Antimicrobial Stewardship Program

Quarterly Report

Fiscal Year: 2016/17

Quarter: 1

Executive Summary

Northern Health's Antimicrobial Stewardship (AMS) Program development began in November 2014. The goal of the program is to improve patient care related to antimicrobial use in all NH facilities through collaboration with healthcare providers in order to: successfully treat infections, reduce inappropriate antimicrobial use, minimize toxicities and adverse events and limit selection of antimicrobial resistant strains.

Best Practices

There is ongoing work to develop and revise clinical tools, protocols and order sets. This quarter the Automatic Stop Order policy was revised resulting in removal of 'reserved' antimicrobial durations of 4 days and providing some guidance and education around what the 'Stop Order Report' signifies to clinical staff (i.e. what is the report, what does it mean, what should a nurse/physician consider when assessing report). In conjunction with the Medication Safety Officer, the AMS Program Coordinator has revised the policy and it now includes a detailed section on how to read and interpret the Stop Order Report; it also lists where this report prints at each site. This revised policy is now available on ourNH.

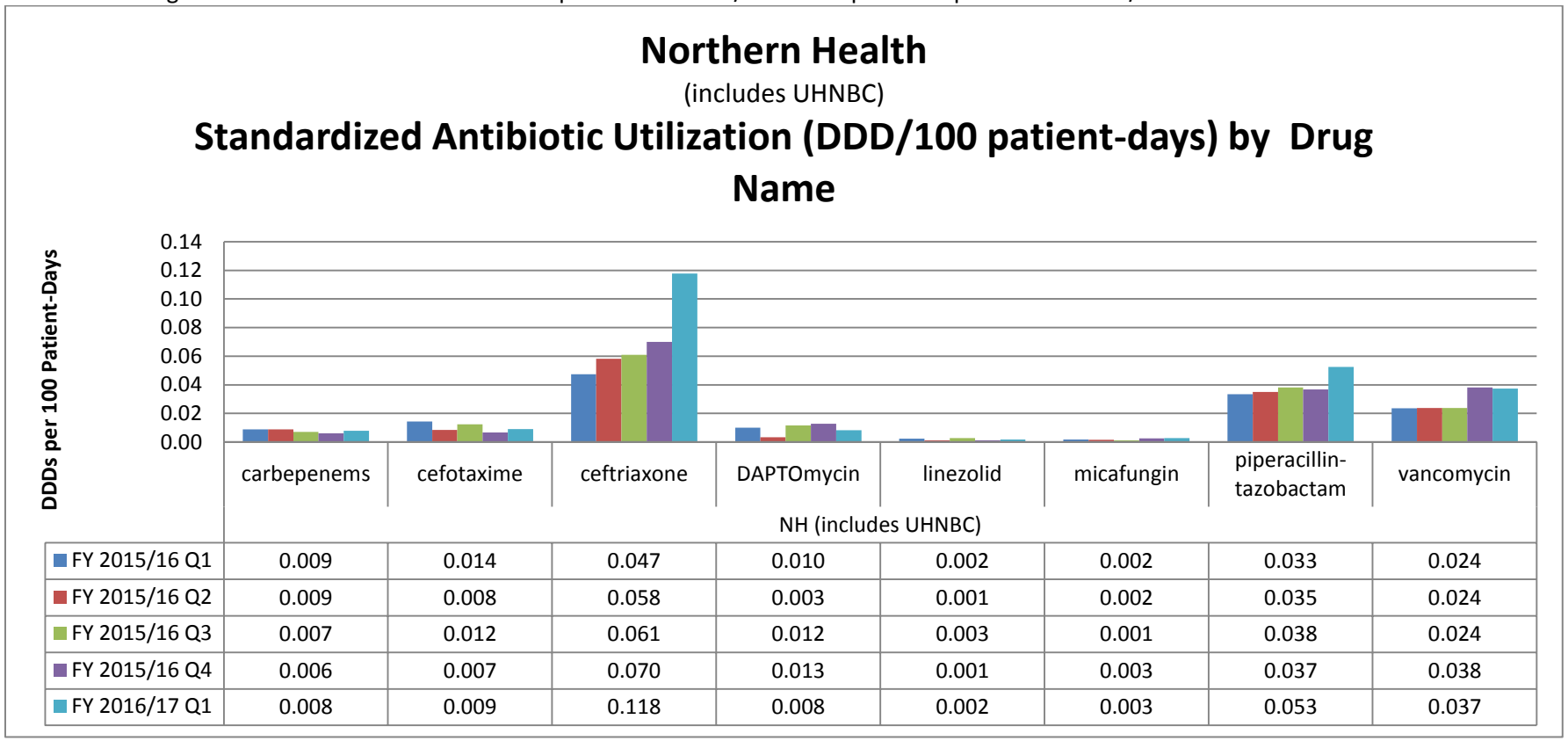
There was also development and approval of a Regional Febrile Neutropenia protocol. The AMS program coordinator in collaboration with a regional working group led by the Critical Care Program Lead worked on development of this protocol. This order set has been approved by NH MAC and is now available for use; if you are unable to locate the document on document source please contact your site administrator or the AMS program coordinator.

Clinical Services

Variations of Prospective Audit and Feedback (A&F) of targeted antimicrobials are currently occurring at UHNBC, GR Baker, Mills Memorial and Kitimat General Hospital. This process involves assessment of patients on antimicrobial therapy evaluated against approved guidelines to ensure the optimal use of drug therapy. This strategy is employed after the drug has been initiated; currently reviews are being done on a weekly to biweekly basis for rural sites and daily to biweekly basis for UHNBC. Initiation of A&F at sites outside UHNBC will be occurring in a stepwise manner, initiating 1 new site on a monthly basis. Priority sites are identified based on availability of on-site pharmacists.

Antimicrobial Consumption

The top 3 targeted antimicrobials with highest use across Northern Health remain to be ceftriaxone, piperacillin-tazobactam and vancomycin. The graph below shows higher use of these 3 antimicrobials in quarter 1 of 2016/17 FY compared to quarter 1 of 2015/16.



