics approval from UBC and Northern Health Research committees has been granted and data collection will be commencing in Dec 2017.

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. The data collection phase was completed in August 2017. Data analysis is currently underway and aimed to be completed by April 30th, 2018.

2. Education Initiatives

2.1 Education session 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, will be giving 2 presentations in quarter 3; the first on Sept 29th on Management of Community Acquired Pneumonia in adults and the second on Nov 10th on Management of Urinary Tract Infections in adults. Prescribers are encouraged to watch for communications on these and other infectious disease related presentations from the physician education group.

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 will be 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 min to complete (including the quiz). The module information and framework has been submitted to the learning hub web design team and we are aiming for release in November 2017.

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.

OPAT allows for enhanced patient quality of life, reallocation of resources for higher acuity patients, and prevention of nosocomial infections compared to inpatient therapy. With adherence to published standards of practice, OPAT is as safe and effective as inpatient care. Therefore, adherence to published standards is essential to prevent complications and hospital readmissions. Standardization of practice and alignment to published standards is a priority to achieving optimal safety and efficacy outcomes for OPAT in Northern Health.

A gap analysis was performed and data for 21 sites was captured. The majority of OPAT was delivered through the emergency department. Standards referring to “standardized forms and documentation” had the lowest compliance at 13%. This is reflected by the following frequently reported barrier: “lack standardized forms” (18/21 sites). Based on the information gathered from this analysis a regional order set and antimicrobial flow sheet for nursing were created and implemented across the health authority. Next steps will include following up on usage of these standardized forms at all NH facilities that provide outpatient IV antimicrobial therapy.

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. A draft was distributed to stakeholder groups and feedback received has been incorporated. The final draft will be submitted to NHMAC for endorsement in September 2017.

3.3 Regional Sepsis protocol revisions/updates

The AMS program coordinator is participating on a regional working group led by the Critical Care Program. Extensive revisions were done on the previously existing order set with hopes of shortening the form and updating the content to align with the 2016 Surviving Sepsis guidelines. The working group has monthly meetings and the order set is currently in the stakeholder feedback stage. The aim is for submission to NHMAC in November.

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

Over the first 2 quarters of this fiscal year variations of Prospective Audit and Feedback (A&F) of targeted antimicrobials have been continued (with mentorship from the AMS program coordinator at UHNBC) at Kitimat General Hospital, Bulkley Valley & District Hospital and Wrinch Memorial Hospital and the Omineca Lakes district facilities. Mills Memorial Hospital and Prince Rupert Regional Hospital have graduated to a more independent model for identifying and resolving drug therapy problems related to antimicrobials. Patient case reviews at Fort St. John and GR Baker Hospitals have been put on hold pending pharmacist clinical development and are planned to commence Nov 2017 and Jan 2018, respectively.

Approx. 900 patient cases were reviewed and 422 drug therapy problems were identified with a 73% resolution rate. This is our highest recorded resolution rate thus far, up from 60% last fiscal year – approaching our goal of 80%. At this point in the year our rates of unresolved due to pharmacist workload and patient status change (discharged or deceased) are at an all-time low each at ~6%, down respectively from 56% and 22% from quarter 4 last fiscal.

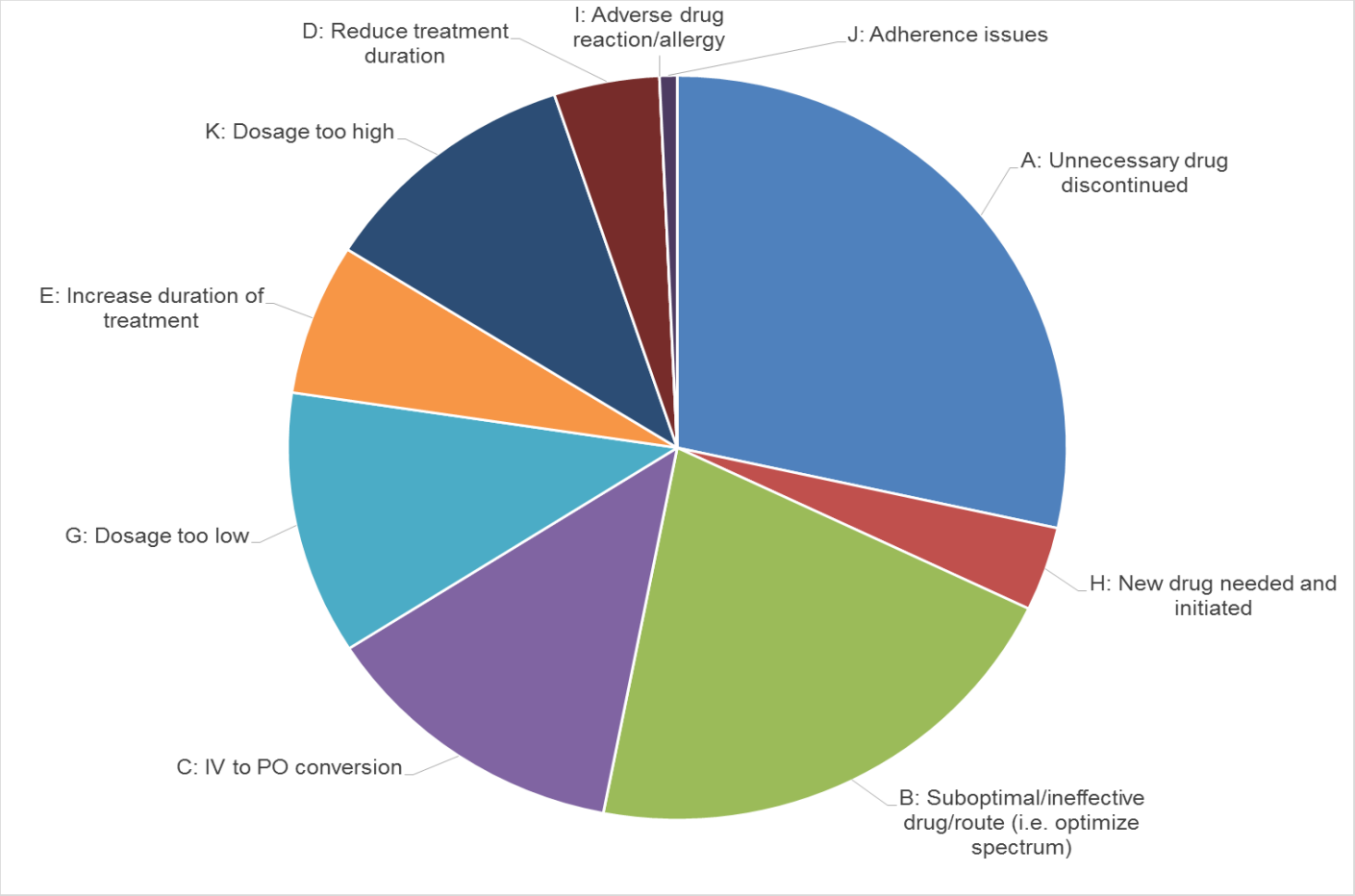
There are a variety of types of antimicrobial therapy problems; Figure 1 displays various types of drug therapy problems **identified.** The top 3 drug therapy problems are consistent from last fiscal and include: #1 Unnecessary Antimicrobial Discontinued, #2 Suboptimal or ineffective therapy and #3.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

