

SHS + UHN

ASP

ANTIMICROBIAL
STEWARDSHIP
PROGRAM



Q2 REPORT

FISCAL YEAR 2016 | 2017



**Mount Sinai
Hospital**

Sinai Health System
Joseph & Wolf Lebovic
Health Complex



UHN

Toronto General
Toronto Western
Princess Margaret
Toronto Rehab

TABLE OF CONTENTS

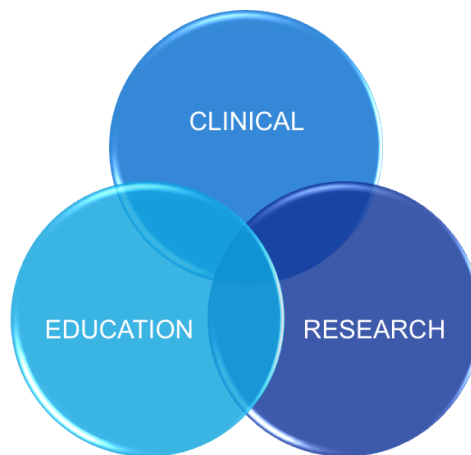
EXECUTIVE SUMMARY	4
FISCAL YEAR 16/17 Q2 RESULTS	8
CRITICAL CARE	8
MOUNT SINAI HOSPITAL: MEDICAL SURGICAL ICU	8
MOUNT SINAI HOSPITAL: NEONATAL ICU	14
TORONTO GENERAL HOSPITAL: CARDIOVASCULAR ICU	15
TORONTO GENERAL HOSPITAL: MEDICAL SURGICAL ICU	19
TORONTO WESTERN HOSPITAL: MEDICAL, SURGICAL, AND NEUROSURGICAL ICU	23
EMERGENCY DEPARTMENT	28
MOUNT SINAI HOSPITAL: EMERGENCY DEPARTMENT	28
GENERAL INTERNAL MEDICINE	29
MOUNT SINAI HOSPITAL: GENERAL INTERNAL MEDICINE	29
TORONTO GENERAL HOSPITAL: GENERAL INTERNAL MEDICINE	31
TORONTO WESTERN HOSPITAL: GENERAL INTERNAL MEDICINE	33
IMMUNOCOMPROMISED HOST	35
PRINCESS MARGARET CANCER CENTRE: LEUKEMIA SERVICE	35
PRINCESS MARGARET CANCER CENTRE: ALLOGENEIC BONE MARROW TRANSPLANT	40

TORONTO GENERAL HOSPITAL: MULTI-ORGAN TRANSPLANT PROGRAM (MOTP)	43
BEST PRACTICE GUIDELINES AND ALGORITHMS	45
RESEARCH	46
EDUCATION	47
PROVINCIAL ROLE	48
NATIONAL ROLE	48
STRATEGIC PLANNING	50
APPENDIX 1: FY 16/17 Q2 TOP 5 ANTIMICROBIALS BY USAGE (DDDS PER 100 PATIENT DAYS) AND EXPENDITURES BY ICU SITE	51
APPENDIX 2: GENERAL INTERNAL MEDICINE FY 16/17 Q2 TOP 5 ANTIMICROBIALS BY USAGE (DDDS PER 100 PATIENT DAYS) AND EXPENDITURES	52

“Getting patients the right antibiotics, when they need them”

EXECUTIVE SUMMARY

The Sinai Health System-University Health Network Antimicrobial Stewardship Program (SHS-UHN ASP) was established in 2009. The SHS-UHN ASP uses a collaborative and evidence-based approach to improve the quality of antimicrobial use by getting patients the right antibiotics when they need them. The ASP follows data-driven quality improvement methodology to pursue the best possible clinical outcomes for its patients.



The SHS-UHN ASP blends research, education, and clinical care to take a leadership role in antimicrobial stewardship and improving the quality of health care.

ANTIMICROBIAL CONSUMPTION AND COSTS

The ASP works with clinical teams across both Sinai Health System (Bridgepoint Health and Mount Sinai Hospital) and University Health Network (Princess Margaret Cancer Centre, Toronto General Hospital, Toronto Rehabilitation Institute, and Toronto Western Hospital).

Where possible, we show Defined Daily Doses (DDD) together with Days of Therapy (DOT). The metrics are extracted from the hospital pharmacy databases and the Provincial Critical Care Information System (CCIS). Although these two metrics are closely related, using lower or higher doses of antimicrobials will result in a corresponding change in DDD without any change in DOT (i.e. in patients with renal dysfunction, extremes of body mass, or central nervous system infections.)

There is a general trend of decreased antimicrobial consumption and cost in the MSH ICU, TWH ICU, and TGH ICU. Antimicrobial consumption in the TGH CVICU is decreasing, however, cost has increased primarily due to the reintroduction of micafungin prophylaxis in heart transplant patients. There is an increase in cost in the MSH NICU, with a minimal increase in usage. The MSH GIM wards are also showing a decrease in consumption and cost, while there has been a rise this past quarter at TGH GIM and TWH GIM. These increases can be attributed to antifungal usage, in particular amphoteric B liposomal. The Leukemia service is also showing a decrease in consumption and cost with a slight increase in Allo-BMT. There have been several cases of invasive candidiasis in MOTP which may explain the increase in antifungal consumption and cost.

Table 1: Summary of Antimicrobial Usage and Cost by Hospital/Unit

Hospital/Unit	Antimicrobial Usage	Antimicrobial Cost
Mount Sinai Hospital: Medical Surgical ICU	↓	↓
Mount Sinai Hospital: Neonatal ICU	↑	↑
Toronto General Hospital: Cardiovascular ICU	↓	↑
Toronto General Hospital: Medical Surgical ICU	↑	↓
Toronto Western Hospital: Medical Surgical Neurosurgical ICU	↓	↓
Mount Sinai Hospital: General Internal Medicine	↓	↓
Toronto General Hospital: General Internal Medicine	↑	↑
Toronto Western Hospital: General Internal Medicine	↑	↑
Princess Margaret Cancer Centre: Leukemia Service	↓	↓
Princess Margaret Cancer Centre: Allogeneic Bone Marrow Transplant	↑	↑
Toronto General Hospital: Multi-Organ Transplant Program	↑	↑



Decrease compared to previous YTD



Increase of < 10% compared to previous YTD



Increase of > 10% compared to previous YTD

FISCAL YEAR 16/17 Q2 HIGHLIGHTS

Research – Published In This Quarter

The following articles were published or accepted for publication in peer-reviewed medical journals:

- Bai A, Showler A, Burry L, Steinberg M, Tomlinson G, Bell CM, Morris AM. Clinical prediction rules in *Staphylococcus aureus* bacteremia demonstrates the usefulness of reporting likelihood ratios in infectious diseases. *Eur J Clin Microbiol Infect Dis*. 2016 Sept. 35(9): 1393–1398
- Vallipuram J, Dhalla S, Bell CM, Dresser L, Han H, Husain S, Minden MD, Paul NS, So M, Steinberg M, Vallipuram M, Wong G, Morris AM. Chest CT Scans are Frequently Abnormal in Asymptomatic Patients with Newly Diagnosed Acute Myeloid Leukemia. *Leuk. Lymphoma*. 2016 Sept. Epub ahead of print. DOI: 10.1080/ 10428194. 2016. 1213825
- Hughes JS, Hurford A, Finley RL, Patrick DM, Wu J, Morris AM. Empiric therapy indices: novel measures of the impact of antibiotic resistance on populations. *BMJ Open*. 2016 Nov [in press].

There are currently an additional three manuscripts that have been submitted to medical journals and are undergoing peer review.

Best Practices

Several algorithms have been developed, including the **First Episode *Clostridium Difficile* Infection (CDI) Management Algorithm**, which was implemented into practice across UHN and SHS, along with electronic order sets to support the use of the algorithm. **The CDI algorithm was reformatted** based on clinician and project stakeholder feedback **and can be found [here](#)** on our ASP website. The revised formatting is based on Human Factors Engineering principles and is easier to navigate and print for frontline clinicians.

ASP nurse-focused initiative aimed at reducing overtreatment of **Asymptomatic Bacteriuria**. Key deliverables of this initiative include building on the work done during the pilot project in FY15/16: refining the updated policy on urine cultures, providing audit and feedback to selected units, and educational sessions and urine culture surveys to assess nurse behaviour and sentiment practices towards urine cultures. The updated policy was approved and is currently in practice. Educational sessions with/without audit and feedback are currently underway. Results of this initiative will help to further inform us of best strategies to support knowledge translation and reduce unnecessary urine C&S utilization and reduce asymptomatic bacteriuria and/or antibiotic usage.

Our ASP nurse-focused initiative is being led by an ASP Nurse Leader, Linda Jorgoni. **This ASP Nurse Leader position is the first of its kind in Canada.**

Provincial and National Role: Our team has partnered with Public Health Ontario in hosting an Ontario Antimicrobial Stewardship Roundtable. This roundtable meeting included a cross-section of experts in antimicrobial stewardship, including primary care, long-term care, acute care, and perspectives from the Assistant Deputy Minister, Health Systems Quality and Funding, and Strategy and Policy Advisor and Infectious Disease Policy and Programs Sections. A follow-up meeting will have this group reconvene in Q3.

United Nations General Assembly: On September 21, 2016, **Dr. Andrew Morris was invited to New York to attend the 71st Session of the UN General Assembly to attend meetings on antimicrobial resistance.** This was only the fourth time in the history of the UN that a health topic was discussed at the General Assembly. Heads of State and Heads of Delegations acknowledged and addressed the seriousness and scope of the situation, and member states agreed to commit efforts towards sustainable, multi-sectoral approaches to addressing antimicrobial resistance.

The **SHS-UHN ASP has also been working closely with HealthCareCAN, the National Collaborating Centre for Infectious Diseases (NCCID), and the Public Health Agency of Canada (PHAC) to inform our national health leaders on Antimicrobial Stewardship and Resistance.** The SHS-UHN ASP was on the steering and program committee for the Pan-Canadian Action Round Table, which took place in Toronto on June 16 and 17, 2016. The outcome of the Pan-Canadian Action Round Table led to the development of a National Action Plan on antimicrobial stewardship (AMS), with a focus on the human health context as part of a “One Health” approach. The Action Plan was circulated for review and comments by key influencers and stakeholders and will be finalized in Q3. **A post-Action Round Table Steering Committee “AMS Canada” has been formed with SHS-UHN ASP team members included (Dr. Andrew Morris and Yoshiko Nakamachi).**

The SHS-UHN ASP continues to be a leader in antimicrobial stewardship and is currently working with, and providing expert guidance to, over 30 hospitals, as well as to SASS (Students for Antimicrobial Stewardship Society).



We continued to partner with **Accreditation Canada** in the development and delivery of an **online ASP course** and a series of interactive group webinars. This online course offering is in its second year. Our program has also partnered with CHA Learning, the professional development branch of HealthCareCAN, to develop materials for a course in change leadership in the healthcare setting.

FISCAL YEAR 16/17 Q2 RESULTS

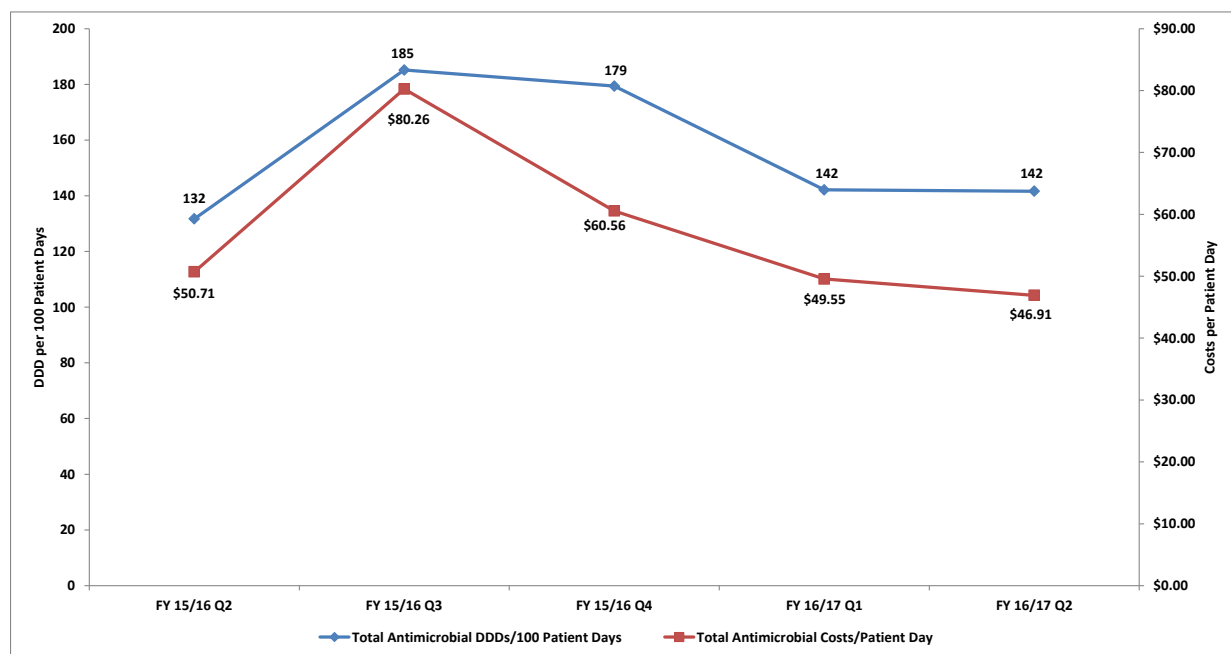
CRITICAL CARE

Mount Sinai Hospital: Medical Surgical ICU

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) decreased (↓) by 12.4% compared to YTD last year.
- Antimicrobial costs per patient day decreased (↓) by 16.0% compared to YTD last year.
- Antibacterial costs per patient day decreased (↓) by 39.2% compared to YTD last year.
- Antifungal costs per patient day increased (↑) by 2.9% compared to YTD last year.
- NB: Patients transferred from Princess Margaret accounted for 17% of patient visits and 73% of the antimicrobial costs.

Mount Sinai Hospital: Medical Surgical ICU Antimicrobial Consumption and Costs Per Patient Day



To view **Appendix 1: FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 Patient Days) and Expenditures by ICU Site**, please click [here](#).

Mount Sinai Hospital: Medical Surgical ICU Antimicrobial Consumption as Defined Daily Dose versus Antimicrobial Consumption as Days of Therapy

- Antibacterial Days of Therapy (DOT) per 100 patient days increased (↑) by 1.4% compared to YTD last year.
- Antifungal Days of Therapy (DOT) per 100 patient days increased (↑) by 6.2% compared to YTD last year.