NH (includes UHNBC)	carbepenems	cefotaxime	ceftriaxone	DAPTOmycin	linezolid	micafungin	piperacillin-tazobactam	vancomycin
FY 2015/16 Q1	0.009	0.014	0.047	0.010	0.002	0.002	0.033	0.024
FY 2015/16 Q2	0.009	0.008	0.058	0.003	0.001	0.002	0.035	0.024
FY 2015/16 Q3	0.007	0.012	0.061	0.012	0.003	0.001	0.038	0.024
FY 2015/16 Q4	0.006	0.007	0.070	0.013	0.001	0.003	0.037	0.038
FY 2016/17 Q1	0.008	0.009	0.118	0.008	0.002	0.003	0.053	0.037

These results indicate that special attention should be paid to prescribing these antimicrobials. In the case of broad-spectrum agents (i.e. ceftriaxone and piperacillin-tazobactam), reassessment of infections should be done once culture results or source of infection identified in order to achieve narrowing of

therapy, reducing risk of adverse events and microbial resistance. In cases where vancomycin is initiated empirically, patient history should have indication of high risk for MRSA infection, as well as reassessment of therapy if/when culture results available.

Fiscal Year 16/17 Q1 Results

Program Goals

To improve patient care related to antimicrobial use in all NH facilities through collaboration with healthcare providers in order to:

- Successfully treat infections
- Reduce inappropriate antimicrobial use
- Minimize toxicities and adverse events
- Limit selection of antimicrobial resistant strains

Ongoing Program Initiatives

I. Clinical tools, standards, policies and education initiatives
II. Regional Order Set development
III. Prospective Audit and Feedback service including Outcome and Process Measures

1. Clinical tools, standards, policies and education initiatives

1.1 Automatic Stop Order (ASO) Policy revision

Historically NH has had an ASO policy which contained restricted antimicrobials with a 4 day duration. Due to a few cases across the region where antibiotics were inappropriately stopped due to a lack of presence of or use of the stop order report on a weekend where pharmacy coverage was minimal, the Antimicrobial Stewardship Working group was asked to revisit this policy. The working group discussed several different factors, 1) state of ASO policies in other health authorities, 2) evidence behind the ASO 3) results of NH Pharmacy Resident's (Cindy Yuen) research project 4) current situation regarding pharmacy services region wide 5) abilities of system to change/alter ASO reports 6) barriers to the ASO reports. Consensus among the group was reached and decision made to remove the designation of 'restricted or reserved' antimicrobials therefore eliminating the 4 day stop.

This revised ASO policy now has all antimicrobials IV or PO default to a 7 day stop (exception = azithromycin 5 day stop) unless otherwise ordered by prescriber. In addition to this change – education around what the stop order report signifies to clinical staff will need to be incorporated into the implementation of this change (i.e. what is the report, what does it mean, what should a nurse/physician consider when assessing report).

In conjunction with the Medication Safety Officer, the AMS Program Coordinator has revised the policy and it now includes a detailed section on how to read and interpret the stop order report; it also lists where this report prints at each site. This revised policy is now available on ourNH and will be presented at NH Policy Rounds September 14th, 2016.

2. Regional Order Set development

2.1 Febrile Neutropenia

The AMS program coordinator participated in a regional working group led by the Critical Care Program Lead to develop a regional Febrile Neutropenia protocol. This working group included members from Fraser Health who participated in development of their febrile neutropenia order set under the guidance of oncology experts from BCCA. This order set has been approved by NH MAC and is now available for use; if you are unable to locate the document on document source please contact your site administrator or the AMS program coordinator.

3. Prospective Audit and Feedback at UHNBC, GR Baker, Mills Memorial and Kitimat General

Audit and Feedback (A&F) is an evidence-based practice of reviewing a patient's antimicrobial therapy with the prescriber to optimize treatment. 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:

- Narrowing the spectrum and optimizing the duration of broad-spectrum antimicrobial therapies to preserve the potency of these agents
- 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

- Collecting and collating data on antimicrobial utilization (outcome measure) and A&F interventions (process measure) to provide feedback to physician services, evaluate impact of the program and identify areas for improvement

The following antimicrobials have been targeted by the AMS pharmacist for A&F:

<u>Broad spectrum and restricted antibiotics targeted for narrowing of spectrum/limiting use:</u>

- Piperacillin-tazobactam
- Carbepenems (imipenem, meropenem, ertapenem)
- Ceftriaxone/Cefotaxime
- Vancomycin
- Linezolid IV/PO
- Daptomycin
- Micafungin
- Tobramycin/Gentamicin

<u>IV antibiotics with oral bioequivalence targeted for conversion:</u>

- Ciprofloxacin
- Moxifloxacin
- Metronidazole
- Clindamycin
- Co-trimoxazole (Sulfamethoxazole-trimethoprim)
- Fluconazole