Analysis of the cases reviewed, drug therapy problems identified and resolved was done collectively for all sites active at any point during Q1 and Q2 (see Table 1).

Table 1 - Audit and Feedback antimicrobial drug therapy problem resolutions

Measure	**Number of Patients**
Patient Chart Reviewed	906
Antimicrobial therapy problems identified	422
Antimicrobial therapy recommendations resolved	309
Unresolved drug therapy problems due to pharmacist workload demands	6%
Unresolved drug therapy problems due to patient discharge	5.7%

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. Table 2a and 2b below are summaries of the change in usage of certain targeted antimicrobials (carbepenems, 3rd generation cephalosporins: cefotaxime and cefTRIAXone, DAPTOmycin, aminoglycosides, micafungin, piperacillin-tazobactam and vancomycin) compared to Q1 and Q2 last fiscal year. Table 2a shows that overall usage has decreased, likely influenced by the decrease seen at UHNBC. The Northern Interior (excluding UHNBC) showed a less than 10% increase and the North West showed no change compared to Q1 last FY. We see that in Q1 there was still an increase in use in the NE which was seen in our annual report for 16/17. However if you look at the summary provided in Table 2b we see a decrease in usage across the entire health authority. Being that this is the second year of measuring these metrics, we will be monitoring for stabilization of changes or whether these differences are simply due to seasonal fluctuations.

Table 2a (Q1 FY 16/17 versus Q1 FY 17/18)

Targeted Antimicrobial Utilization Trends (DDD/100 patient-days)

(Comparison of Q1 2016/17 to Q1 2017/18)

(Carbepenem (Ertapenem, Imipenem-Cilastatin, Meropenem), Cefotaxime, Ceftriaxone, Daptomycin, Gentamicin, Micafungin, Piperacillin-Tazobactam, Tobramycin, Vancomycin)

HSDA	Antimicobial 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
Table prepared by: Planning and Performance Improvement

Table 2b (Q2 FY 16/17 versus Q2 FY 17/18)

Targeted Antimicrobial Utilization Trends (DDD/100 patient-days)

(Comparison of Q2 2016/17 to Q2 2017/18)

(Carbepenem (Ertapenem, Imipenem-Cilastatin, Meropenem), Cefotaxime, Ceftriaxone, Daptomycin, Gentamicin, Micafungin, Piperacillin-Tazobactam, Tobramycin, Vancomycin)