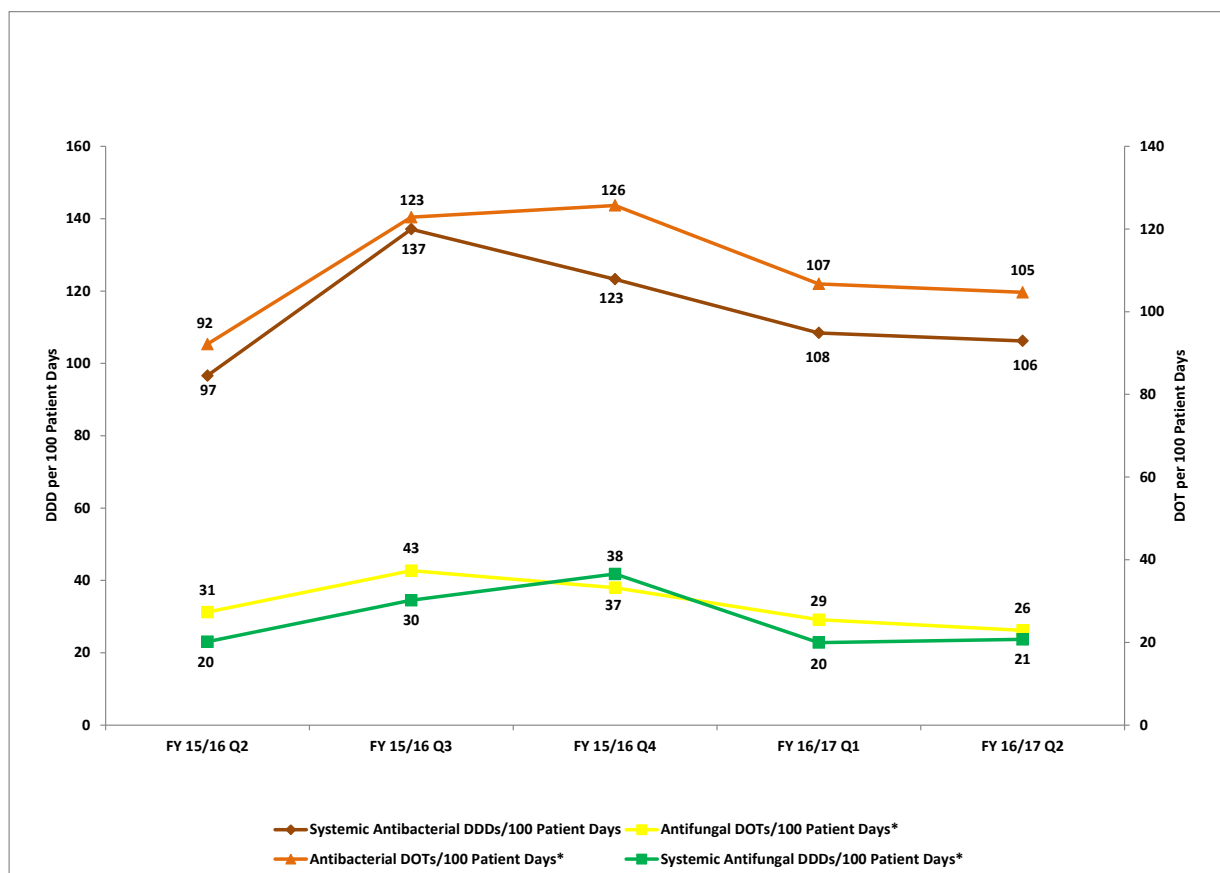


Table 2: Mount Sinai Hospital: Medical Surgical ICU

Indicators	FY 08/09 (Pre-ASP)	FY 09/10	FY 10/11	FY 11/12	FY 12/13	FY 13/14	FY 14/15	FY 15/16	FY16/17 Performance					YTD of Previous Year	
									Q1	Q2	Q3	Q4	YTD		
Antimicrobial Usage and Costs															
Total Antimicrobial DDDs/100 Patient Days	177	171	144	167	170	172	164	156	142	142				142	162
Systemic Antibacterial DDDs/100 Patient Days	142	128	111	128	127	123	136	116	108	106				107	128
Systemic Antifungal DDDs/100 Patient Days	31	24	20	33	35	41	25	32	29	26				28	30
Total Antimicrobial Costs	\$332,724	\$285,975	\$193,129	\$279,859	\$291,470	\$424,044	\$232,814	\$274,258	\$59,907	\$53,895				\$113,802	\$117,348
Total Antimicrobial Costs/Patient Day	\$69.01	\$59.23	\$40.95	\$59.22	\$62.37	\$84.36	\$62.54	\$61.45	\$49.55	\$46.91				\$48.26	\$57.44
Systemic Antibacterial Costs	\$174,339	\$142,134	\$95,773	\$125,339	\$134,811	\$106,886	\$92,928	\$68,246	\$15,318	\$14,278				\$29,596	\$42,209
Systemic Antibacterial Costs/Patient Day	\$36.16	\$29.44	\$20.31	\$26.94	\$28.85	\$21.92	\$20.71	\$15.29	\$12.67	\$12.43				\$12.55	\$20.66
Systemic Antifungal Costs	\$143,100	\$132,519	\$88,998	\$141,877	\$144,811	\$296,573	\$134,504	\$189,661	\$42,494	\$35,494				\$77,988	\$65,693
Systemic Antifungal Costs/Patient Day	\$29.68	\$27.45	\$18.87	\$30.50	\$30.99	\$59.70	\$40.53	\$42.50	\$35.15	\$30.89				\$33.07	\$32.16
Antibacterial Days of Therapy/100 Patient Days*	n/a	n/a	n/a	n/a	n/a	n/a	111	109	115	107	105			106	104
Antifungal Days of Therapy/100 Patient Days*	n/a	n/a	n/a	n/a	n/a	n/a	17	21	27	20	21			20	19
Patient Care Outcomes															
Hospital-Acquired C. difficile Cases (rate per 1,000 pt days)	NA	NA	NA	5 (1.07)	8 (1.71)	4 (0.91)	7 (1.59)	5 (1.12)	0 (0.00)	0 (0.00)				0 (0.00)	3 (1.47)
ICU Average Length of Stay (Days)	5.84	5.57	5.67	5.51	5.24	6.10	5.26	4.45	4.18	4.33				4.26	3.71
ICU Mortality Rate (as a %)	20.1	17.6	16.3	16.5	17.04	15.3	13.9	14.2	9.5	12.7				11.1	13.8
ICU Readmission Rate Within 48 Hrs (as a %)	3.2	2.9	2.7	2.7	1.86	3.2	2.6	2.1	3.2	0.0				0.9	2.4
ICU Ventilator Days	NA	3286	2934	2677	2749	3069	2597	2504	552	616				1168	1025
ICU Multiple Organ Dysfunction Score (MODS)	4.00	4.04	4.12	4.25	4.62	4.87	4.73	4.43	3.6	3.95				3.78	4.28

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs + systemic antivirals; non-systemic antimicrobials are excluded. Data Sources: Antimicrobial DDD and Costs (PharmNet), C difficile (Infection Control Dashboards), Other ICU Patient Care Indicators (Critical Care Information System).

Historical antimicrobial usage and cost data updated due to the discovery that selected added drug dosages (Fluconazole 400mg/200ml bag, Pip-Tazo 13.5gm vial, Daptomycin 500mg vial) were not included in the report. Data have been revised to include Fluconazole starting August 2013, Pip-Tazo January 2015, and Daptomycin, November 2015.

Table 3: Mount Sinai Hospital: Medical Surgical ICU Total Antimicrobial Costs

MSH ICU Total Antimicrobial Costs (Antimicrobial Cost per Patient Day)												
	FY 10/11	FY 11/12	FY 12/13	FY 13/14	FY 14/15	FY 15/16	FY 16/17 Q1	FY 16/17 Q2	FY 16/17 Q3	FY 16/17 Q4	FY 16/17 YTD	Previous YTD
Non-PM Patients	\$78,737	\$87,931	\$109,283	\$150,870	\$135,395	\$71,509	\$17,979	\$17,441			\$35,420	\$34,483
	(\$21.14)	(\$25.42)	(\$31.77)	(\$37.54)	(\$37.70)	(\$23.5)	(\$8.28)	(\$16.44)			(\$10.96)	(\$21.10)
PM Patients	\$114,392	\$191,928	\$182,188	\$273,174	\$97,419	\$202,749	\$41,928	\$36,454			\$78,382	\$82,864
	(\$179.02)	(\$181.58)	(\$249.91)	(\$317.64)	(\$135.68)	(\$218.05)	(251.06)	(\$144.09)			(\$186.62)	(\$216.92)
Total	\$193,129	\$279,859	\$291,470	\$424,044	\$232,814	\$274,258	\$59,907	\$53,895			\$113,802	\$117,348
	(\$44.26)	(\$61.97)	(\$69.91)	(\$87.40)	(\$52.46)	(\$67.17)	(25.62)	(\$41.02)			(31.16)	(\$58.21)

Note: 15/16 is open year data; totals and cost per day may change based on coding changes. Antimicrobial costs from PharmNet; ICU visits and patient days from CIHI DAD Database.

Historical antimicrobial usage and cost data updated due to the discovery that selected added drug dosages (Fluconazole 400mg/200ml bag, Pip-Tazo 13.5gm vial, Daptomycin 500mg vial) were not included in the report. Data have been revised to include Fluconazole starting August 2013, Pip-Tazo January 2015, and Daptomycin, November 2015.

Mount Sinai Hospital: Medical Surgical ICU Antimicrobial Costs Per Patient Day for PM and Non-PM Patients

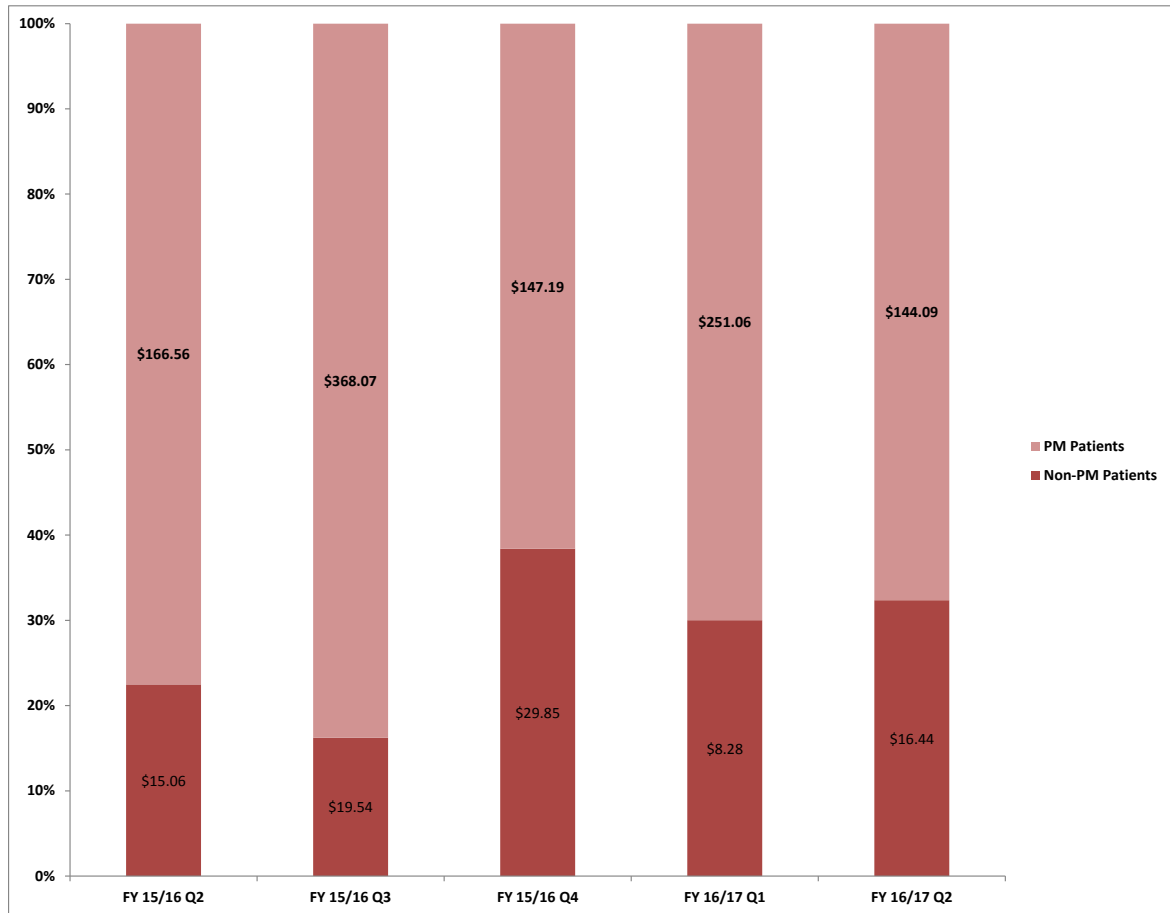
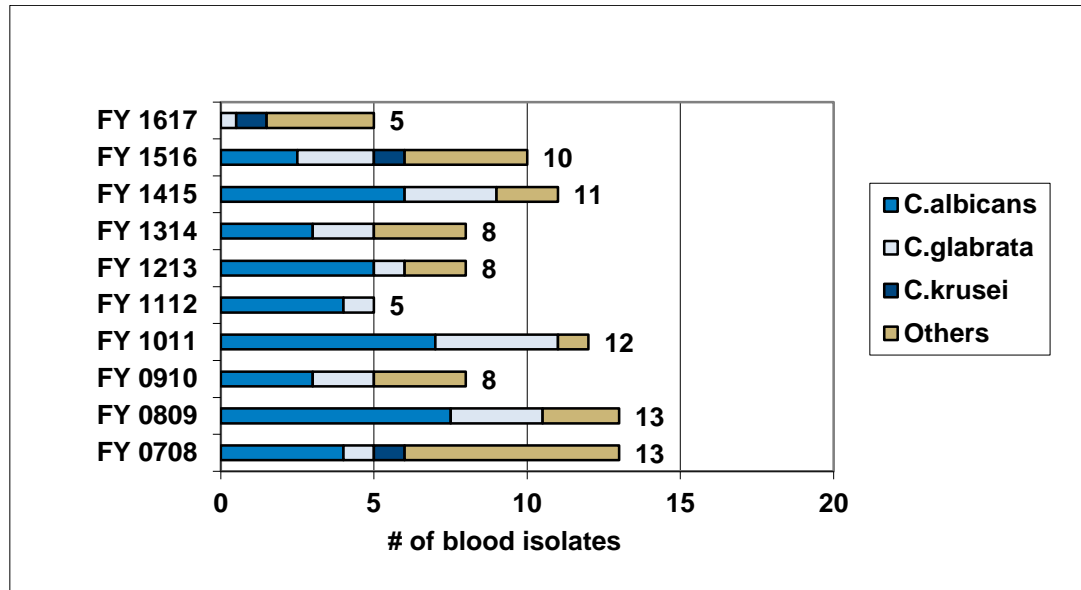
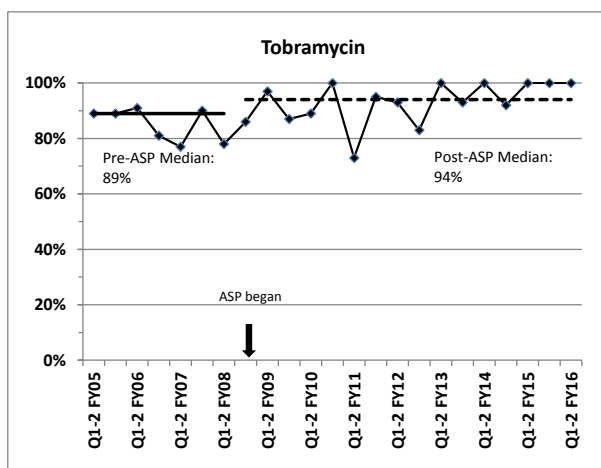
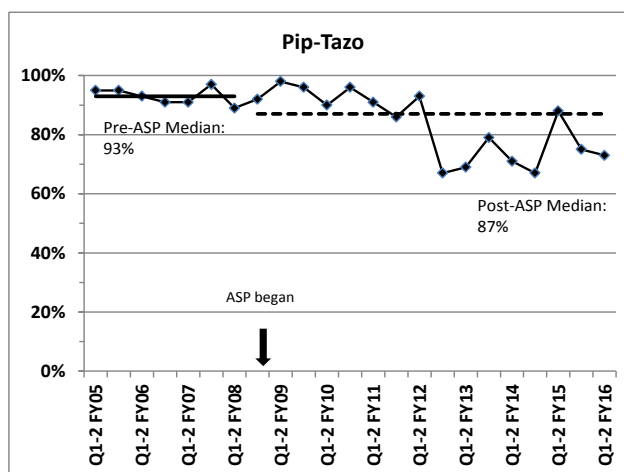
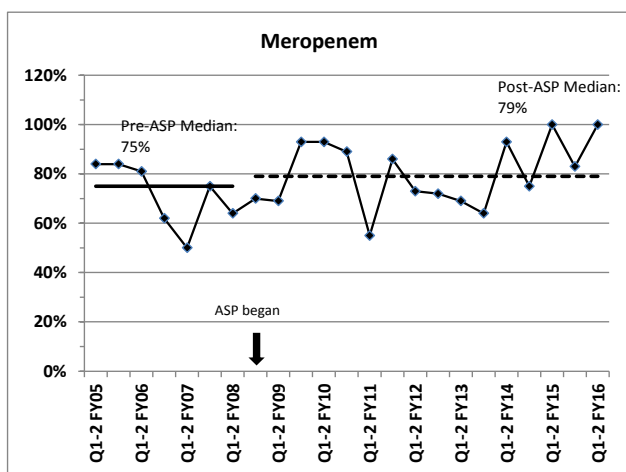
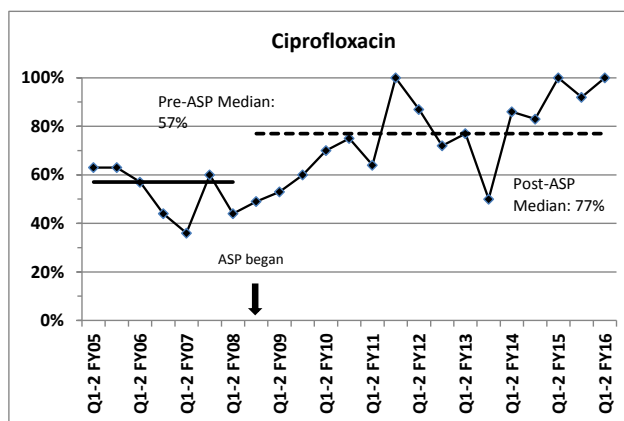
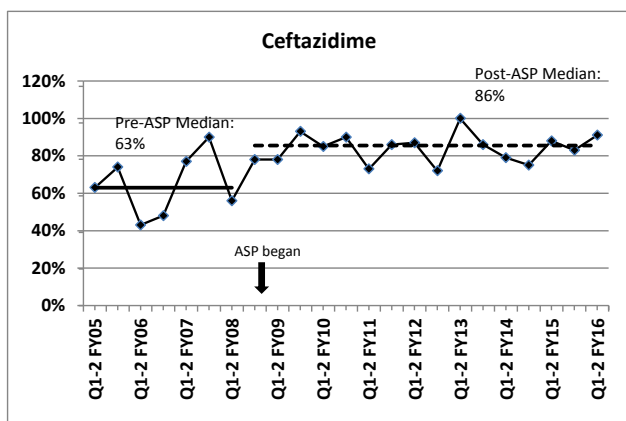