3.1 Outcome Measure Evaluation: Antibiotic Utilization across NH

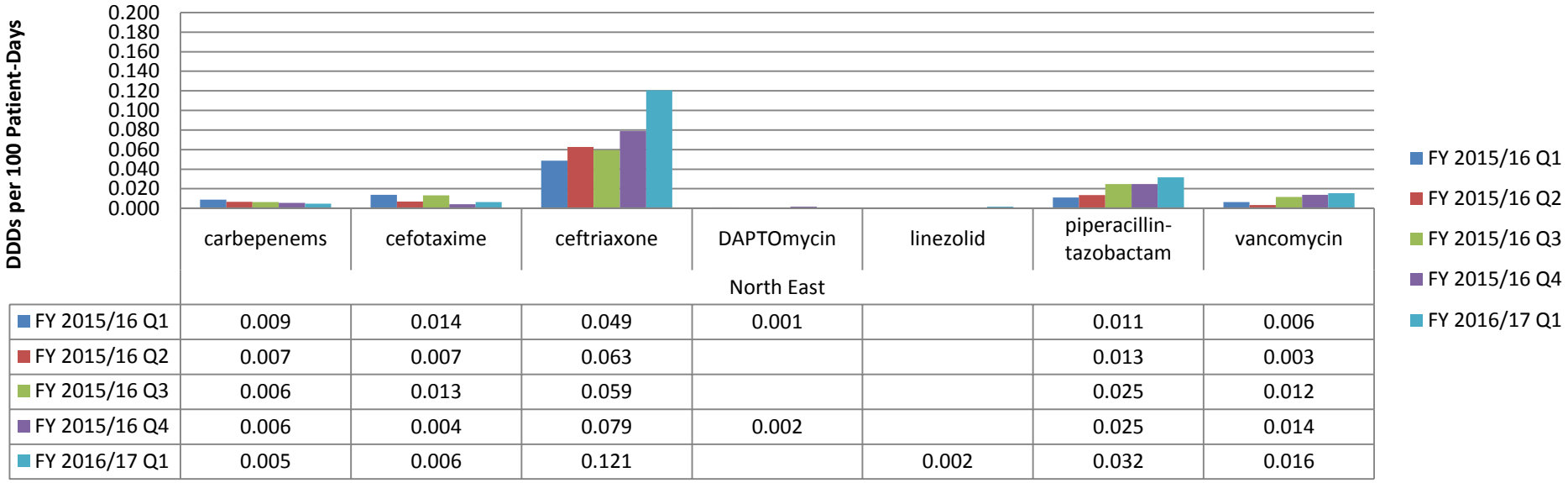
Antibiotic utilization, measured in defined daily dose (DDD) per 100 patient-days, is calculated to track the utilization trend overtime. The DDD is the assumed average adult maintenance dose per day for a drug used for its main indication. The conversion of drug utilization amount to DDD units is performed to standardize utilization of different classes of antibiotics, allowing comparisons to be made across different facilities or patient groups (excluding pediatric populations). The trends in antibiotic utilization will be used to identify priority areas for A&F services (see Figures 1 – 4).

Another method of measuring antibiotic utilization is tracked as Days of Therapy (DOT) which is defined as the number of days a patient receives an antimicrobial agent regardless of the dose; 1 DOT is equal to any dose of antimicrobial that is received in a 24 hr period. Similar to DDD, DOT is also standardized to 100 patient-days. This method is preferred for analyzing populations where standard adult dosing does not apply, i.e. pediatric and renal failure patients. Due to limitations of the data collection system, patients with renal failure admitted to inpatient wards were not able to be accounted for. Pediatric patients not admitted to a pediatric ward were also not filterable for data analysis, therefore only the UHNBC pediatric ward was able to be analyzed (see Figure 5).

Timely conversion from intravenous (IV) to oral (PO) antimicrobial therapy is effective for a variety of infections, especially for agents with excellent bioavailability. Conversion from IV to PO antimicrobials in select patients results in cost savings for the facility as well as positive clinical outcomes. Antimicrobials targeted due to their high oral bioequivalence were also compared per HSDA using the DDD per 100 patient-days (see figures 6 – 9)

Targeted Antimicrobial Utilization (DDD/100 Patient-days)

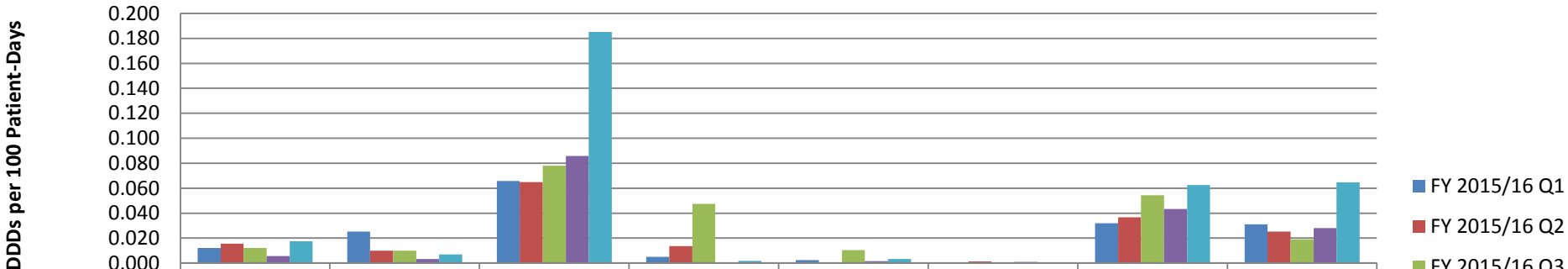
Figure 1



	carbepenems	cefotaxime	ceftriaxone	DAPTOmycin	linezolid	piperacillin-tazobactam	vancomycin
FY 2015/16 Q1	0.009	0.014	0.049	0.001		0.011	0.006
FY 2015/16 Q2	0.007	0.007	0.063			0.013	0.003
FY 2015/16 Q3	0.006	0.013	0.059			0.025	0.012
FY 2015/16 Q4	0.006	0.004	0.079	0.002		0.025	0.014
FY 2016/17 Q1	0.005	0.006	0.121		0.002	0.032	0.016