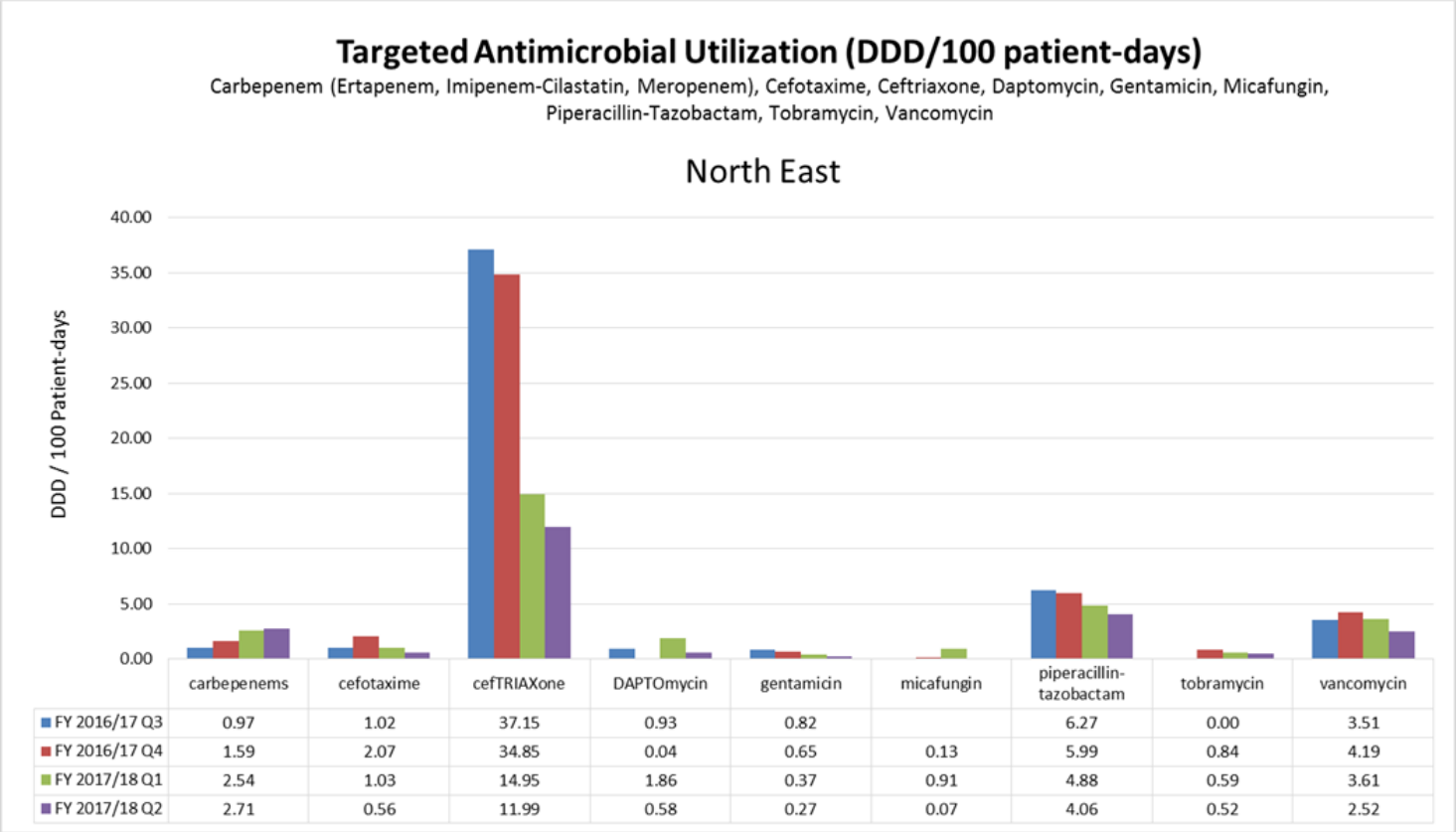
HSDA	Antimicobial Usage
North East	↓
Northern Interior (excludes UHNBC)	↓
University Hospital of Northern BC	↓
North West	↓
Northern Health (includes UHNBC)	↓

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
Table prepared by: Planning and Performance Improvement

In order to illustrate where the increases and decreases are happening across the health authority we have divided the information from Table 2a and 2b further to show individual drug usage in each HSDA, see Figures 2 – 5.