Table 4: Yeast Species Isolated in Blood – Mount Sinai Hospital: Medical Surgical ICU



MSH ICU Pseudomonas Susceptibility



Mount Sinai Hospital: Neonatal ICU

Currently there are no active ASP rounds in the NICU, however, we have continued to collect days of therapy (DOT), which is considered to be the standard metric for antimicrobial consumption for neonates. FY 16/17 Q2 highlights include:

- Antimicrobial days of therapy (DOT) per 100 patient days increased (↑) by 17.0% compared to YTD last year.
- Antimicrobial costs per patient day were lower this quarter and have remained largely unchanged compared to YTD last year.
- In July there was a reduction in pricing of ampicillin for the NICU.

Mount Sinai Hospital: Neonatal ICU Antimicrobial Consumption and Costs Per Patient Day

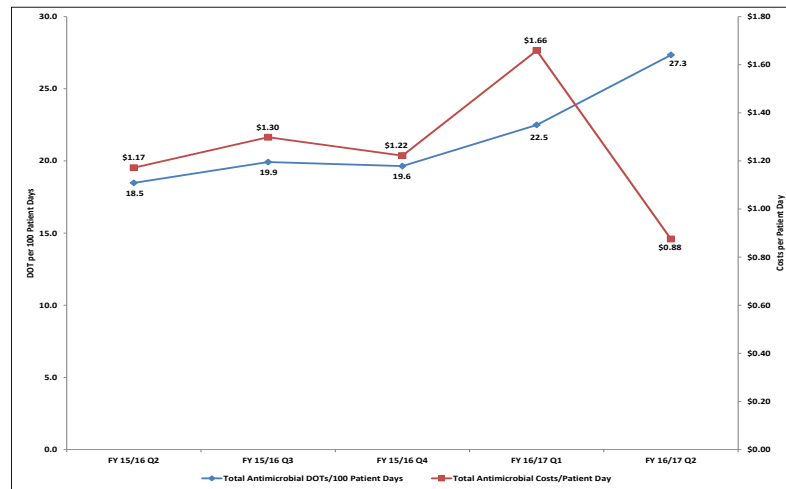


Table 5: Mount Sinai Hospital: Neonatal ICU

Indicators	FY 11/12	FY 12/13	FY 13/14	FY 14/15	FY 15/16	FY15/16 Performance					YTD of Previous Year
						Q1	Q2	Q3	Q4	YTD	
Antimicrobial Usage and Costs											
Total Antimicrobial DOTs/100 Patient Days	67.3	55.4	49.4	33.5	20.6	22.5	27.3			25.0	21.3
Systemic Antibacterial DOTs/100 Patient Days	65.1	53.5	48.7	32.7	19.9	21.9	26.0			24.0	20.5
Systemic Antifungal DOTs/100 Patient Days	2.2	1.8	0.7	0.8	0.7	0.6	1.3			1.0	0.8
Total Antimicrobial Costs	\$16,415	\$17,682	\$26,162	\$21,371	\$21,232	\$7,022	\$3,870			\$10,892	\$10,899
Total Antimicrobial Costs/Patient Day	\$1.31	\$1.51	\$2.17	\$1.26	\$1.26	\$1.66	\$0.88			\$1.26	\$1.25
Systemic Antibacterial Costs	\$14,783	\$16,505	\$25,290	\$20,516	\$20,804	\$6,810	\$3,719			\$10,529	\$10,702
Systemic Antibacterial Costs/Patient Day	\$1.18	\$1.41	\$2.10	\$1.21	\$1.23	\$1.61	\$0.84			\$1.22	\$1.23
Systemic Antifungal Costs	\$1,632	\$1,177	\$872	\$855	\$428	\$212	\$151			\$363	\$198
Systemic Antifungal Costs/Patient Day	\$0.13	\$0.10	\$0.07	\$0.05	\$0.03	\$0.050	\$0.03			\$0.04	\$0.02

Notes: Effective January 15, 2014, the NICU changed to a mixed-acuity model of care. Prior to this, ASP reported level 3 pharmacy data only. As of January 15, pharmacy data includes both level 2 and level 3 usage and cost. Patient days include both level 2 and 3 days; January level 2 days were determined by dividing the total days for the month by 2, since the change occurred midway through the month.

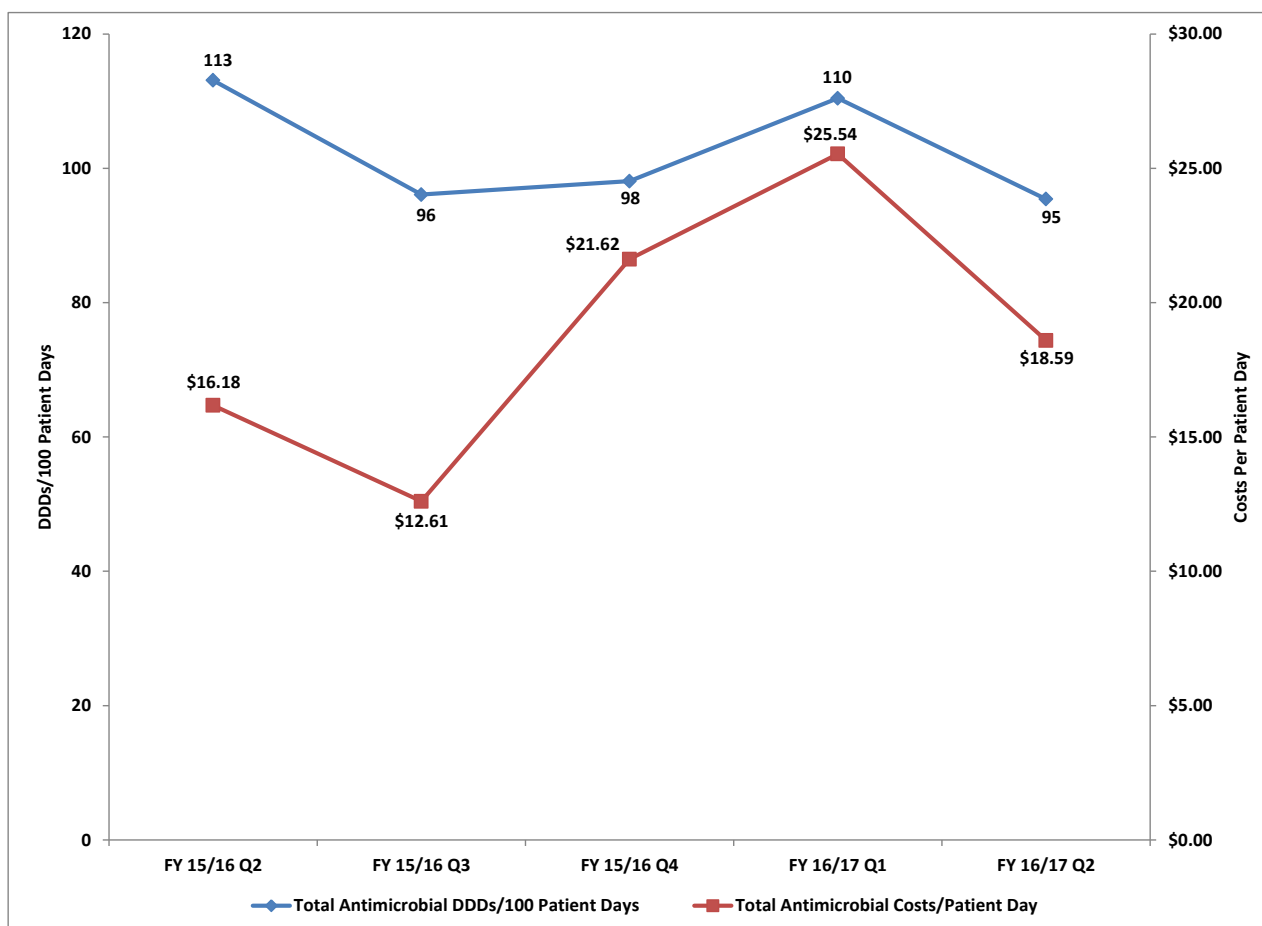
Days of Therapy (DOT) was used as the metric for antimicrobial consumption, which is considered to be the standard for neonates.

Toronto General Hospital: Cardiovascular ICU

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) decreased (↓) by 1.7% compared to YTD last year.
 - Antimicrobial costs per patient day increased (↑) by 42.7% compared to YTD last year.
 - Antibacterial costs per patient day increased (↑) by 10.3% compared to YTD last year.
 - Antifungal costs per patient day increased (↑) by 238.7% compared to YTD last year.
- NB: micafungin prophylaxis in heart transplant patients had stopped in October 2015 and was then reinstated in March of 2016.

Toronto General Hospital: Cardiovascular ICU Antimicrobial Consumption and Costs Per Patient Day



Toronto General Hospital: Cardiovascular ICU Antimicrobial Consumption as Defined Daily Dose Versus Antimicrobial Consumption as Days of Therapy

- Antibacterial Days of Therapy (DOT) per 100 patient days increased (↑) by 3.5% compared to YTD last year.
- Antifungal Days of Therapy (DOT) per 100 patient days increased (↑) by 4.2% compared to YTD last year.

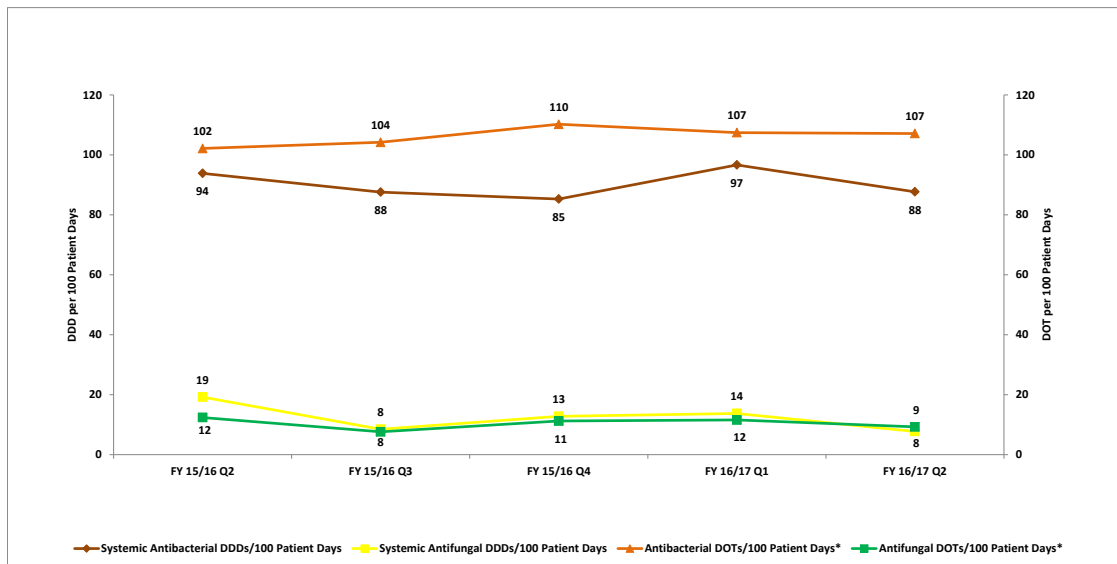
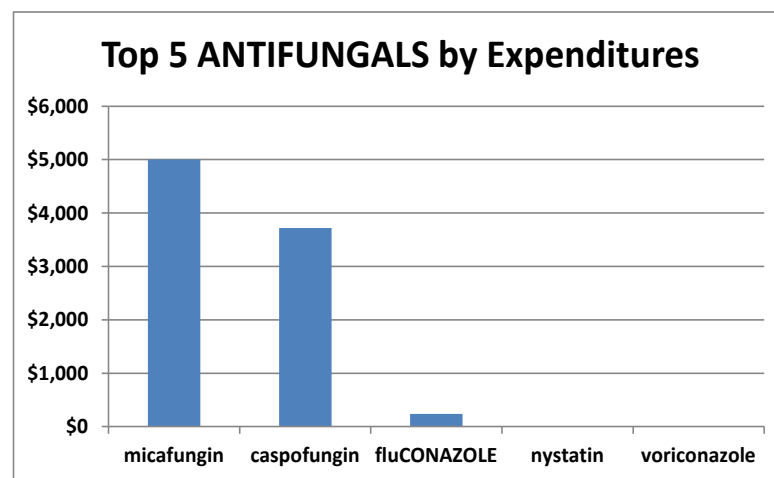
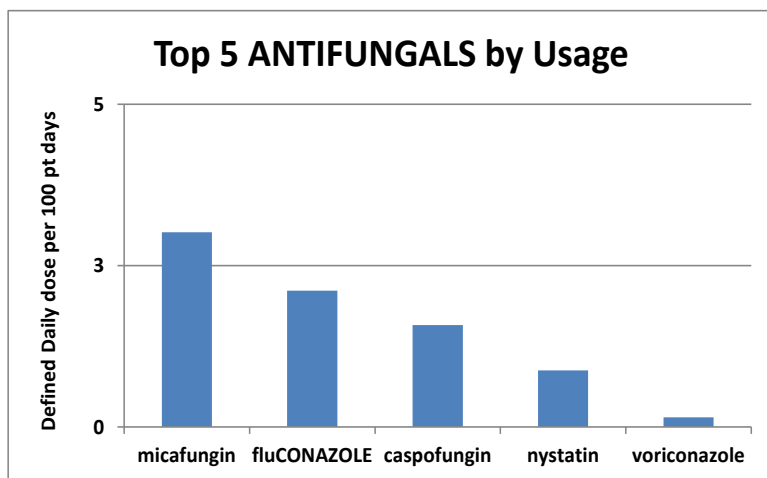
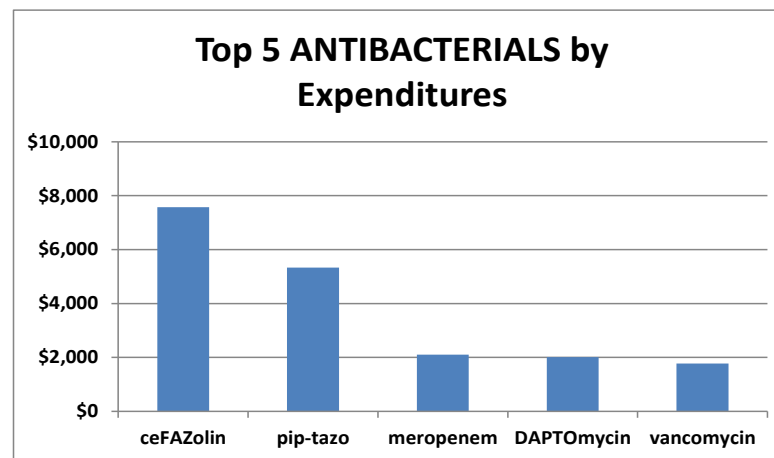
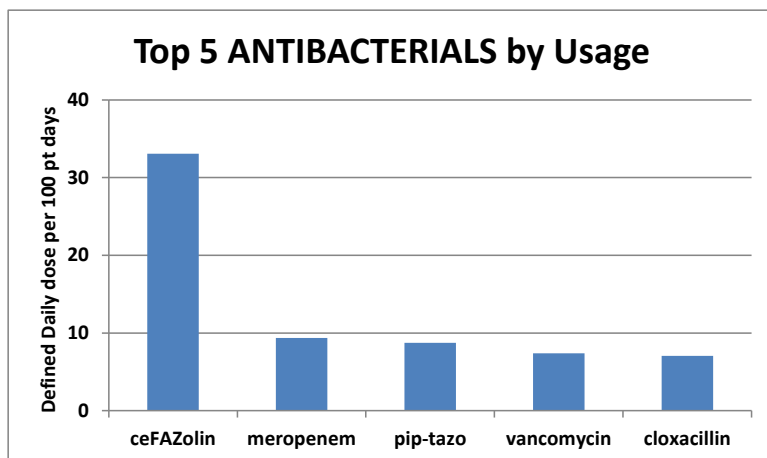