Figure 2

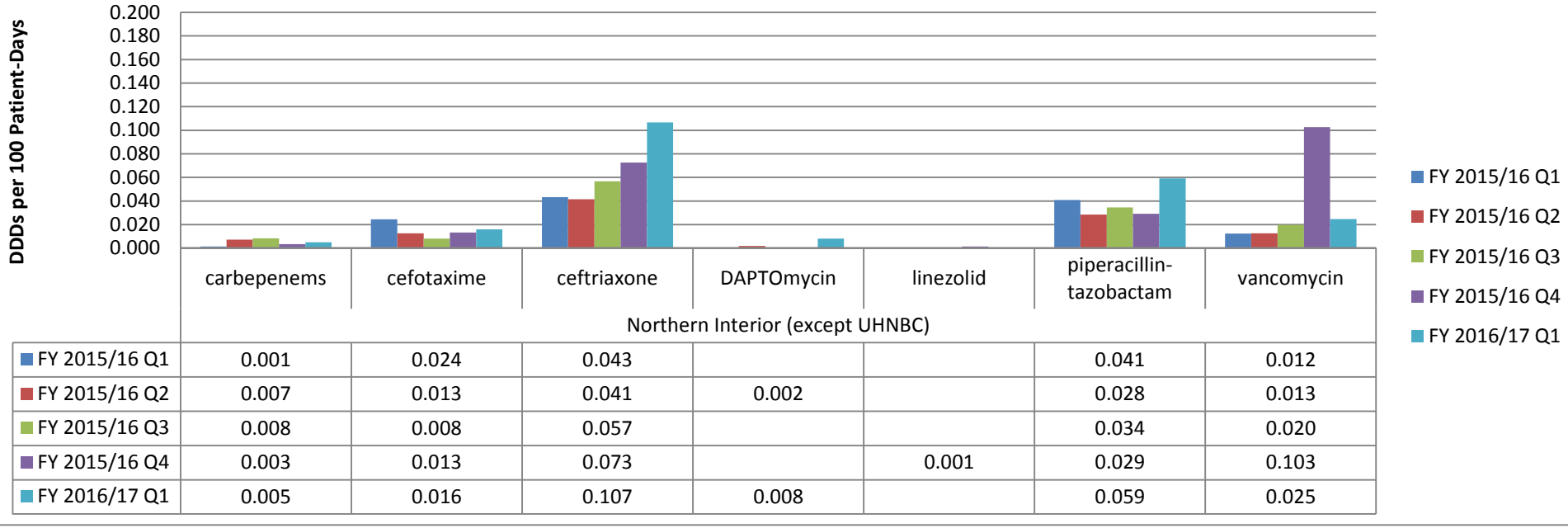
Standardized Antibiotic Utilization (DDD/100 patient-days) by Drug Name
North West



	carbepenems	cefotaxime	ceftriaxone	DAPTOmycin	linezolid	micafungin	piperacillin-tazobactam	vancomycin
FY 2015/16 Q1	0.012	0.025	0.066	0.005	0.002		0.032	0.031
FY 2015/16 Q2	0.016	0.010	0.065	0.014		0.001	0.037	0.025
FY 2015/16 Q3	0.012	0.010	0.078	0.047	0.010		0.054	0.019
FY 2015/16 Q4	0.006	0.003	0.086		0.002	0.001	0.043	0.028
FY 2016/17 Q1	0.018	0.007	0.185	0.002	0.003		0.063	0.065

Figure 3

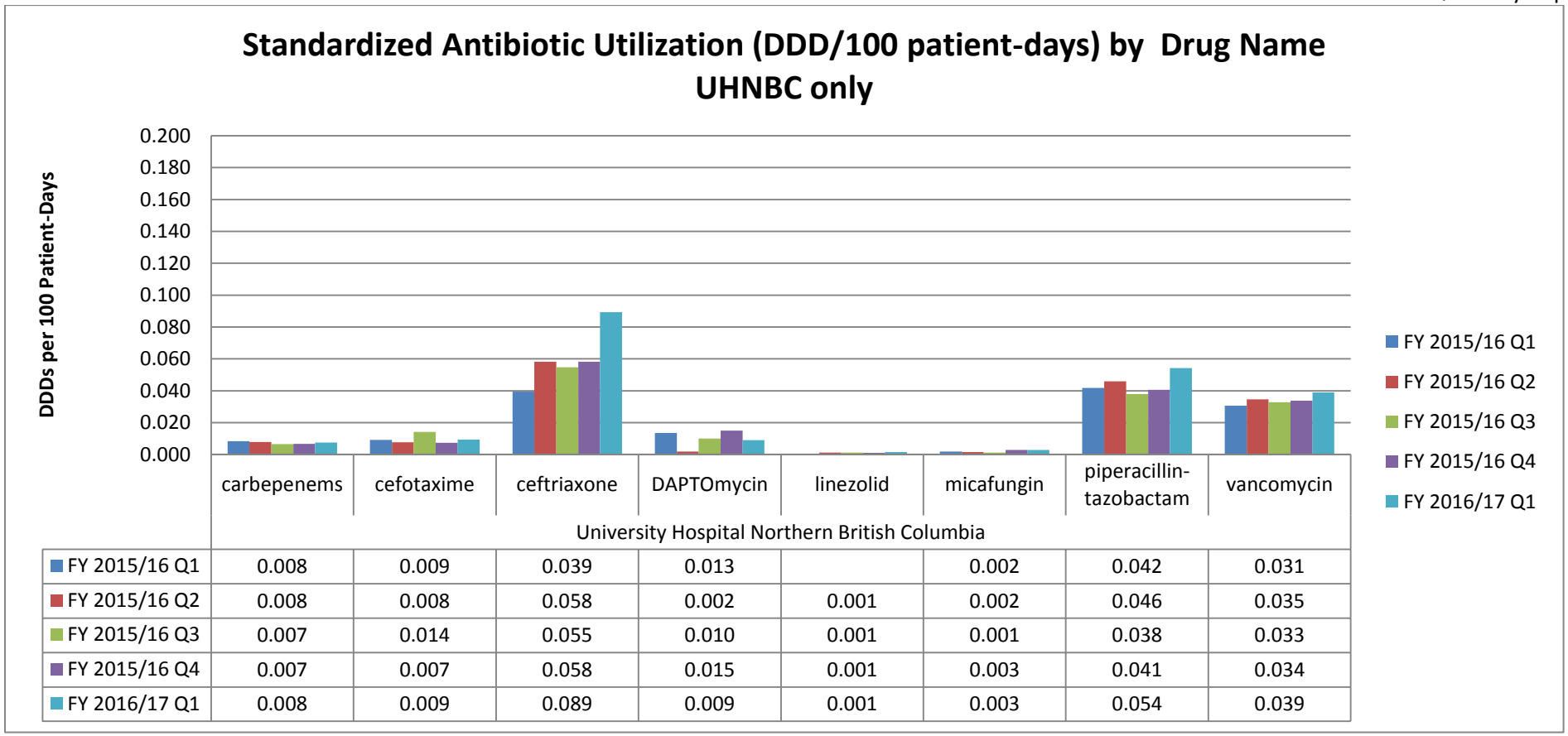
Standardized Antibiotic Utilization (DDD/100 patient-days) by Drug Name
Northern Interior (except UHNBC)