Figure 2

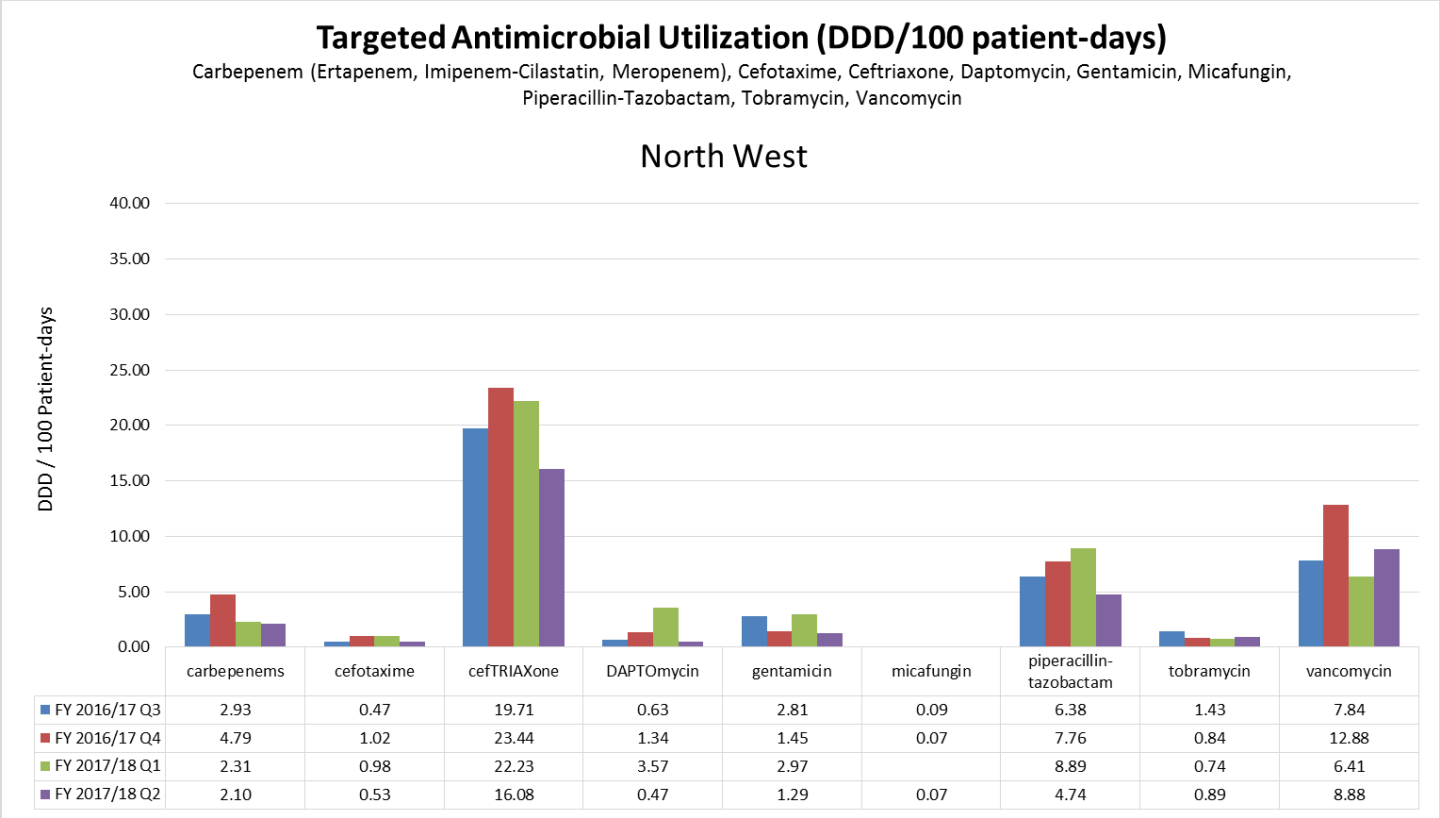


	carbepenems	cefotaxime	cefTRIAXone	DAPTOmycin	gentamicin	micafungin	piperacillin-tazobactam	tobramycin	vancomycin
FY 2016/17 Q3	0.97	1.02	37.15	0.93	0.82		6.27	0.00	3.51
FY 2016/17 Q4	1.59	2.07	34.85	0.04	0.65	0.13	5.99	0.84	4.19
FY 2017/18 Q1	2.54	1.03	14.95	1.86	0.37	0.91	4.88	0.59	3.61
FY 2017/18 Q2	2.71	0.56	11.99	0.58	0.27	0.07	4.06	0.52	2.52

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Graph prepared by: Planning and Performance Improvement

We see here that the previously noted increase in usage of cefTRIAXone in the North East has substantially decreased, with notable decreases in both piperacillin-tazobactam as well as vancomycin. The decrease in cefTRIAXone may be due to re-introduction of ceFAZolin plus probenecid for outpatient treatment and if so we should see this decreased sustained over the fiscal year. With the exception of carbepenems, there has been a decrease in all groups. At the end of last fiscal we had seen a decrease in the use of carbepenems which appears to be on a slight climb. Starting in quarter 3 we should have the ability for pharmacist focused reviews of patients prescribed antimicrobials at our facility in Fort St. John and therefore may see further reductions in the second half of the year.