Table 6: Toronto General Hospital: Cardiovascular ICU

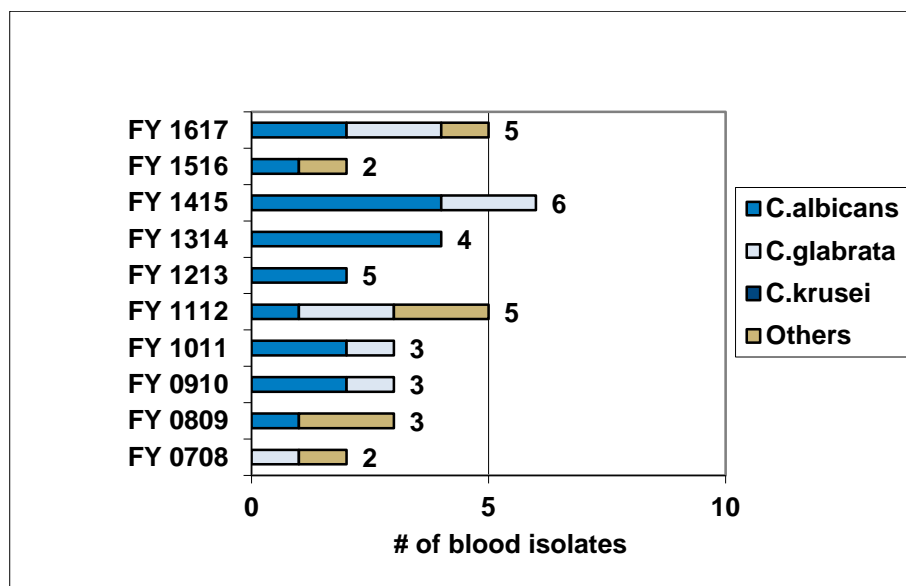
Indicators	FY 10/11 (Pre-ASP)	FY 11/12	FY 12/13	FY 13/14	FY 14/15	FY 15/16	FY16/17 Performance					YTD of Previous Year
							Q1	Q2	Q3	Q4	YTD	
Antimicrobial Usage and Costs												
Total Antimicrobial DDDs/100 Patient Days	105	98	102	97	102	101	110	95			103	105
Systemic Antibacterial DDDs/100 Patient Days	95	86	89	86	93	89	97	88			92	91
Systemic Antifungal DDDs/100 Patient Days	10	12	13	11	9	13	14	8			11	14
Total Antimicrobial Costs	\$108,172	\$108,464	\$85,916	\$100,736	\$129,314	\$110,716	\$44,457	\$30,843			\$75,300	\$54,694
Total Antimicrobial Costs/Patient Day	\$18.20	\$19.06	\$14.99	\$17.00	\$20.46	\$16.34	\$25.54	\$18.59			\$22.15	\$15.52
Systemic Antibacterial Costs	\$100,375	\$99,261	\$74,232	\$80,204	\$91,366	\$85,343	\$28,103	\$21,865			\$49,968	\$46,942
Systemic Antibacterial Costs/Patient Day	\$16.89	\$17.44	\$12.95	\$13.54	\$14.45	\$12.60	\$16.14	\$13.18			\$14.70	\$13.32
Systemic Antifungal Costs	\$7,797	\$9,204	\$11,684	\$20,532	\$37,948	\$25,373	\$16,354	\$8,977			\$25,332	\$7,752
Systemic Antifungal Costs/Patient Day	\$1.31	\$1.62	\$2.04	\$3.47	\$6.00	\$3.75	\$9.39	\$5.41			\$7.45	\$2.20
Antibacterial Days of Therapy/100 Patient Days*	n/a	n/a	n/a	n/a	129	105	107	107			107	104
Antifungal Days of Therapy/100 Patient Days*	n/a	n/a	n/a	n/a	28	10	12	9			10	10
Patient Care Outcomes												
Hospital-Acquired C. difficile Cases (rate per 1,000 pt days)	2 (0.34)	5 (0.88)	6 (1.05)	7 (1.18)	7 (1.11)	7 (1.03)	1 (0.57)	2 (1.21)			3 (0.88)	5 (1.42)
ICU Average Length of Stay (days)	3.12	2.95	2.97	3.20	3.46	3.45	3.13	3.39			3.25	3.5
ICU Mortality Rate (as a %)	3.5	3.0	3.0	4.6	4.6	4.0	4.6	4.2			4.4	4.0
ICU Readmission Rate Within 48 Hrs (as a %)	1.6	2.2	1.8	2.2	2.4	1.6	1.9	1.8			1.9	0.8
Central Line Infection Rate (per 1000 pt days)	0.73	0.17	0.34	0.16	0.15	0.53	0.0	1.66			0.83	0.27
Ventilator-Associated Pneumonia Rate (per 1,000 pt days)	2.99	2.80	1.91	1.73	2.81	0.94	1.89	3.55			2.75	0.94
ICU Multiple Organ Dysfunction Score (MODS)	6.22	6.07	5.51	5.77	5.60	5.83	6.15	5.83			5.99	5.74
ICU Ventilator Days	3015	3571	3676	4049	3925	4239	1056	1803			2859	2120

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs; non-systemic antimicrobials and antivirals are excluded.
Data Sources: Antimicrobial DDD and Costs (Centricity). *An error in DDD calculation for Pip-tazo was detected in Q3 2013; all historical data prior to this was rerun, resulting in minor changes to antibacterial DDDs.

Table 7: TGH CVICU FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDD per 100 patient days) and Expenditures



**Table 8: Yeast Species Isolated in Blood – Toronto General Hospital
Cardiovascular ICU**

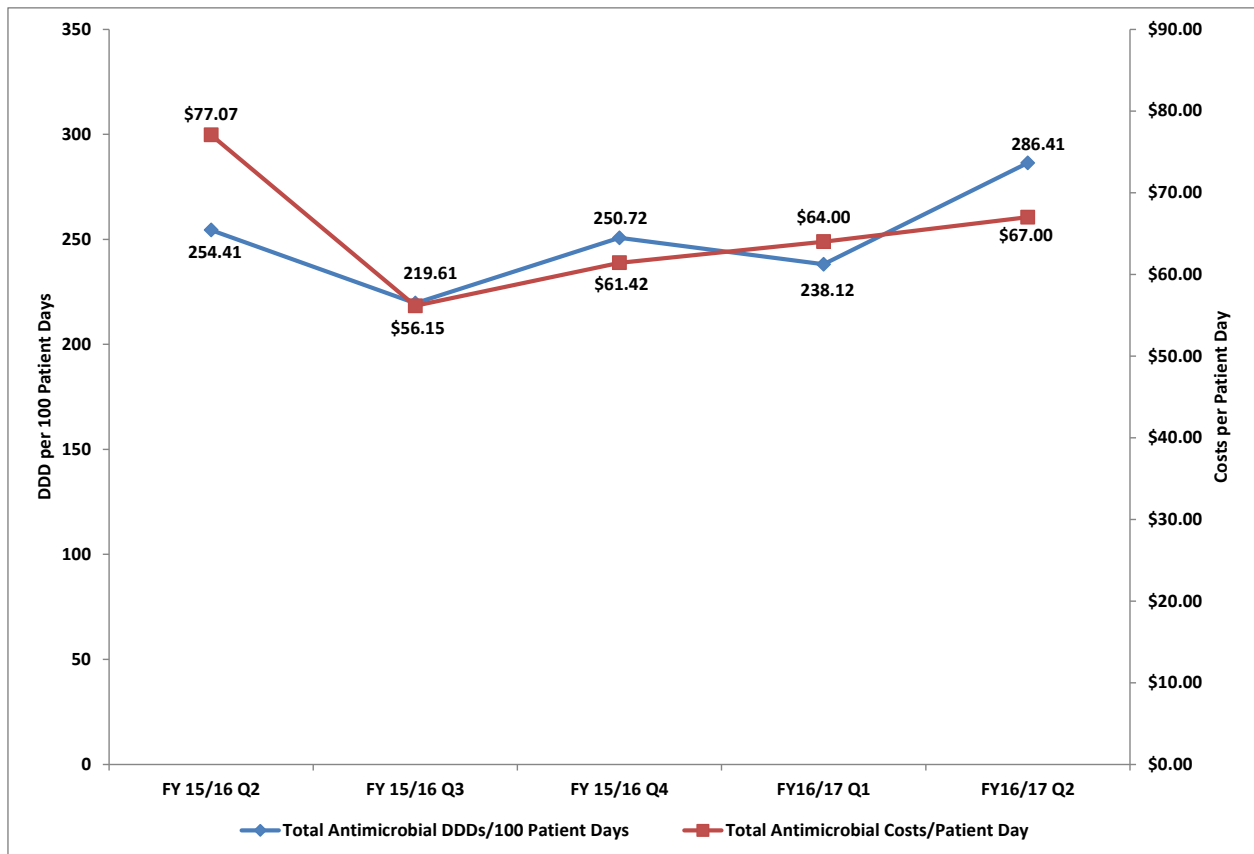


Toronto General Hospital: Medical Surgical ICU

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) increased (↑) by 8.0% compared to YTD last year.
- Antimicrobial costs per patient day decreased (↓) by 21.5% compared to YTD last year.
- Antibacterial costs per patient day decreased (↓) by 4.9% compared to YTD last year.
- Antifungal costs per patient day decreased (↓) by 33.5% compared to YTD last year.

Toronto General Hospital: Medical Surgical ICU Antimicrobial Consumption and Costs Per Patient Day



To view **Appendix 1: FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 Patient Days) and Expenditures by ICU Site**, please click [here](#).

Toronto General Hospital: Medical Surgical ICU Antimicrobial Consumption as Defined Daily Dose Versus Antimicrobial Consumption as Days of Therapy

- Antibacterial Days of Therapy (DOT) per 100 patient days increased (↑) by 16.0% compared to YTD last year.
- Antifungal Days of Therapy (DOT) per 100 patient days increased (↑) by 25.6% compared to YTD last year.

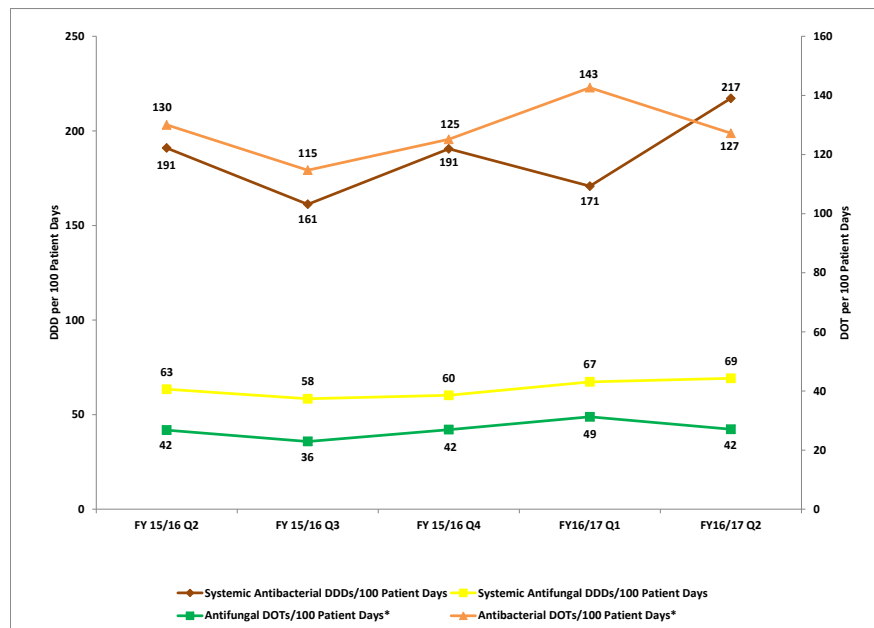
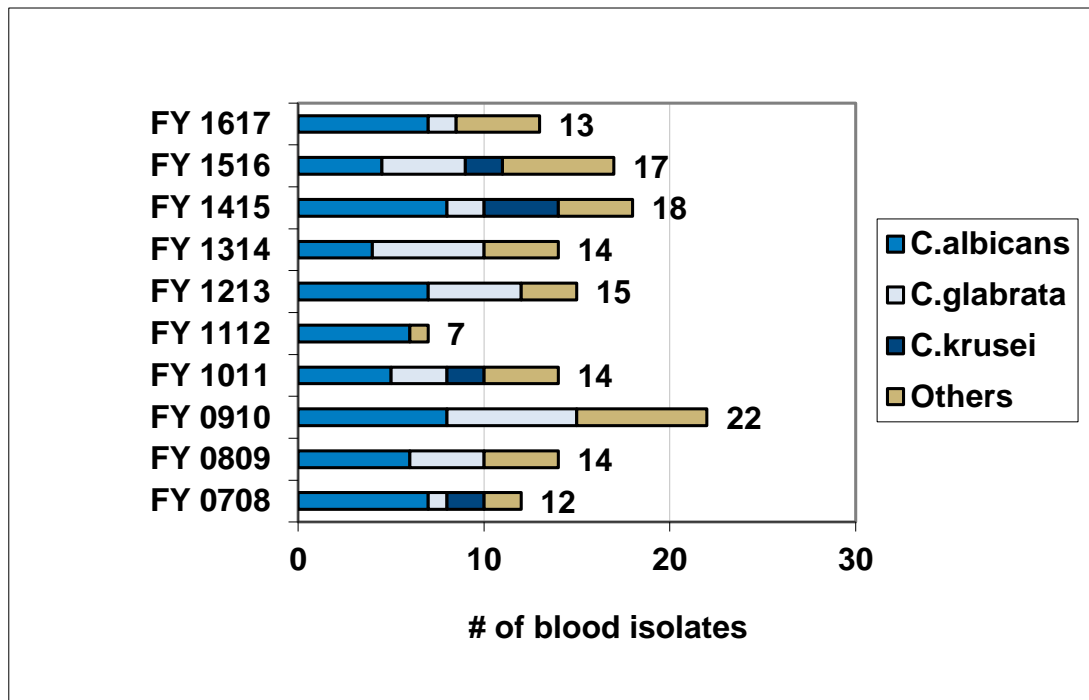