Northern Interior (except UHNBC)

	carbepenems	cefotaxime	ceftriaxone	DAPTOmycin	linezolid	piperacillin-tazobactam	vancomycin
FY 2015/16 Q1	0.001	0.024	0.043			0.041	0.012
FY 2015/16 Q2	0.007	0.013	0.041	0.002		0.028	0.013
FY 2015/16 Q3	0.008	0.008	0.057			0.034	0.020
FY 2015/16 Q4	0.003	0.013	0.073		0.001	0.029	0.103
FY 2016/17 Q1	0.005	0.016	0.107	0.008		0.059	0.025

Figure 4



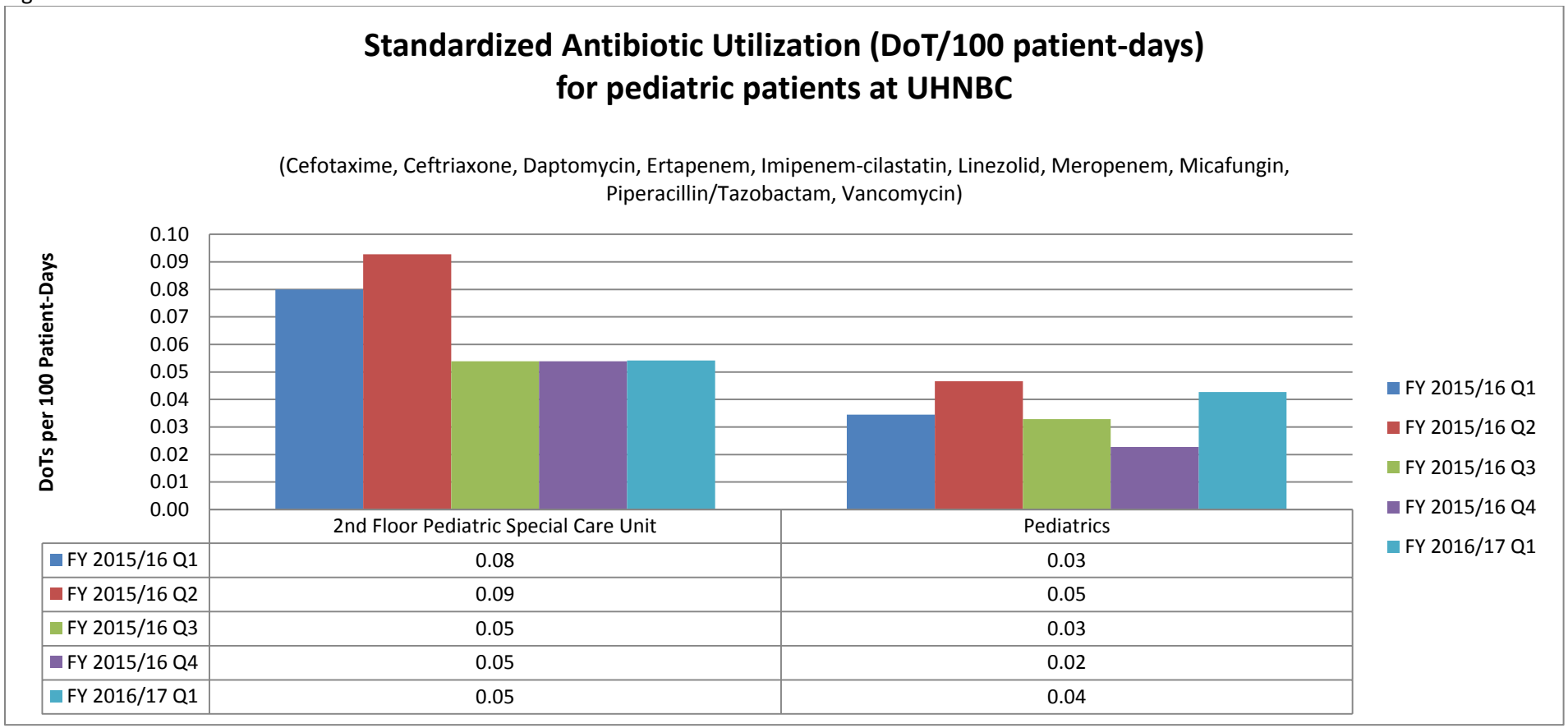
University Hospital Northern British Columbia

	carbepenems	cefotaxime	ceftriaxone	DAPTOmycin	linezolid	micafungin	piperacillin-tazobactam	vancomycin
FY 2015/16 Q1	0.008	0.009	0.039	0.013		0.002	0.042	0.031
FY 2015/16 Q2	0.008	0.008	0.058	0.002	0.001	0.002	0.046	0.035
FY 2015/16 Q3	0.007	0.014	0.055	0.010	0.001	0.001	0.038	0.033
FY 2015/16 Q4	0.007	0.007	0.058	0.015	0.001	0.003	0.041	0.034
FY 2016/17 Q1	0.008	0.009	0.089	0.009	0.001	0.003	0.054	0.039

Figures 1 – 4 above show the antimicrobial usage for targeted antibiotics (either broad spectrum or restricted) divided by HSDA with UHNBC displayed separately. Comparing this year's first quarter to last year's first quarter there are some fluctuations in usage of carbepenems, cefotaxime, daptomycin, linezolid and micafungin, however across the region there is an increase in use of ceftriaxone, piperacillin-tazobactam and Vancomycin. This may indicated that there is a culture for prescribing broad-spectrum antimicrobials which may be clinically reasonable initially, however reassessment for need of antibiotics or potential to narrow coverage will remain a focus of AMS initiatives and A&F reviews.