Figure 3

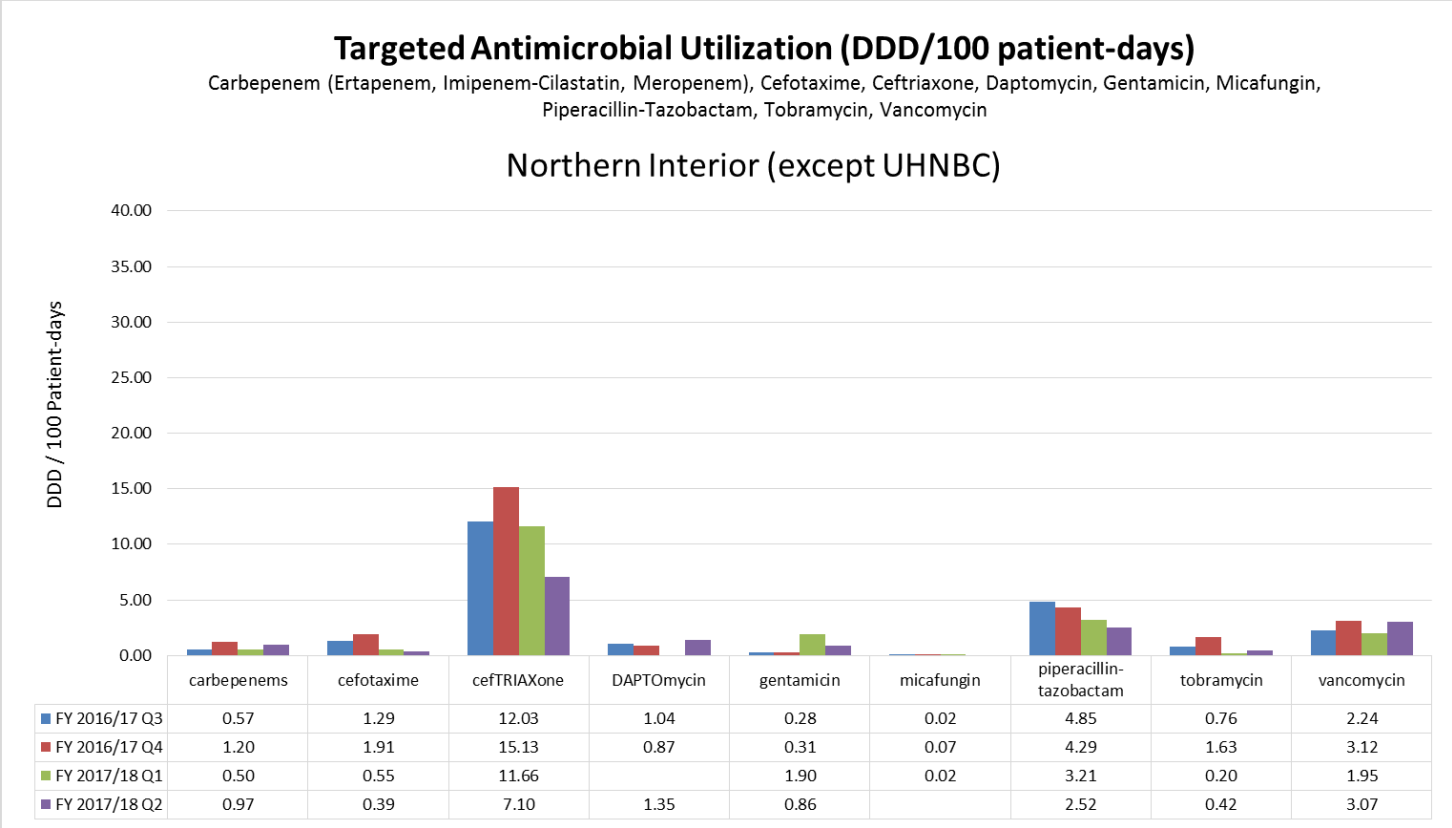


	carbepenems	cefotaxime	cefTRIAXone	DAPTOmycin	gentamicin	micafungin	piperacillin-tazobactam	tobramycin	vancomycin
FY 2016/17 Q3	2.93	0.47	19.71	0.63	2.81	0.09	6.38	1.43	7.84
FY 2016/17 Q4	4.79	1.02	23.44	1.34	1.45	0.07	7.76	0.84	12.88
FY 2017/18 Q1	2.31	0.98	22.23	3.57	2.97		8.89	0.74	6.41
FY 2017/18 Q2	2.10	0.53	16.08	0.47	1.29	0.07	4.74	0.89	8.88

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Graph prepared by: Planning and Performance Improvement

The data for the North West shows a decrease from Q1 to Q2 of this fiscal in majority of the targeted antimicrobials, including cefTRIAXone, with the exception of vancomycin and tobramycin, however everything is lower compared to the previous fiscal year (Q3 and 4). The previously identified increase in carbepenem use was not sustained and has in fact been reduced. Pharmacists at 4 of the major sites in the North West have been making efforts to target antimicrobial prescribing to ensure more appropriate use either empirically or targeted based on culture results.