Table 9: Toronto General Hospital: Medical Surgical ICU

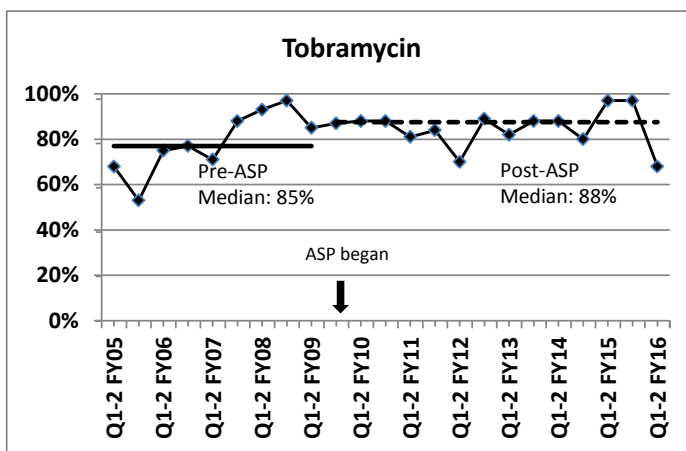
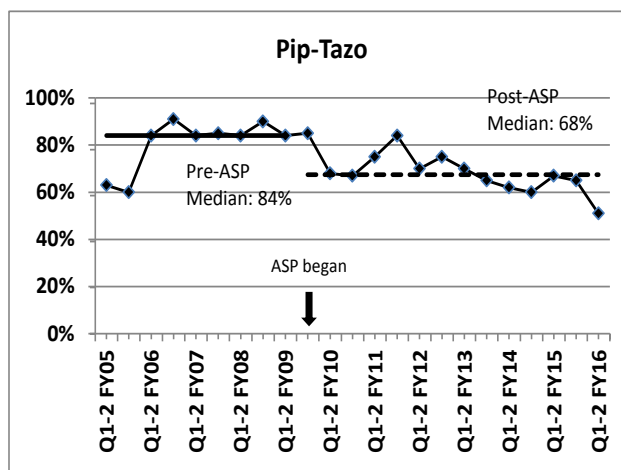
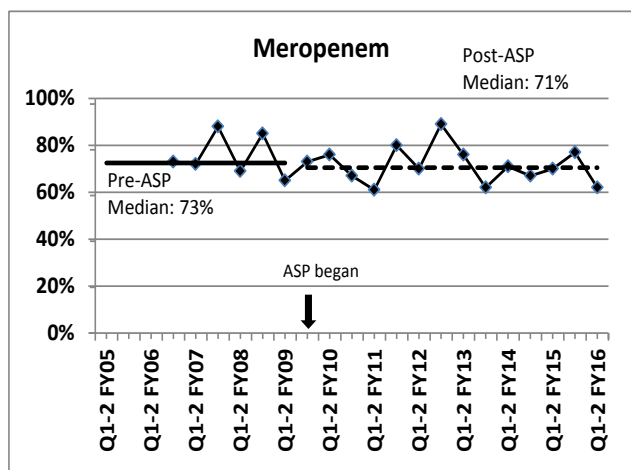
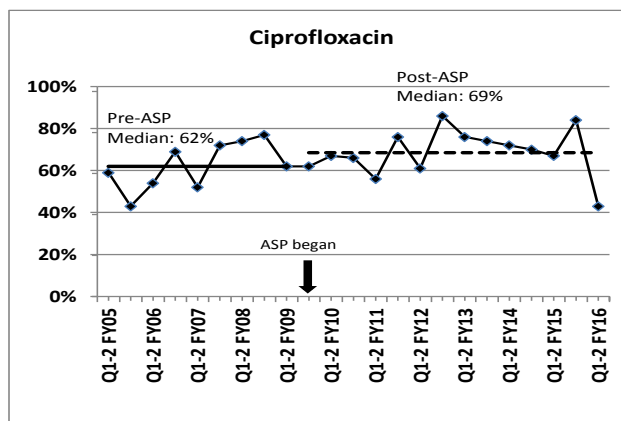
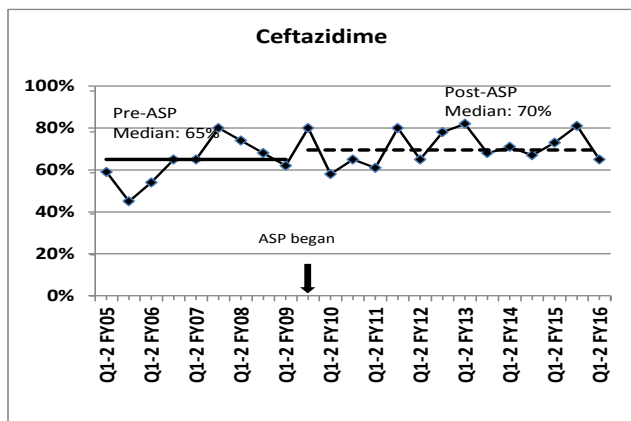
Indicators	FY 09/10 (Pre-ASP)	FY 10/11	FY 11/12	FY 12/13	FY 13/14	FY 14/15	FY 15/16	FY 16/17 Performance					YTD of Previous Year
								Q1	Q2	Q3	Q4	YTD	
Antimicrobial Usage and Costs													
Total Antimicrobial DDDs/100 Patient Days	266	209	199	213	217	235	239	238	286			261	242
Systemic Antibacterial DDDs/100 Patient Days	184	155	143	159	156	175	178	171	217			193	179
Systemic Antifungal DDDs/100 Patient Days	82	55	55	54	61	60	61	67	69			68	63
Total Antimicrobial Costs	\$701,451	\$629,472	\$567,532	\$473,613	\$584,018	\$686,577	\$587,950	\$155,901	\$148,810			\$304,711	\$343,445
Total Antimicrobial Costs/Patient Day	\$102.52	\$84.06	\$76.93	\$63.75	\$75.71	\$83.65	\$71.06	\$64.00	\$67.00			\$65.43	\$83.38
Systemic Antibacterial Costs	\$390,209	\$375,436	\$292,355	\$231,171	\$225,557	\$293,126	\$254,392	\$78,696	\$75,922			\$154,618	\$143,800
Systemic Antibacterial Costs/Patient Day	\$57.03	\$50.14	\$39.63	\$31.12	\$29.24	\$35.71	\$30.75	\$32.31	\$34.18			\$33.20	\$34.91
Systemic Antifungal Costs	\$311,242	\$254,036	\$275,176	\$242,443	\$358,461	\$393,451	\$333,559	\$77,205	\$72,888			\$150,093	\$199,646
Systemic Antifungal Costs/Patient Day	\$45.49	\$33.93	\$37.30	\$32.63	\$46.47	\$47.94	\$40.31	\$31.69	\$32.82			\$32.23	\$48.47
Antibacterial Days of Therapy/100 Patient Days*	n/a	n/a	n/a	n/a	n/a	107.9	118.3	143	127			135	117
Antifungal Days of Therapy/100 Patient Days*	n/a	n/a	n/a	n/a	n/a	34.1	37.7	49	42			46	36
Patient Care Outcomes													
Hospital-Acquired C. difficile Cases (rate per 1,000 pt days)	10 (1.46)	10 (1.33)	11 (1.49)	11 (1.48)	12 (1.56)	10 (1.22)	10 (1.21)	3 (1.23)	7 (3.15)			10 (2.15)	6 (1.46)
ICU Average Length of Stay (days)	8.24	8.61	8.85	7.79	8.22	8.08	7.62	8.77	9.68			9.23	7.31
ICU Mortality Rate (as a %)	16.2	15.7	16.3	16.0	17.8	17.2	17.2	16.4	17.4			16.9	17.4
ICU Readmission Rate Within 48 Hrs (as a %)	3.8	4.4	4.4	2.8	3.5	3.0	3.4	2.7	5.4			4.0	3.5
ICU Ventilator Days	5399	6256	6507	6458	24620	7330	7048	2161	2319			4480	3589
Apache II Score	n/a	n/a	16.1	15.775	15.9	15.1	15.4	16.5	16.4			16.5	15.3

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs; non-systemic antimicrobials and antivirals are excluded.
Data Sources: Antimicrobial DDD and Costs (Centricity). *An error in DDD calculation for Pip-tazo was detected in Q3 2013; all historical data prior to this was rerun, resulting in minor changes to antibacterial DDDs.
Due to a calculation error in Centricity, Antifungal and Total DDD/100pt days for Q2 and FYTD have been corrected.

Table 10: Yeast Species Isolated in Blood – Toronto General Hospital: Medical Surgical ICU



TGH MSICU Pseudomonas Susceptibility

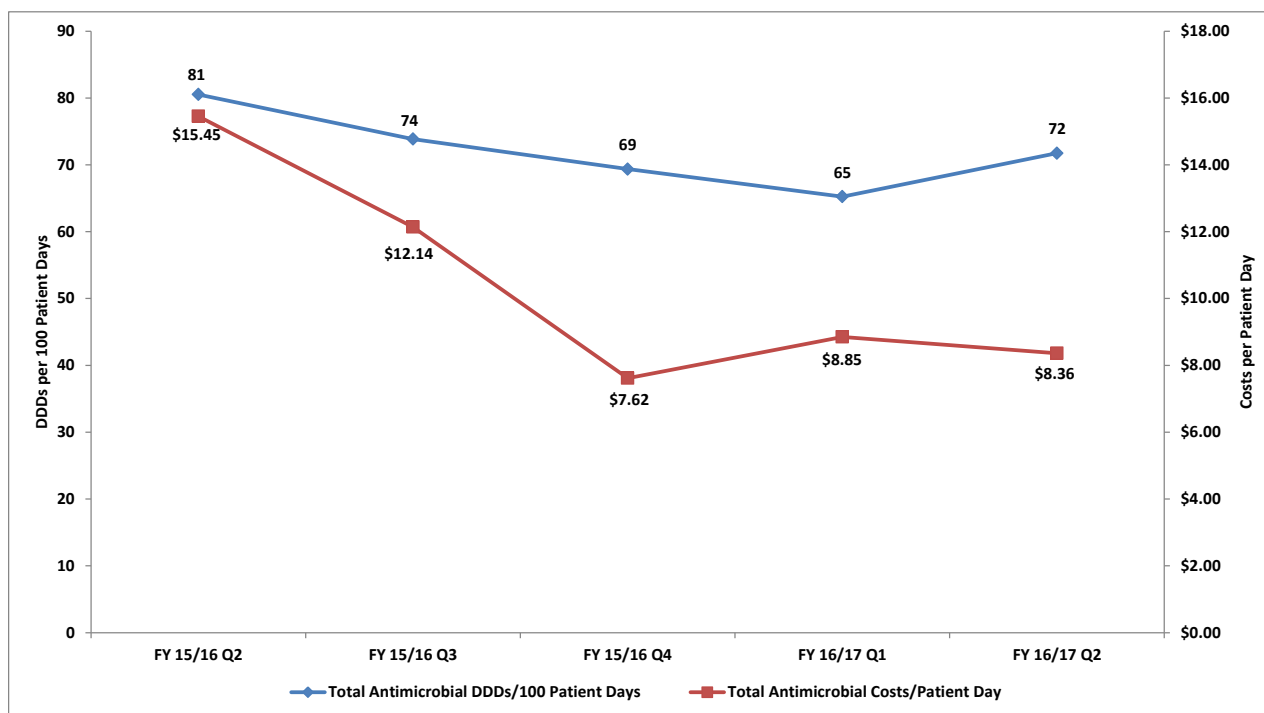


Toronto Western Hospital: Medical, Surgical, and Neurosurgical ICU

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) decreased (↓) by 8.2% compared to YTD last year.
- Antimicrobial costs per patient day decreased (↓) by 30.6% compared to YTD last year.
- Antibacterial costs per patient day decreased (↓) by 19.6% compared to YTD last year.
- Antifungal costs per patient day decreased (↓) by 45.1% compared to YTD last year.

Toronto Western Hospital: Medical, Surgical, and Neurosurgical ICU Antimicrobial Consumption and Costs Per Patient Day



To view **Appendix 1: FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 Patient Days) and Expenditures by ICU Site**, please click [here](#).

Toronto Western Hospital: Medical, Surgical, Neurosurgical ICU Antimicrobial Consumption as Defined Daily Dose Versus Antimicrobial Consumption as Days of Therapy

- Antibacterial Days of Therapy (DOT) per 100 patient days decreased (↓) by 0.4% compared to YTD last year.
- Antifungal Days of Therapy (DOT) per 100 patient days decreased (↓) by 28.8% compared to YTD last year.