Standardized Antimicrobial Utilization (DOT/100 patient-days) for pediatric patients at UHNBC

Figure 5

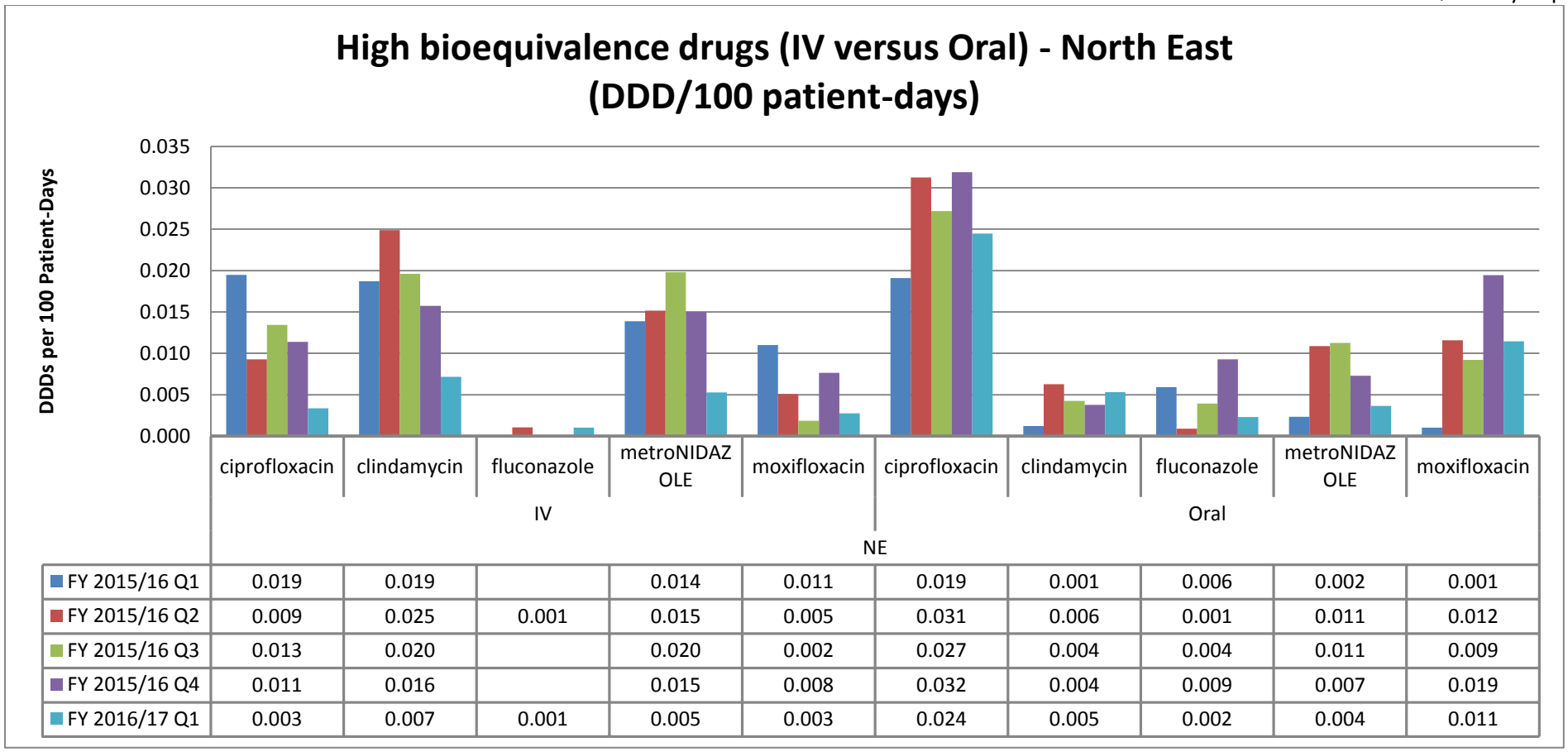


	2nd Floor Pediatric Special Care Unit	Pediatrics
FY 2015/16 Q1	0.08	0.03
FY 2015/16 Q2	0.09	0.05
FY 2015/16 Q3	0.05	0.03
FY 2015/16 Q4	0.05	0.02
FY 2016/17 Q1	0.05	0.04

Figure 5 displays usage of targeted antimicrobials on pediatric wards at UHNBC. Usage on the pediatric special care unit remains consistent during the last 3 quarters. Usage on the pediatric ward is higher than previous 2 quarters but less than Q2 last year. These numbers may be influenced by off service adult patients on the pediatric ward.

High bioequivalence drugs (IV versus Oral) - (DDD/100 patient-days)