Figure 4

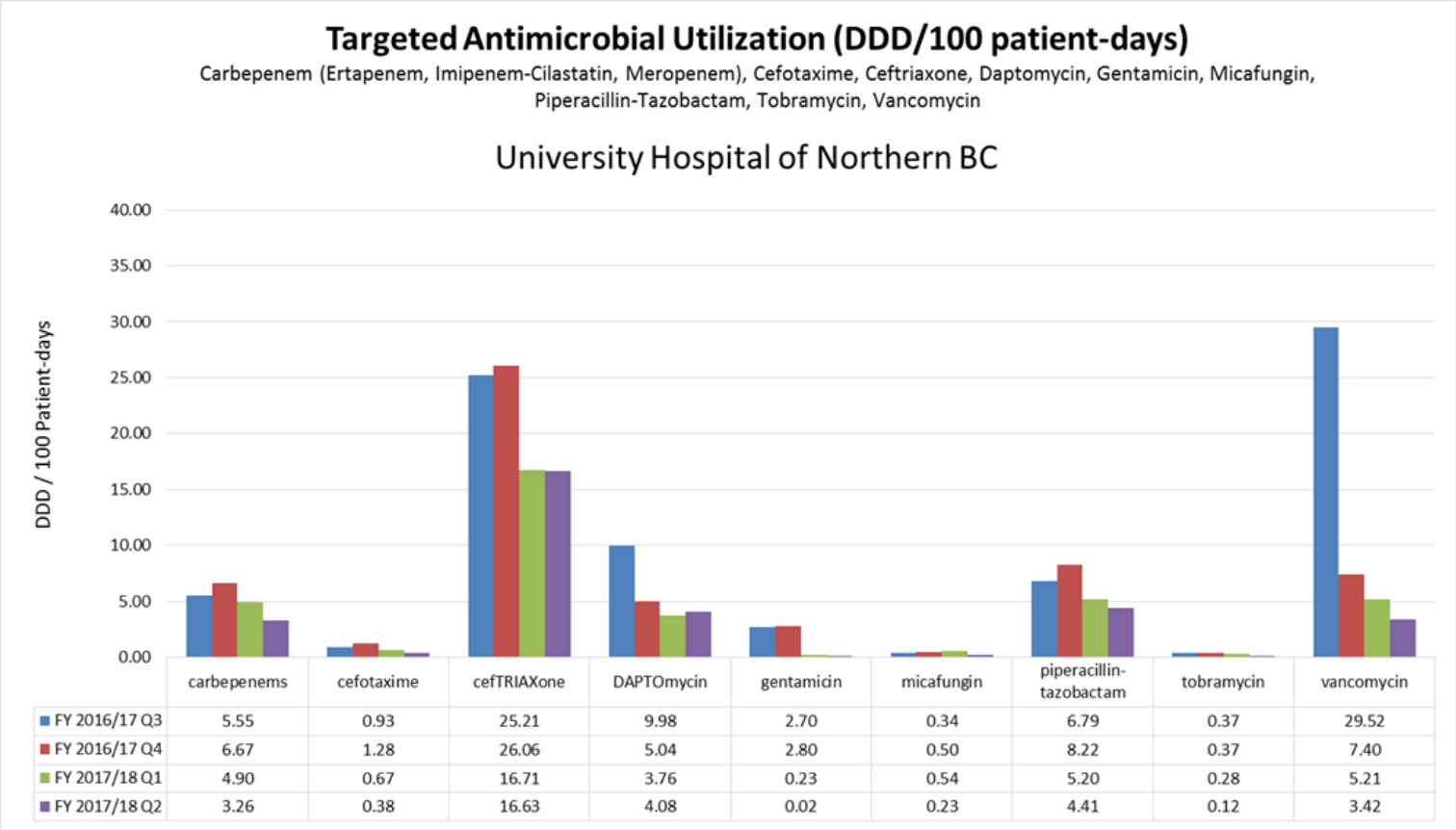


	carbepenems	cefotaxime	cefTRIAXone	DAPTOmycin	gentamicin	micafungin	piperacillin-tazobactam	tobramycin	vancomycin
FY 2016/17 Q3	0.57	1.29	12.03	1.04	0.28	0.02	4.85	0.76	2.24
FY 2016/17 Q4	1.20	1.91	15.13	0.87	0.31	0.07	4.29	1.63	3.12
FY 2017/18 Q1	0.50	0.55	11.66		1.90	0.02	3.21	0.20	1.95
FY 2017/18 Q2	0.97	0.39	7.10	1.35	0.86		2.52	0.42	3.07

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Graph prepared by: Planning and Performance Improvement

The Northern Interior data shows a mixture of increased and decreased usage between Q1 and 2 of this fiscal. However it is clear that there is an overall decrease in usage of most agents compared to last fiscal with exception of vancomycin and DAPTOmycin. Again we see a decrease in cefTRIAXone usage, we will be watching for further decrease or possible stabilization over the rest of the fiscal year.

Figure 5



	carbepenems	cefotaxime	cefTRIAXone	DAPTOmycin	gentamicin	micafungin	piperacillin-tazobactam	tobramycin	vancomycin
FY 2016/17 Q3	5.55	0.93	25.21	9.98	2.70	0.34	6.79	0.37	29.52
FY 2016/17 Q4	6.67	1.28	26.06	5.04	2.80	0.50	8.22	0.37	7.40
FY 2017/18 Q1	4.90	0.67	16.71	3.76	0.23	0.54	5.20	0.28	5.21
FY 2017/18 Q2	3.26	0.38	16.63	4.08	0.02	0.23	4.41	0.12	3.42

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Graph prepared by: Planning and Performance Improvement

We see here that the previously noted increase in usage of cefTRIAXone, vancomycin and DAPTOmycin at UHNBC has substantially decreased in Q1 and 2 this year compared to previous quarters. We can speculate here as well that the decrease in cefTRIAXone may be due to re-introduction of ceFAZolin plus probenecid for outpatient treatment and if so we should see this decreased sustained over the fiscal year. Across the board we see decreases in all groups here as well.

It is encouraging to see this reduction trend so far this fiscal year, despite reports of increased patient admissions and facilities maintaining patient loads over census. It is still difficult to draw any concrete conclusions from our data until we have more fiscal years to analyze and compare, however so far it appears that our antimicrobial usage for 2017/18 is different compared to last fiscal year.

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 3a – Quarter 1 NE

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

HSDA North East

Medication	FY 2016/17 Q1		FY 2017/18 Q1	
	IV	PO	IV	PO
ciprofloxacin	10%	90%	18%	82%
clindamycin	69%	31%	82%	18%
fluconazole	0%	100%	24%	76%
linezolid	100%	0%	100%	0%
metroNIDAZOLE	64%	36%	69%	31%
moxifloxacin	39%	61%	63%	37%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Table prepared by: Planning and Performance Improvement

Table 3b – Quarter 2 NE

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

HSDA North East

Medication	FY 2016/17 Q2		FY 2017/18 Q2	
	IV	PO	IV	PO
ciprofloxacin	31%	69%	25%	75%
clindamycin	82%	18%	82%	18%
fluconazole	90%	10%	93%	7%
linezolid	72%	28%	0%	0%
metroNIDAZOLE	62%	38%	72%	28%
moxifloxacin	51%	49%	26%	74%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Table prepared by: Planning and Performance Improvement

Table 4a – Quarter 1 NW

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

HSDA North West

Medication	FY 2016/17 Q1		FY 2017/18 Q1	
	IV	PO	IV	PO
ciprofloxacin	19%	81%	18%	82%
clindamycin	70%	30%	68%	32%
fluconazole	41%	59%	26%	74%
linezolid	100%	0%	0%	100%
metroNIDAZOLE	51%	49%	53%	47%
moxifloxacin	58%	42%	42%	58%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Table prepared by: Planning and Performance Improvement

Table 4b - Quarter 2 NW

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

HSDA North West

Medication	FY 2016/17 Q2		FY 2017/18 Q2	
	IV	PO	IV	PO
ciprofloxacin	15%	85%	23%	77%
clindamycin	60%	40%	79%	21%
fluconazole	75%	25%	21%	79%
linezolid	30%	70%	0%	100%
metroNIDAZOLE	54%	46%	58%	42%
moxifloxacin	23%	77%	16%	84%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Table prepared by: Planning and Performance Improvement