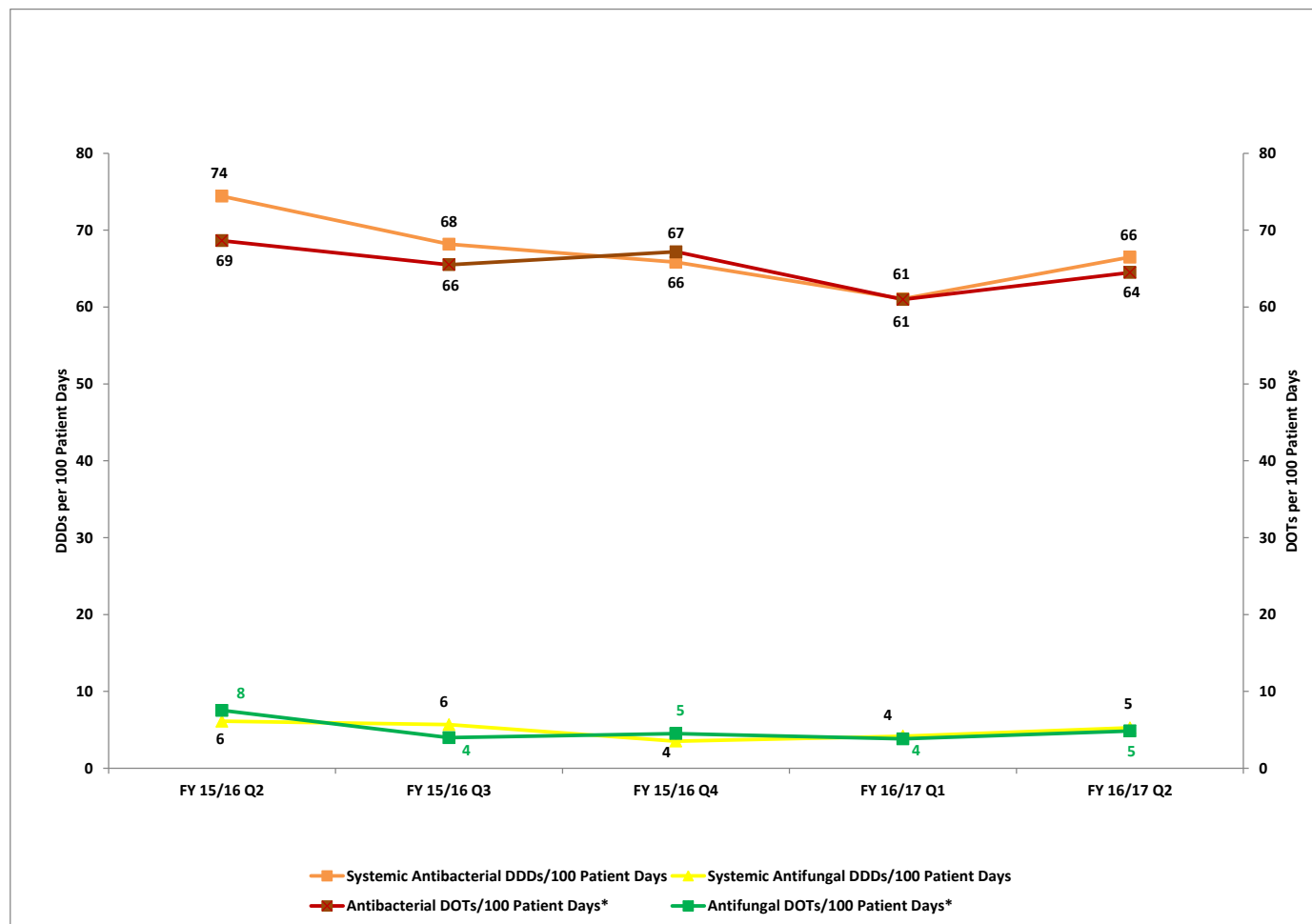


Table 11: Toronto Western Hospital: Medical, Surgical, and Neurosurgical ICU

Indicators	FY 08/09 (Pre-ASP)	FY 09/10	FY 10/11	FY 11/12	FY 12/13	FY 13/14	FY 14/15	FY 15/16	FY16/17 Performance					YTD of Previous Year
									Q1	Q2	Q3	Q4	YTD	
Antimicrobial Usage and Costs														
Total Antimicrobial DDDs/100 Patient Days	99	88	79	83	83	92	67	77	65	72			69	75
Systemic Antibacterial DDDs/100 Patient Days	92	78	73	77	78	86	62	68	61	66			64	69
Systemic Antifungal DDDs/100 Patient Days	6	10	6	6	5	6	5	9	4	5			5	5
Total Antimicrobial Costs	\$136,758	\$100,408	\$101,191	\$105,899	\$102,978	\$120,538	\$138,014	\$127,293	\$25,988	\$24,792			\$50,780	\$72,663
Total Antimicrobial Costs/Patient Day	\$18.16	\$13.24	\$13.17	\$13.60	\$13.37	\$13.49	\$11.97	\$11.10	\$8.85	\$8.36			\$8.61	\$12.40
Systemic Antibacterial Costs	\$123,314	\$87,445	\$79,280	\$89,784	\$70,099	\$85,916	\$89,382	\$74,877	\$14,840	\$16,598			\$33,438	\$41,297
Systemic Antibacterial Costs/Patient Day	\$16.37	\$11.53	\$10.32	\$11.53	\$9.10	\$9.61	\$7.75	\$6.53	\$5.05	\$6.27			\$5.67	\$7.05
Systemic Antifungal Costs	\$13,444	\$12,963	\$21,911	\$16,115	\$32,879	\$34,623	\$48,631	\$52,416	\$11,148	\$6,194			\$17,343	\$31,366
Systemic Antifungal Costs/Patient Day	\$1.79	\$1.71	\$2.85	\$2.07	\$4.27	\$3.87	\$4.22	\$4.57	\$3.80	\$2.09			\$2.94	\$5.35
Antibacterial Days of Therapy/100 Patient Days*	n/a	n/a	n/a	n/a	n/a	n/a	60	65	61	64			63	63
Antifungal Days of Therapy/100 Patient Days*	n/a	n/a	n/a	n/a	n/a	n/a	4	5	4	5			4	6
Patient Care Outcomes														
Hospital-Acquired C. difficile Cases (rate per 1,000 pt days)	6 (0.79)	9 (1.18)	4 (0.52)	13 (1.66)	5 (0.65)	12 (1.34)	10 (1.16)	9 (0.78)	1 (0.34)	3 (1.01)			4 (0.68)	5 (0.85)
ICU Average Length of Stay (days)	8.39	7.44	10.68	9.71	7.98	7.68	8.7	8.01	10.88	7.4			9.1	7.0
ICU Mortality Rate (as a %)	19.6	19.9	18.1	17.0	16.4	17.1	19.0	17.9	19.2	15.3			17.2	15.6
ICU Readmission Rate Within 48 Hrs (as a %)	3.9	4.7	4.9	3.21	3.00	3.85	3.40	2.54	1.23	1.09			1.15	2.48
ICU Ventilator Days	4617	6305	5960	5578	4947	5523	5180	5414	1371	1010			2381	2710
ICU Apache II Score	15.0	14.7	13.7	13.8	12.9	12.8	13.2	13.0	13.6	12.9			13.3	12.0

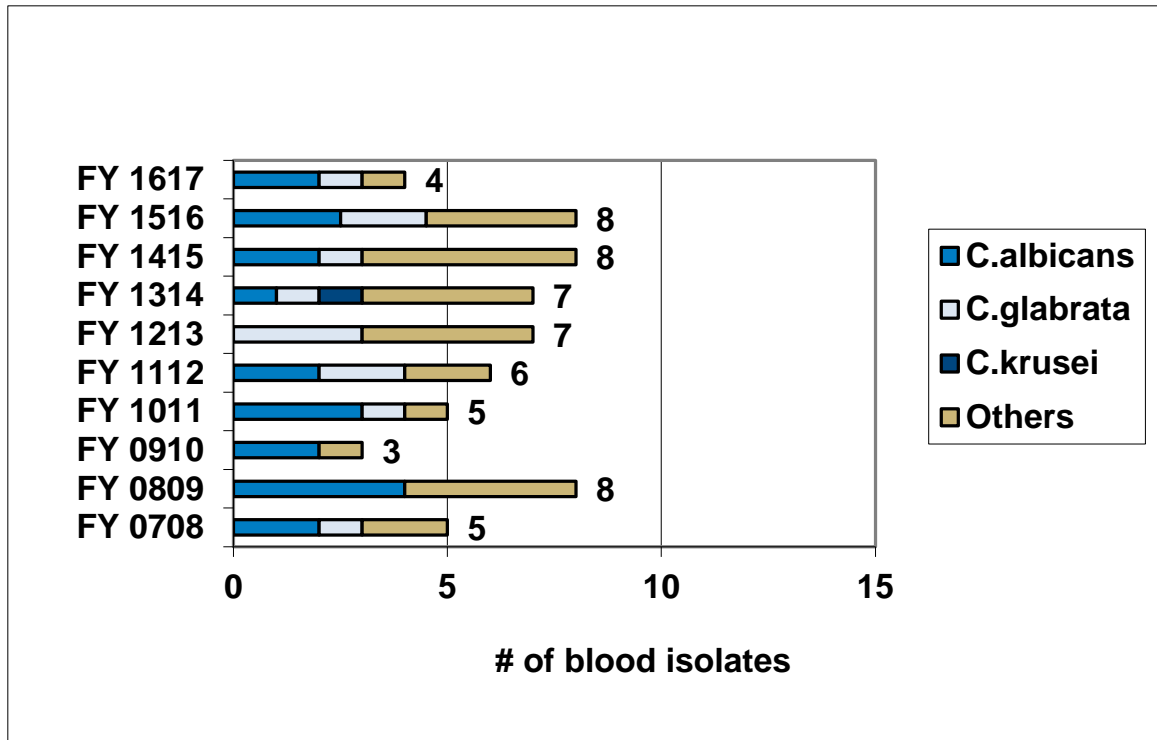
Notes: Q4 13/14 data consists of MSNICU patients (including eight ICU II patients).

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs; non-systemic antimicrobials and antivirals are excluded.

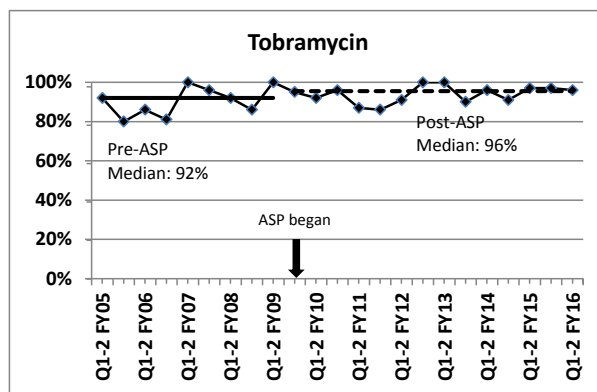
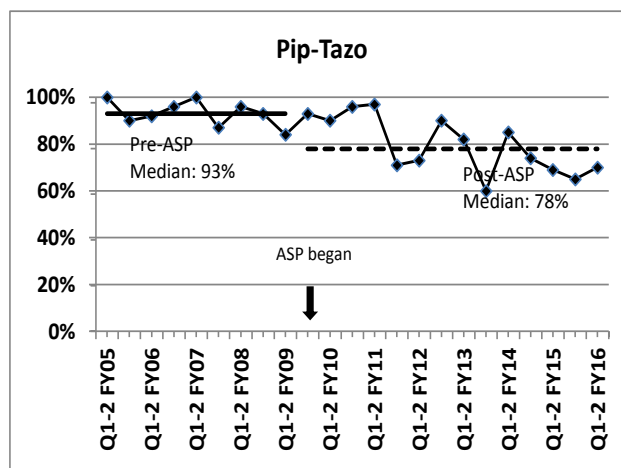
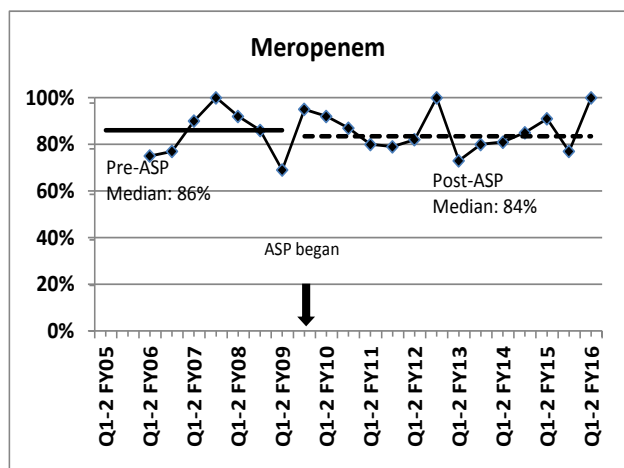
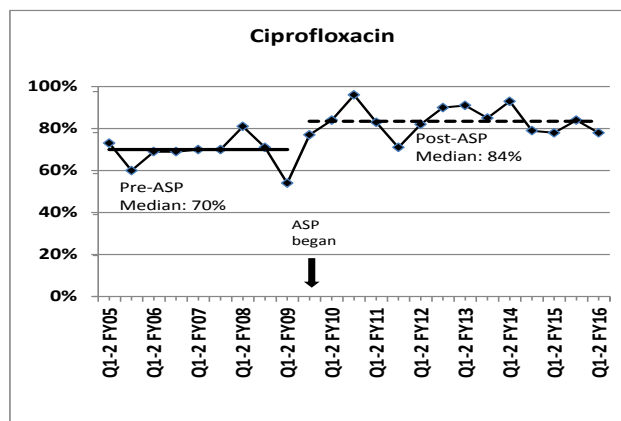
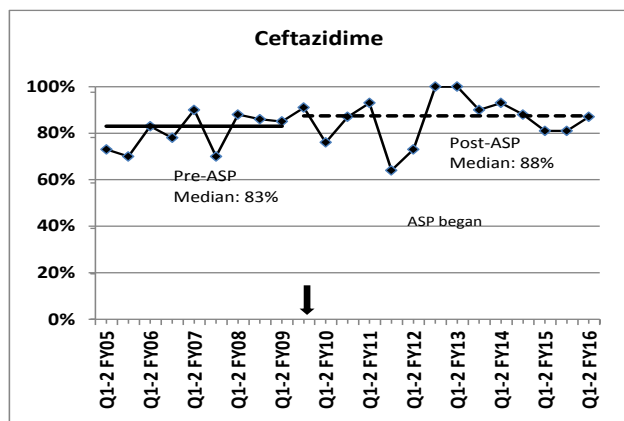
Data Sources: Antimicrobial DDD and Costs (Centricity) *An error in DDD calculation for Pip-tazo was detected in Q3 2013; all historical data prior to this was rerun, resulting in minor changes to antibacterial DDDs.

Due to a calculation error in Centricity, Antifungal and Total DDD/100pt days for Q2 and FYTD have been corrected.

Table 12: Yeast Species Isolated in Blood – Toronto Western Hospital: Medical, Surgical, and Neurosurgical ICU



TWH MSICU Pseudomonas Susceptibility



EMERGENCY DEPARTMENT

Mount Sinai Hospital: Emergency Department

FY 16/17 Q2 highlights include:

Sepsis Project

SNAP (Sepsis Now A Priority) Project: The SNAP algorithm continues to be utilized in the Mount Sinai Emergency Department. Algorithm-related interventional times continue to be monitored and reported back to frontline staff via monthly SNAP scorecards. Reporting of the SNAP scorecard is being managed by the Emergency Department. There have been recent discussions with the MSH ED staff to determine how best to continue improving care and increasing awareness and use of the SNAP algorithm.

Dr. Christine McDonald collected and analyzed pre- and post-algorithm data on patients from the SNAP protocol. A manuscript detailing the results will be submitted for publication in the coming months.

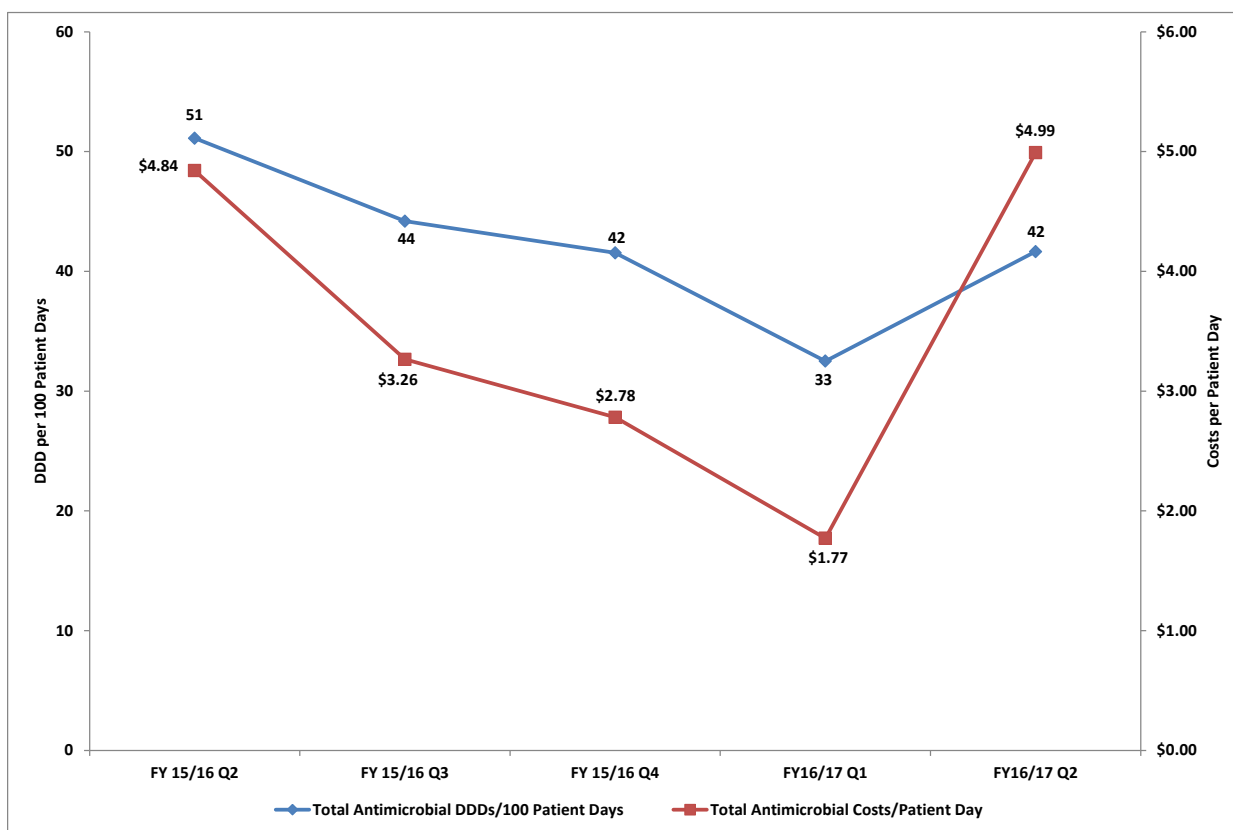
GENERAL INTERNAL MEDICINE

Mount Sinai Hospital: General Internal Medicine

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) decreased (↓) by 23.9% compared to YTD last year.
 - Antimicrobial costs per patient day decreased (↓) by 16.9% compared to YTD last year.
 - Antibacterial costs per patient day decreased (↓) by 43.3% compared to YTD last year.
 - Antifungal costs per patient day increased (↑) by 207.0% compared to YTD last year.
- NB: Usage data calculated for patients admitted by admission to GIM medical service at MSH.
From July to September there was significant use of Amphotericin B liposomal in one patient.

Mount Sinai Hospital: General Internal Medicine Antimicrobial Consumption and Costs Per Patient Day



To view **Appendix 2: General Internal Medicine FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 patient days) and Expenditures**, please click [here](#).