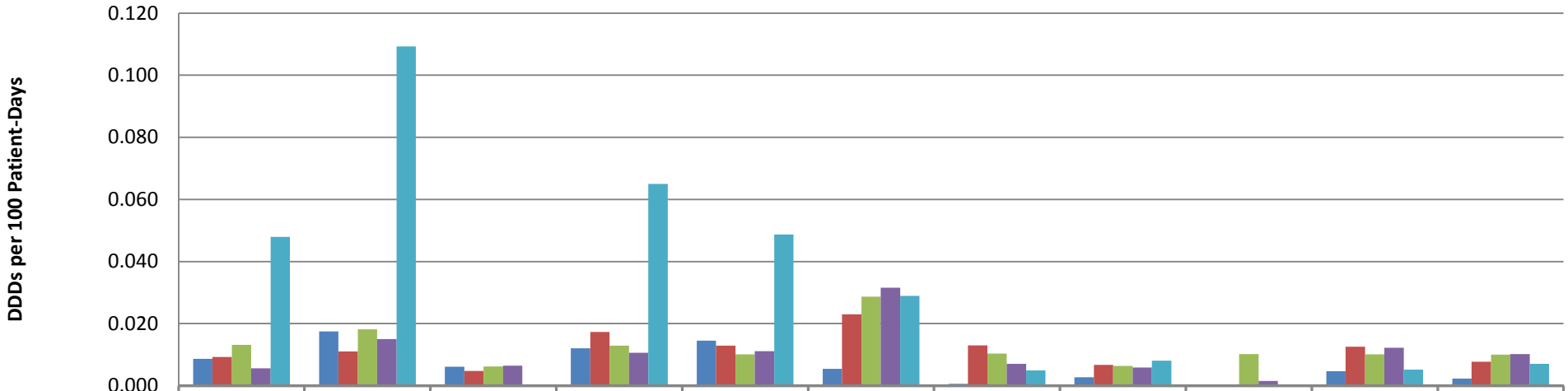
Figure 6



	IV					Oral				
	ciprofloxacin	clindamycin	fluconazole	metroNIDAZOLE	moxifloxacin	ciprofloxacin	clindamycin	fluconazole	metroNIDAZOLE	moxifloxacin
FY 2015/16 Q1	0.019	0.019		0.014	0.011	0.019	0.001	0.006	0.002	0.001
FY 2015/16 Q2	0.009	0.025	0.001	0.015	0.005	0.031	0.006	0.001	0.011	0.012
FY 2015/16 Q3	0.013	0.020		0.020	0.002	0.027	0.004	0.004	0.011	0.009
FY 2015/16 Q4	0.011	0.016		0.015	0.008	0.032	0.004	0.009	0.007	0.019
FY 2016/17 Q1	0.003	0.007	0.001	0.005	0.003	0.024	0.005	0.002	0.004	0.011

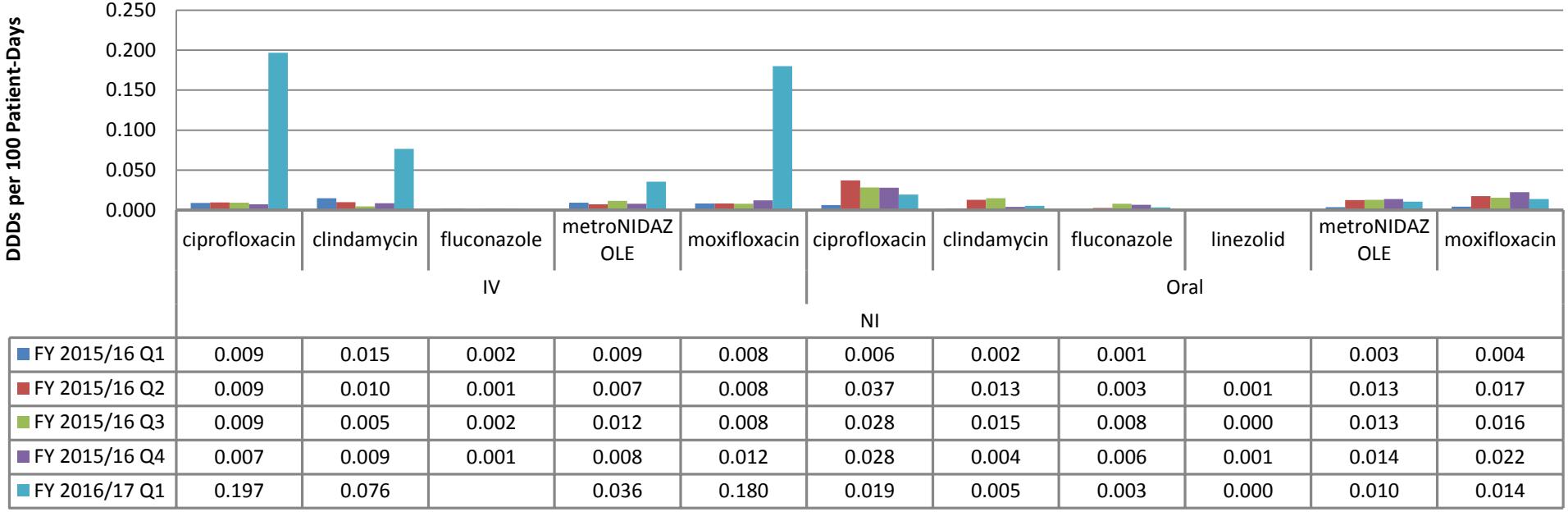
Figure 7

High bioequivalence drugs (IV versus Oral) - North West (DDD/100 patient-days)



	ciprofloxacin	clindamycin	fluconazole	metroNIDAZOLE	moxifloxacin	ciprofloxacin	clindamycin	fluconazole	linezolid	metroNIDAZOLE	moxifloxacin
	IV					Oral					
FY 2015/16 Q1	0.009	0.017	0.006	0.012	0.015	0.005	0.001	0.003		0.005	0.002
FY 2015/16 Q2	0.009	0.011	0.005	0.017	0.013	0.023	0.013	0.007		0.013	0.008
FY 2015/16 Q3	0.013	0.018	0.006	0.013	0.010	0.029	0.010	0.006	0.010	0.010	0.010
FY 2015/16 Q4	0.006	0.015	0.006	0.011	0.011	0.032	0.007	0.006	0.002	0.012	0.010
FY 2016/17 Q1	0.048	0.109		0.065	0.049	0.029	0.005	0.008		0.005	0.007