Table 5a – Quarter 1 – NI (excluding UHNBC)

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

HSDA Northern Interior (except UHNBC)

Medication	FY 2016/17 Q1		FY 2017/18 Q1	
	IV	PO	IV	PO
ciprofloxacin	34%	66%	39%	61%
clindamycin	56%	44%	49%	51%
fluconazole	0%	100%	45%	55%
linezolid	0%	0%	0%	0%
metroNIDAZOLE	48%	52%	60%	40%
moxifloxacin	55%	45%	37%	63%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Table prepared by: Planning and Performance Improvement

Table 5b – Quarter 2 - NI (excluding UHNBC)

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

HSDA Northern Interior (except UHNBC)

Medication	FY 2016/17 Q2		FY 2017/18 Q2	
	IV	PO	IV	PO
ciprofloxacin	20%	80%	26%	74%
clindamycin	74%	26%	79%	21%
fluconazole	7%	93%	34%	66%
linezolid	0%	0%	0%	100%
metroNIDAZOLE	73%	27%	69%	31%
moxifloxacin	43%	57%	29%	71%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Table prepared by: Planning and Performance Improvement

Table 6a – Quarter 1 - UHNBC

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

HSDA UHNBC

Medication	FY 2016/17 Q1		FY 2017/18 Q1	
	IV	PO	IV	PO
ciprofloxacin	22%	78%	24%	76%
clindamycin	72%	28%	67%	33%
fluconazole	31%	69%	47%	53%
linezolid	73%	27%	25%	75%
metroNIDAZOLE	52%	48%	57%	43%
moxifloxacin	46%	54%	44%	56%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Table prepared by: Planning and Performance Improvement

Table 6b – Quarter 2 - UHNBC

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

HSDA UHNBC

Medication	FY 2016/17 Q2		FY 2017/18 Q2	
	IV	PO	IV	PO
ciprofloxacin	23%	77%	17%	83%
clindamycin	88%	12%	56%	44%
fluconazole	24%	76%	31%	69%
linezolid	47%	53%	3%	97%
metroNIDAZOLE	63%	37%	61%	39%
moxifloxacin	23%	77%	21%	79%

Data source: Discern Analytics/AMS Supply Chain (GL) Ward Issues and credits; AMS Product Dispenses & Selectable Facilities DDD/Sept 25, 2017
Table prepared by: Planning and Performance Improvement

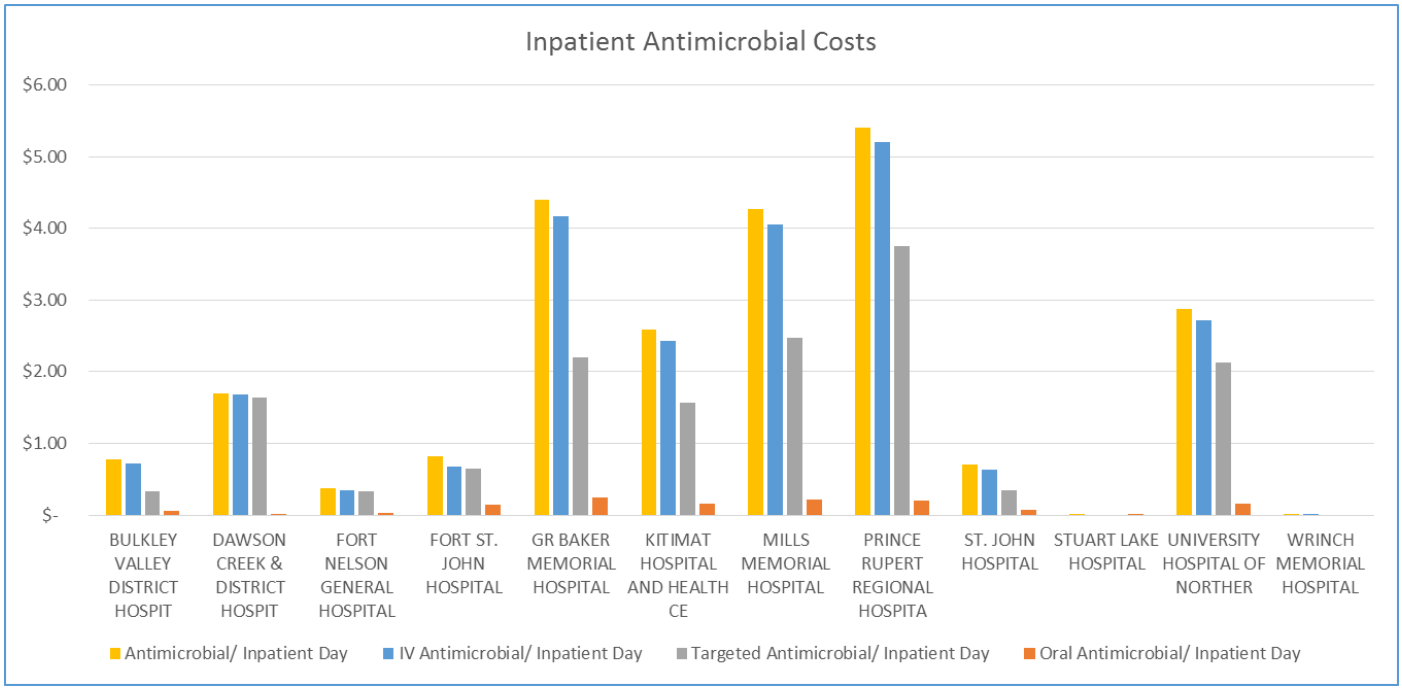
Looking at the comparison between Q1 and Q2 compared to last fiscal year, we see proportional changes of IV versus PO with no defined trends. The variability in IV versus PO lends one to think that there is room for education on which agents can reasonably be given orally when the patient meets appropriate criteria (i.e. GI tract functioning). At this point we do not have baseline data for appropriate use of IV versus oral therapies and therefore do not have benchmarks for improvements. The research project led by the NH pharmacy resident for 2017/18 will be done at UHNBC with the intention of evaluating the frequency of appropriate IV to PO conversion of antibiotics with highly bioequivalent oral formulations. We hope to use this data to extrapolate to NH as a whole and establish some benchmark targets for IV versus PO use.