Table 13: Mount Sinai Hospital: General Internal Medicine

Indicators	FY 12/13 (Q2-4)	FY 13/14	FY 14/15	FY 15/16	FY16/17 Performance					YTD of Previous Year
					Q1	Q2	Q3	Q4	YTD	
Antimicrobial Usage and Costs										
Total Antimicrobial DDDs/100 Patient Days	58	45	48	43	33	42			37	48
Systemic Antibacterial DDDs/100 Patient Days	53	41	43	39	29	36			32	44
Systemic Antifungal DDDs/100 Patient Days	3	3	3	3	3	5			4	4
Total Antimicrobial Costs	\$125,012	\$123,737	\$128,661	\$106,518	\$15,988	\$39,950			\$55,938	\$72,715
Total Antimicrobial Costs/Patient Day	\$5.74	\$3.76	\$3.63	\$2.92	\$1.77	\$4.99			\$3.28	\$3.95
Systemic Antibacterial Costs	\$105,621	\$99,731	\$104,822	\$84,173	\$13,286	\$19,255			\$32,541	\$62,049
Systemic Antibacterial Costs/Patient Day	\$4.85	\$3.03	\$2.96	\$2.31	\$1.47	\$2.41			\$1.91	\$3.37
Systemic Antifungal Costs	\$15,422	\$20,153	\$16,352	\$15,983	\$2,353	\$20,028			\$22,381	\$7,878
Systemic Antifungal Costs/Patient Day	\$0.71	\$0.61	\$0.46	\$0.44	\$0.26	\$2.50			\$1.31	\$0.43
Patient Care Outcomes										
Hospital-Acquired C. difficile Cases (rate per 1,000 patient days)	16 (0.64)	8 (0.32)	7 (0.27)	7 (0.28)	0(0.00)	8 (1.26)			8 (0.62)	3 (0.23)

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs + systemic antivirals; non-systemic antimicrobials are excluded.

Data Sources: Antimicrobial DDD and Costs (PharmNet), C difficile (Infection Control Dashboards).

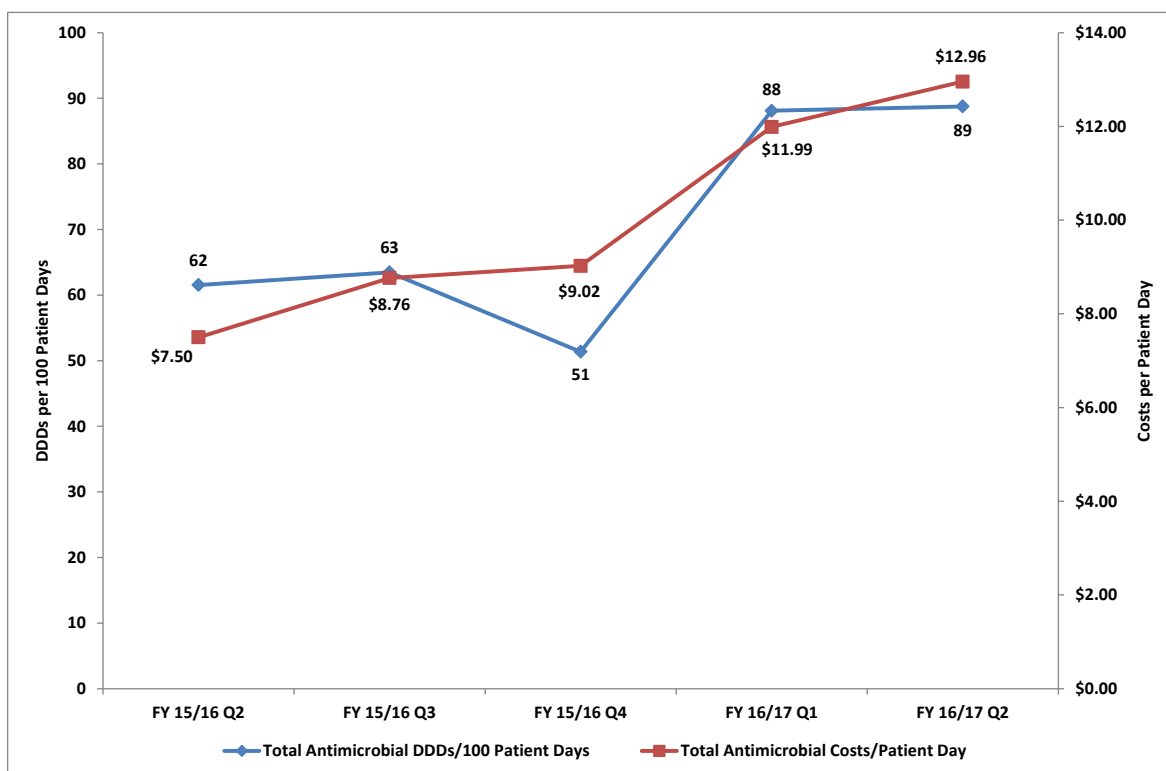
Historical antimicrobial usage and cost data updated due to the discovery that selected added drug dosages (Fluconazole 400mg/200ml bag, Pip-Tazo 13.5gm vial, Daptomycin 500mg vial) were not included in the report. Data have been revised to include Fluconazole starting August 2013, Pip-Tazo January 2015, and Daptomycin, November 2015.

Toronto General Hospital: General Internal Medicine

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) increased (↑) by 30.2% compared to YTD last year.
 - Antimicrobial costs per patient day increased (↑) by 54.5% compared to YTD last year for TGH.
 - Antibacterial costs per patient day increased (↑) by 31.8% compared to YTD last year.
 - Antifungal costs per patient day increased (↑) by 112.6% compared to YTD last year.
- NB: Usage data calculated for patients admitted to primary GIM units at TGH.

Toronto General Hospital: General Internal Medicine Antimicrobial Consumption and Costs Per Patient Day



To view **Appendix 2: General Internal Medicine FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 patient days) and Expenditures**, please click [here](#).

Table 14: Toronto General Hospital: General Internal Medicine

Indicators	FY 12/13 (Q2-4)	FY 13/14	FY 14/15	FY 15/16	FY16/17 Performance					YTD of Previous Year
					Q1	Q2	Q3	Q4	YTD	
Antimicrobial Usage and Costs										
Total Antimicrobial DDDs/100 Patient Days	87	83	83	63	88	89			88	68
Systemic Antibacterial DDDs/100 Patient Days	77	70	73	55	71	75			73	60
Systemic Antifungal DDDs/100 Patient Days	11	13	10	8	17	14			15	8
Total Antimicrobial Costs	\$279,644	\$471,342	\$352,036	\$313,464	\$83,645	\$91,225			\$174,870	\$149,650
Total Antimicrobial Costs/Patient Day	\$14.10	\$18.05	\$13.30	\$8.48	\$11.99	\$12.96			\$12.47	\$8.08
Systemic Antibacterial Costs	\$171,817	\$225,491	\$221,389	\$202,012	\$48,975	\$58,426			\$107,401	\$107,695
Systemic Antibacterial Costs/Patient Day	\$8.67	\$8.64	\$8.36	\$5.47	\$7.02	\$8.30			\$7.66	\$5.81
Systemic Antifungal Costs	\$107,827	\$245,851	\$130,647	\$111,452	\$34,671	\$32,799			\$67,469	\$41,955
Systemic Antifungal Costs/Patient Day	\$5.44	\$9.42	\$4.93	\$3.02	\$4.97	\$4.66			\$4.81	\$2.26
Patient Care Outcomes										
Hospital-Acquired C. difficile Cases (rate per 1,000 patient days)	15 (0.76)	16 (0.61)	15 (0.68)	14 (0.6)	1 (0.14)	1 (0.14)			2 (0.16)	5 (0.27)

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs; non-systemic antimicrobials and antivirals are excluded.

Data Sources: Antimicrobial DDD and Costs (Centricity). *An error in DDD calculation for Pip-tazo was detected in Q3 2013; all historical data prior to this was rerun, resulting in minor changes to antibacterial DDDs.

Toronto Western Hospital: General Internal Medicine

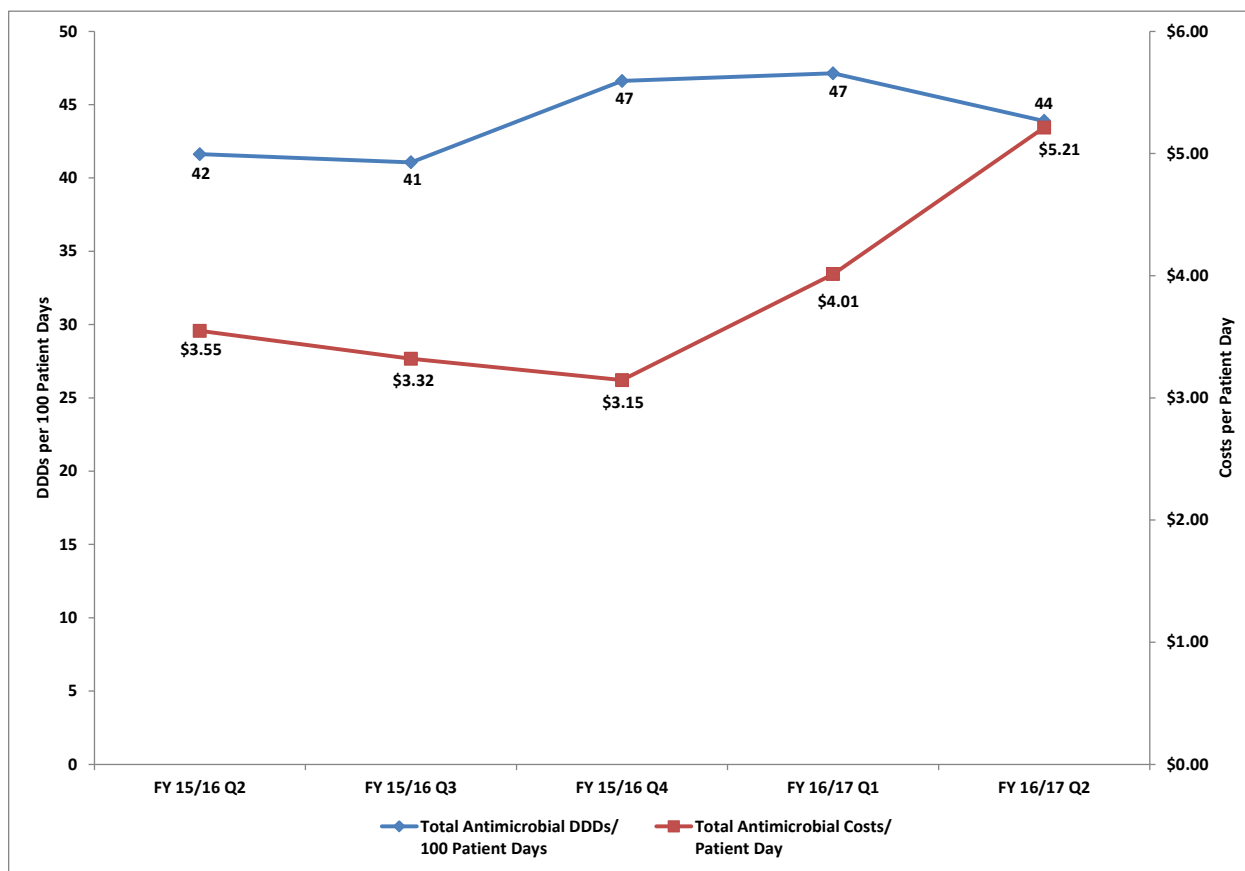
FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) increased (↑) by 3.1% compared to YTD last year.
- Antimicrobial costs per patient day increased (↑) by 35.0% compared to YTD last year.
- Antibacterial costs per patient day decreased (↓) by 4.0% compared to YTD last year.
- Antifungal costs per patient day increased (↑) by 3,663.2% compared to YTD last year*.

NB: Usage data calculated for patients admitted to primary GIM units at TWH.

*In July and August there was significant use of Amphotericin B liposomal in 2 patients.

Toronto Western Hospital: General Internal Medicine Antimicrobial Consumption and Costs Per Patient Day



To view **Appendix 2: General Internal Medicine FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 patient days) and Expenditures**, please click [here](#).

Table 15: Toronto Western Hospital: General Internal Medicine

Indicators	FY 12/13 (Q2-4)	FY 13/14	FY 14/15	FY 15/16	FY16/17 Performance					YTD of Previous Year
					Q1	Q2	Q3	Q4	YTD	
Antimicrobial Usage and Costs										
Total Antimicrobial DDDs/100 Patient Days	44	47	42	47	47	44			46	44
Systemic Antibacterial DDDs/100 Patient Days	41	44	40	42	44	41			43	42
Systemic Antifungal DDDs/100 Patient Days	3	3	3	6	3	3			3	2
Total Antimicrobial Costs	\$74,737	\$115,919	\$110,889	\$108,612	\$32,853	\$41,568			\$74,421	\$55,439
Total Antimicrobial Costs/Patient Day	\$4.36	\$5.01	\$3.32	\$3.32	\$4.01	\$5.21			\$4.60	\$3.41
Systemic Antibacterial Costs	\$60,999	\$93,779	\$103,080	\$105,744	\$26,872	\$25,503			\$52,376	\$54,850
Systemic Antibacterial Costs/Patient Day	\$3.56	\$4.05	\$3.09	\$3.23	\$3.28	\$3.20			\$3.24	\$3.37
Systemic Antifungal Costs	\$13,738	\$22,140	\$7,810	\$2,868	\$5,981	\$16,064			\$22,046	\$589
Systemic Antifungal Costs/Patient Day	\$0.80	\$0.96	\$0.23	\$0.09	\$0.73	\$2.01			\$1.36	\$0.04
Patient Care Outcomes										
Hospital-Acquired C. difficile Cases (rate per 1,000 patient days)	7 (0.41)	14 (0.6)	11 (0.33)	7 (0.21)	1 (0.12)	5 (0.63)			6 (0.37)	5 (0.31)

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs; non-systemic antimicrobials and antivirals are excluded.

Data Sources: Antimicrobial DDD and Costs (Centricity). *An error in DDD calculation for Pip-tazo was detected in Q3 2013; all historical data prior to this was rerun, resulting in minor changes to antibacterial DDDs.

Due to a calculation error in Centricity, Antifungal and Total DDD/100pt days for Q2and FYTD have been corrected.

IMMUNOCOMPROMISED HOST

Princess Margaret Cancer Centre: Leukemia Service

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) decreased (↓) by 4.5% compared to YTD last year.
- Antimicrobial costs per patient day decreased (↓) by 21.2% compared to YTD last year.
- Antibacterial costs per patient day decreased (↓) by 29.7% compared to YTD last year.
- Antifungal costs per patient day decreased (↓) by 17.8% compared to YTD last year.
- Due to an increase in allogeneic BMT patients being placed on the leukemia units, starting on September 12, 2016, Dr. Uday Deotare (and the allogeneic BMT team) are at ASP rounds every Monday.