Figure 8



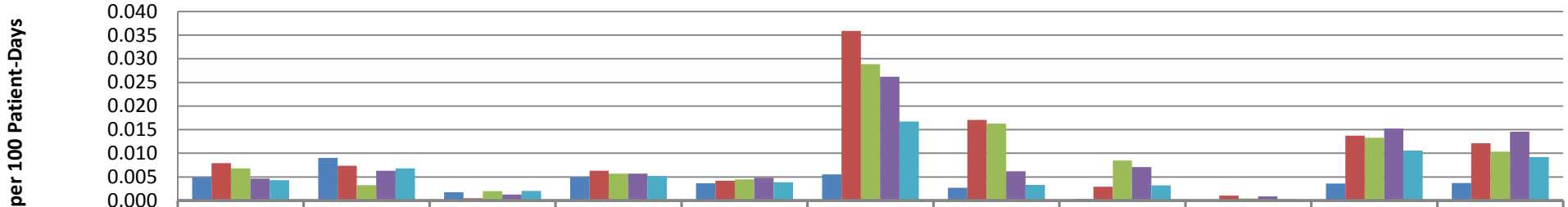
	IV					Oral					
	ciprofloxacin	clindamycin	fluconazole	metroNIDAZOLE	moxifloxacin	ciprofloxacin	clindamycin	fluconazole	linezolid	metroNIDAZOLE	moxifloxacin
FY 2015/16 Q1	0.009	0.015	0.002	0.009	0.008	0.006	0.002	0.001		0.003	0.004
FY 2015/16 Q2	0.009	0.010	0.001	0.007	0.008	0.037	0.013	0.003	0.001	0.013	0.017
FY 2015/16 Q3	0.009	0.005	0.002	0.012	0.008	0.028	0.015	0.008	0.000	0.013	0.016
FY 2015/16 Q4	0.007	0.009	0.001	0.008	0.012	0.028	0.004	0.006	0.001	0.014	0.022
FY 2016/17 Q1	0.197	0.076		0.036	0.180	0.019	0.005	0.003	0.000	0.010	0.014

Figure 9

High bioequivalence drugs (IV versus Oral) - UHNBC Only

excludes sulfamethoxazole-trimethoprim

(DDD/100 patient-days)



	IV					Oral					
	ciprofloxacin	clindamycin	fluconazole	metroNIDAZOLE	moxifloxacin	ciprofloxacin	clindamycin	fluconazole	linezolid	metroNIDAZOLE	moxifloxacin
FY 2015/16 Q1	0.005	0.009	0.002	0.005	0.004	0.006	0.003	0.000		0.004	0.004
FY 2015/16 Q2	0.008	0.007	0.001	0.006	0.004	0.036	0.017	0.003	0.001	0.014	0.012
FY 2015/16 Q3	0.007	0.003	0.002	0.006	0.005	0.029	0.016	0.008	0.000	0.013	0.010
FY 2015/16 Q4	0.005	0.006	0.001	0.006	0.005	0.026	0.006	0.007	0.001	0.015	0.015
FY 2016/17 Q1	0.004	0.007	0.002	0.005	0.004	0.017	0.003	0.003	0.000	0.011	0.009

Figures 6 – 9 above are displaying antimicrobials with a high bioequivalence meaning that their oral formulations have similar potency to the intravenous formulations and should be considered for oral conversion early in management of the patient's infection. The NE and UHNBC show a general decrease in both IV and oral usage with oral having higher usage than IV (ideal situation). However the NW and NI show higher use of IV compared to previous quarters and this use is higher than oral formulations. Upcoming research is planned to assess and standardize outpatient IV antimicrobial therapy (OPAT) across NH. A gap analysis will be conducted by this year's pharmacy resident with the goal of developing a standardized policy and order set for OPAT services. Streamlining this service will ideally aid with reduction in the use of IV formulations of the high bioequivalent agents.

3.2 Process Measure Evaluation: Audit and Feedback Recommendations and Acceptance rates

Variations of prospective audit and feedback (A&F) of targeted antimicrobials are currently occurring at UHNBC, GR Baker, Mills Memorial and Kitimat General Hospital. This process involves assessment of patients on antimicrobial therapy evaluated against approved guidelines to ensure the optimal use of drug therapy. This strategy is employed after the drug has been initiated; currently reviews are being done on a weekly to biweekly basis for rural sites and a daily to biweekly basis for UHNBC. Initiation of A&F at sites outside UHNBC is occurring in a stepwise approach:

Site	**Date initiated**
GR Baker Memorial Hospital	May 13, 2016
Mills Memorial Hospital	June 7, 2016
Kitimat General Hospital	June 9, 2016

Analysis of the cases reviewed and recommendations made was done collectively for UHNBC, GR Baker, Mills Memorial and Kitimat General (see Table 1).

Table 1. Audit and Feedback treatment optimizations; (April 23 – June 16, 2016)

Measures	Number of Patients
Patient Chart Reviewed	586
Antimicrobial therapy recommendations made	227
	Acceptance rate (%)
Physician accepted recommendations	39

This acceptance rate is lower than measured previously for UHNBC only. This number may be lower due to inaccurate measuring of drug therapy problem resolutions not accepted by physicians and those that were unable to be followed through on due to work load constraints of the pharmacists. This will be corrected for data collection in the future.

The AMS program will continue to provide quarterly updates to ensure tracking of antimicrobial usage and acceptance rates of audit and feedback recommendations. For any questions regarding this report or the AMS program please contact the program coordinator (Alicia Ridgewell) at 250-565-5956 or via email alicia.ridgewell@northernhealth.ca.

Acknowledgements for work done in the AMS Program

The Antimicrobial Stewardship Working Group (AMSWG) is an inter-disciplinary working group, mandated as a sub-committee of the NH Medication Safety & Quality Committee (NHMSQC).

Members (As of August 17, 2016)

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Dr. Inban Reddy (Family {Practice MD- Northern Interior)
Barb Falkner (Professional Practice Lead pharmacist)
Carol Pruner (Clinical pharmacist - UHNBC)
Amy Nunley (Clinical Pharmacy Specialist –UHNBC)
Kyla Bertschi (Clinical Pharmacy Specialist - UHNBC)
Andrew Lowe (Pharmacist –North East)
Carly Rosger (Pharmacist – North West)
Nancy Dyck (Medication Use Management pharmacist)
Carey-Anne Lawson (IT-CIS pharmacist)
Sharri Leslie (Microbiology Technologist - UHNBC)
Deanna Danskin (Quality Resource Technologist Microbiology)
Judy Klein (Infection Prevention and Control Practitioner- North East)
Kyla Redlon (Clinical Nurse Educator -UHNBC)
Kelsey Breault (Infection Prevention and Control Practitioner – North East)