Antimicrobial Costs

In the first half of the 2017/18 fiscal year, NH has spent just under a quarter million dollars in drug costs alone for antimicrobial therapies for inpatients; 93% of this cost is due to intravenous agents (Figure 6, blue bar).

Figure 6 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 (similar distribution compared to last fiscal). 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.

Figure 6.

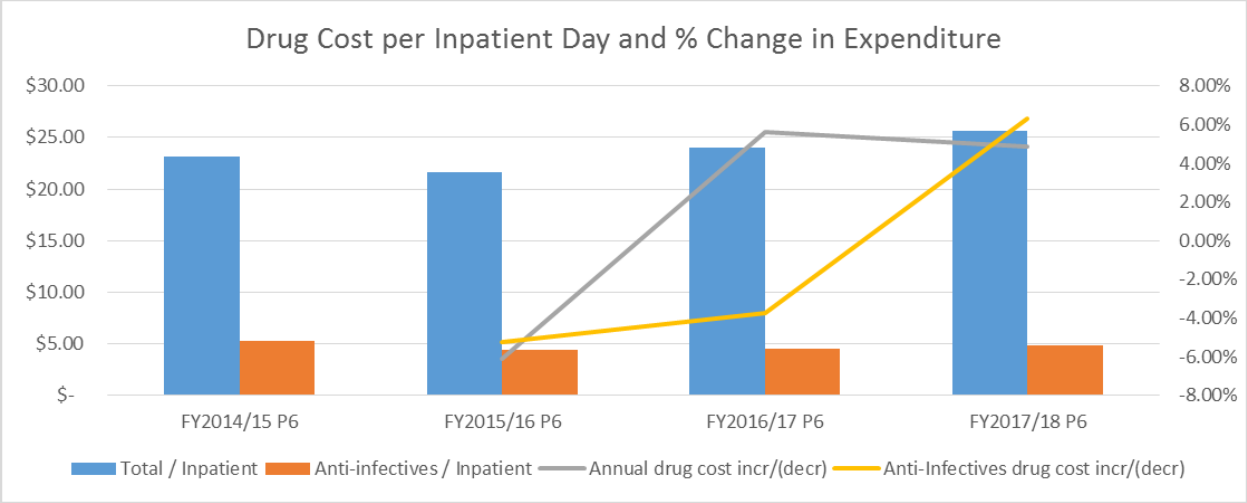


Data source: Cerner database/Accessed November 15, 2017
Graph prepared by: Business Analyst for Pharmacy Group

Previously proposed reductions in drug costs of 10 – 15% over the first few years of operations, seen by other programs in BC has not yet been seen in Northern Health. We anticipate this is due to a few different reasons including, the level of operation of AMS interventions has not yet reached full potential as seen in other programs. Also our Medical Lead has been involved in the program for less than 1 year and we have not yet been able to establish his regular involvement in AMS audit and feedback.

Comparing the last 4 fiscal years up until period 6 (end of quarter 2) 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 in patient day (blue bar).

Figure 7.



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

Accreditation

The next site surveys for Accreditation will be taking place in June 2018. In order to ensure we are 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 to several different disciplines at several different facilities in addition to an audit checklist which was distributed to site leadership. The responses from participants will help us determine how best to support clinicians in Accreditation preparation and ongoing program development work. The results from the self-assessment can be found below (Table 7). The audit checklist results will be collated in Jan 2018.

Table 7.

Responses by profession	**N=156 (%)**	**Response by HSDA (N)**	**No. of respondents that know about (%):**	
Physicians	65 (41.4)	NI (72)	AMS program	72 (45.9)
Nurses	53 (34)	NW (58)	AMS leads	28 (17.9)
Students	7 (4.5)	NE (23)	someone in the program	61 (39.1)
Allied Health	21 (13.5)	Unknown (4)	the reports	29 (18.5)
Nurse practitioner	3 (1.9)			
pharmacists	7 (4.5)			
Respondent's knowledge level of different aspects of the AMS program (%)				
	Know nothing	Know a little	Know a fair bit	Know a lot
pharmacists review antimicrobial regimens	33.3	39.1	16.6	11.5
restriction of antimicrobials requiring approval by pharmacy or ID	37.8	37.8	16.6	7.7
clinical tools available	38.5	26.3	26.1	9
education provided by AMS leads	54.5	25	12.1	3.2
Guidelines to promote conversion from IV to PO	40.4	29.5	19.1	5.8
order sets for common infectious diseases	46.2	25.6	17.8	5.1

It is clear to see that majority of respondents do not know anything about the AMS program, including its existence by name. We were pleased to see a higher response rate from bedside staff including physicians. The AMS committee will be strategizing in early 2018 for ways to improve communications and knowledge about the program and its various initiatives.