Princess Margaret Cancer Centre: Leukemia Service Antimicrobial Consumption and Costs Per Patient Day

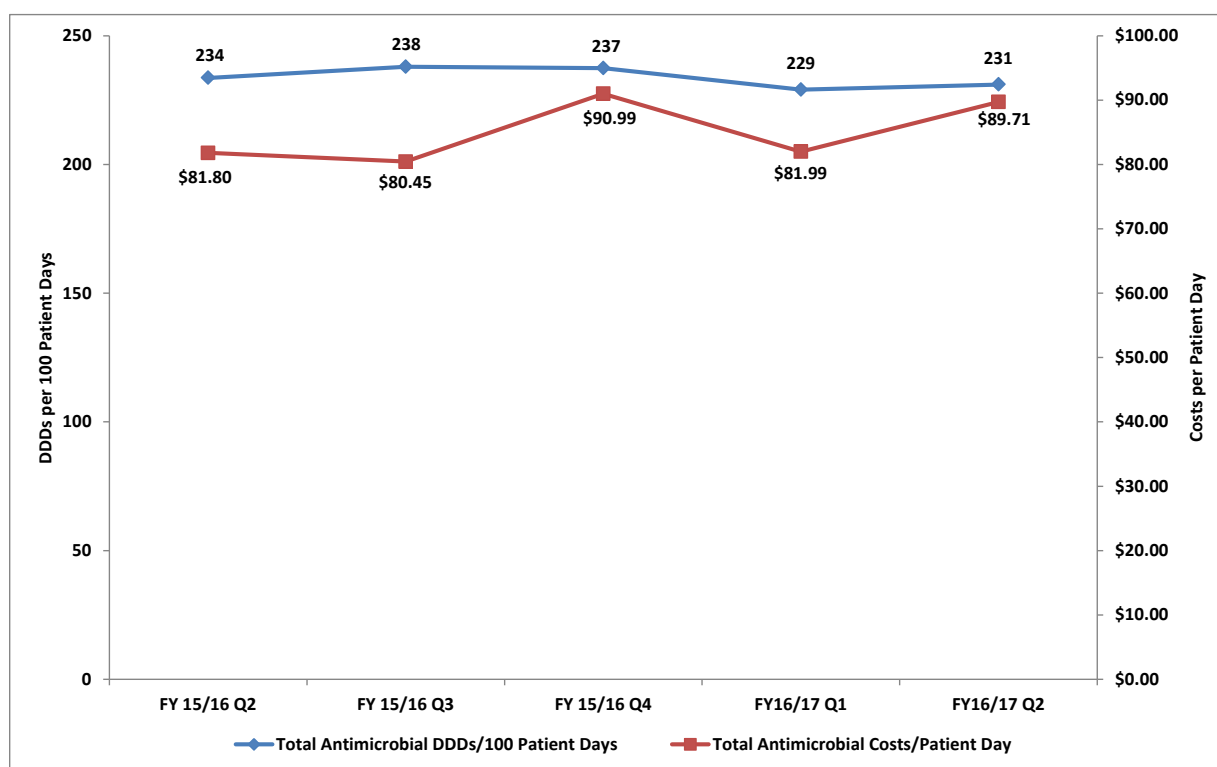


Table 16: Princess Margaret Cancer Centre: Leukemia Service

Indicators	FY16/17 Performance													
	FY 09/10	FY 10/11	FY 11/12	FY 12/13	FY 13/14	FY 14/15	FY 15/16	Q1	Q2	Q3	Q4	YTD	YTD of Previous Year	
Antimicrobial Usage and Costs														
Total Antimicrobial DDDs/100 Patient Days	295	270	239	250	255	244	239	229	231			230	241	
Systemic Antibacterial DDDs/100 Patient Days	191	163	134	146	138	136	138	134	133			134	140	
Systemic Antifungal DDDs/100 Patient Days	104	107	105	104	117	108	101	95	98			97	101	
Total Antimicrobial Costs	\$1,768,317	\$1,641,331	\$1,310,857	\$1,695,539	\$1,534,499	\$1,412,805	\$1,479,103	\$322,206	\$358,666			\$680,871	\$802,474	
Total Antimicrobial Costs/Patient Day	\$167.12	\$154.32	\$115.13	\$128.91	\$117.10	\$96.46	\$96.98	\$81.99	\$89.71			\$85.88	\$109.05	
Systemic Antibacterial Costs	\$659,034	\$609,747	\$663,175	\$422,438	\$485,263	\$471,597	\$403,399	\$88,244	\$86,349			\$174,593	\$230,610	
Systemic Antibacterial Costs/Patient Day	\$62.28	\$57.33	\$58.24	\$45.85	\$37.03	\$32.20	\$26.45	\$22.45	\$21.60			\$22.02	\$31.34	
Systemic Antifungal Costs	\$1,109,283	\$1,031,584	\$647,637	\$1,092,448	\$1,049,236	\$941,208	\$1,075,705	\$233,962	\$272,317			\$506,279	\$571,864	
Systemic Antifungal Costs/Patient Day	\$104.84	\$96.99	\$56.88	\$83.06	\$80.07	\$64.26	\$70.53	\$59.53	\$68.11			\$63.86	\$77.71	
Patient Care Outcomes														
Hospital-Acquired C. difficile Cases (rate per 1,000 patient days)	6 (0.56)	7 (0.65)	14 (1.17)	5 (0.51)	11 (0.84)	13 (0.89)	14 (0.92)	3 (0.76)	4 (1.00)			7 (0.88)	9 (1.22)	

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs; non-systemic antimicrobials and antivirals are excluded.
Data Sources: Antimicrobial DDD and Costs (Centricity). *An error in DDD calculation for Pip-tazo was detected in Q3 2013; all historical data prior to this was rerun, resulting in minor changes to antibacterial DDDs.

Table 17: Yeast Species Isolated in Blood – Princess Margaret Cancer Centre: Leukemia Service

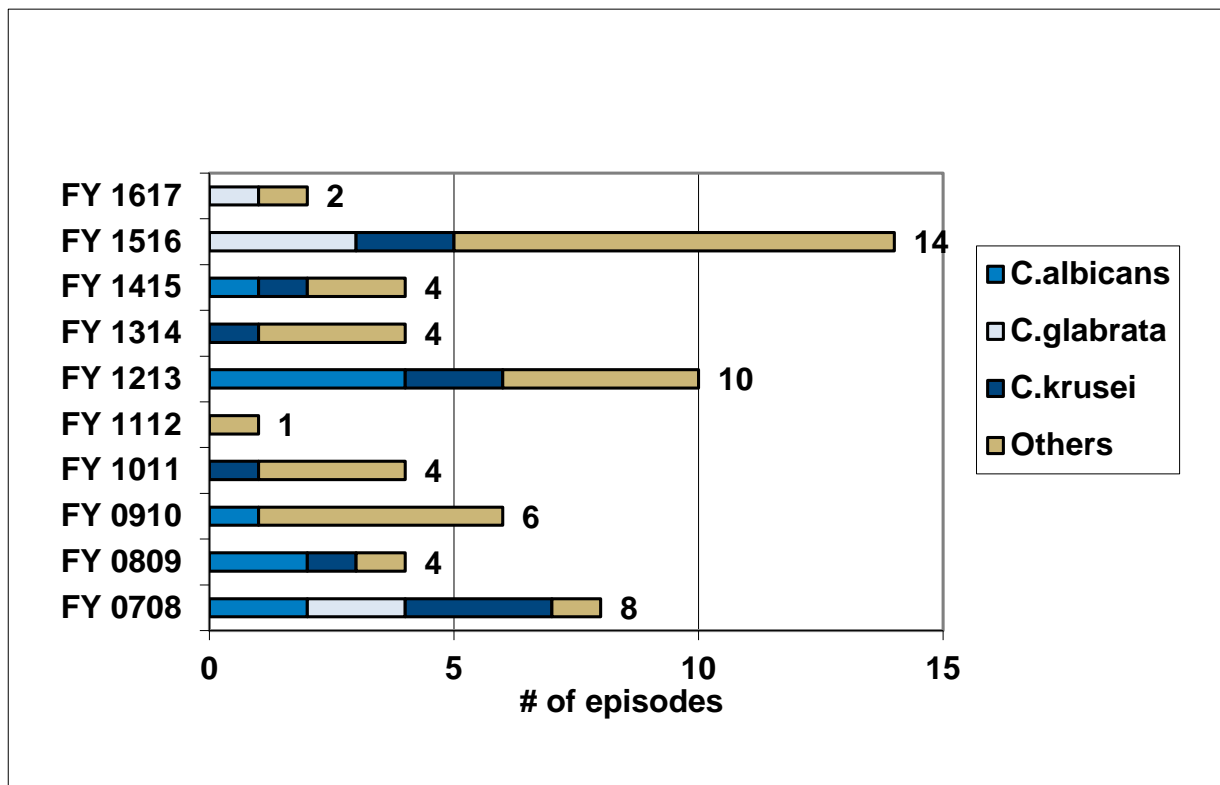
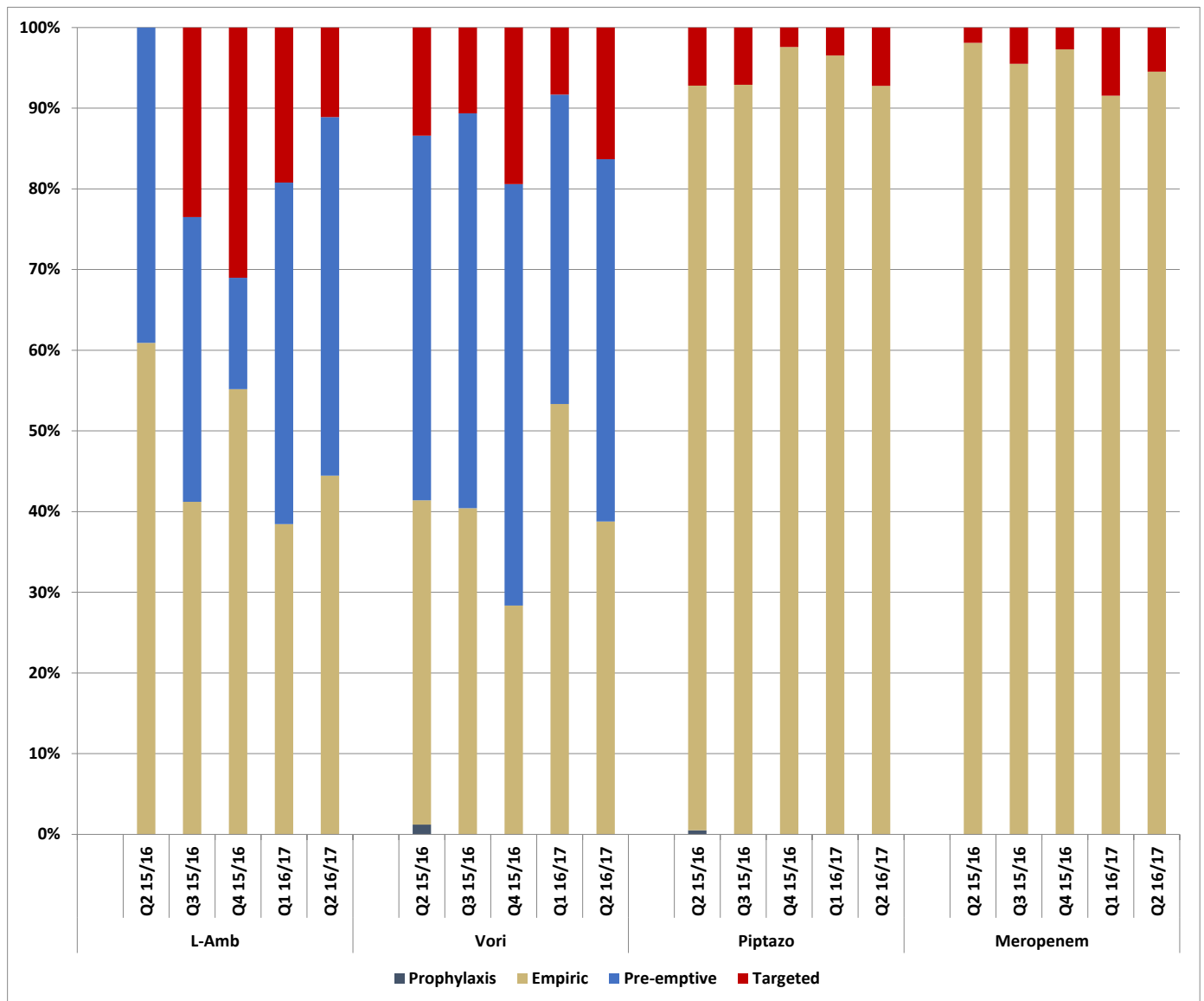
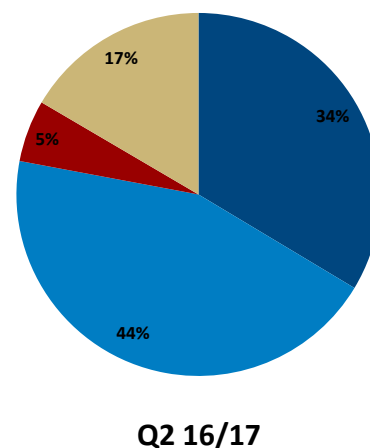
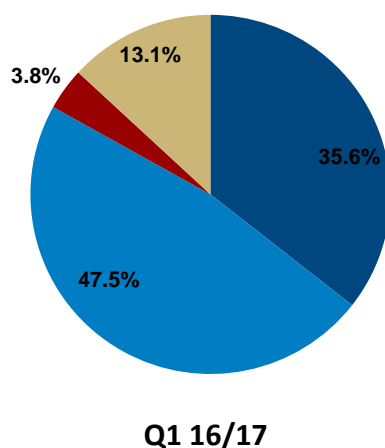
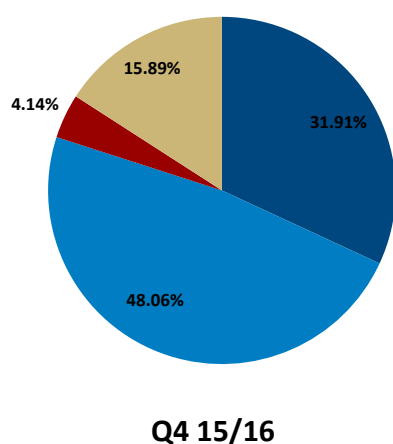
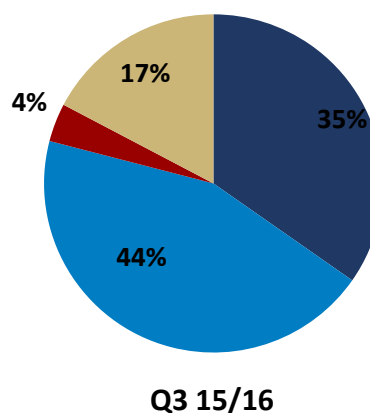
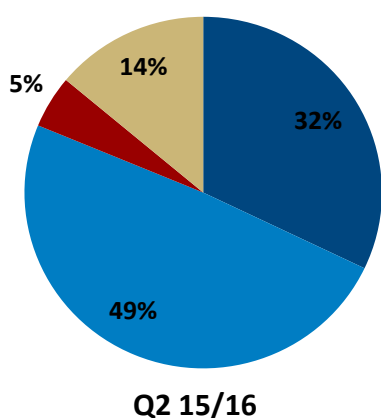


Table 18: Princess Margaret Cancer Centre: Indications for Select Antimicrobials Used in Febrile Neutropenia in Five Rolling Quarters: Q2-4 FY15/16 and Q1-2 FY16/17



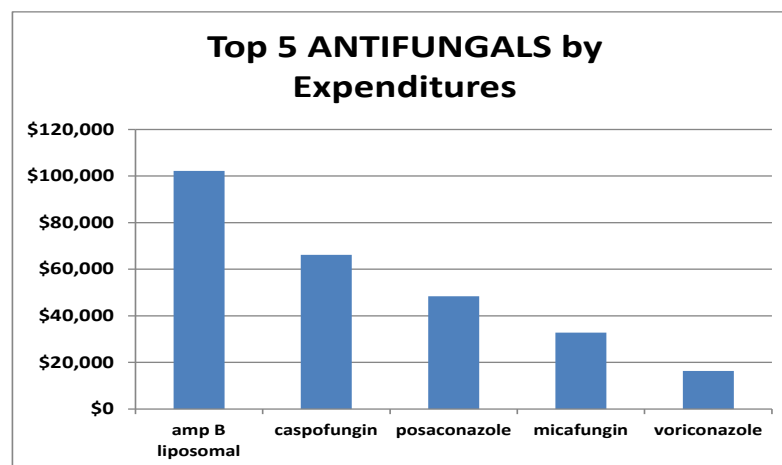
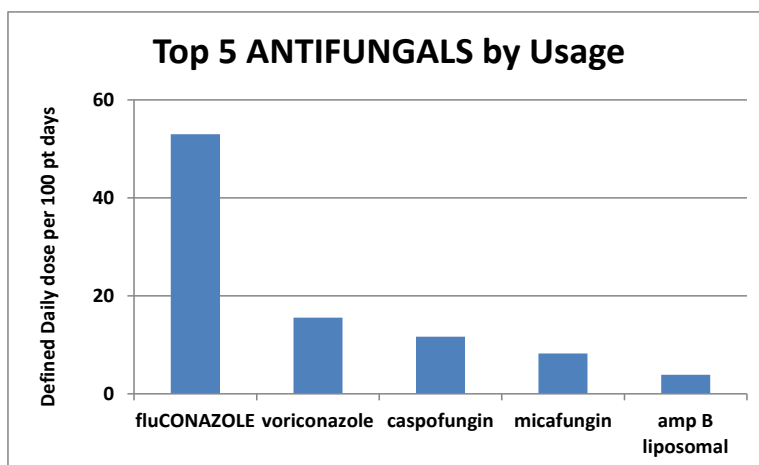
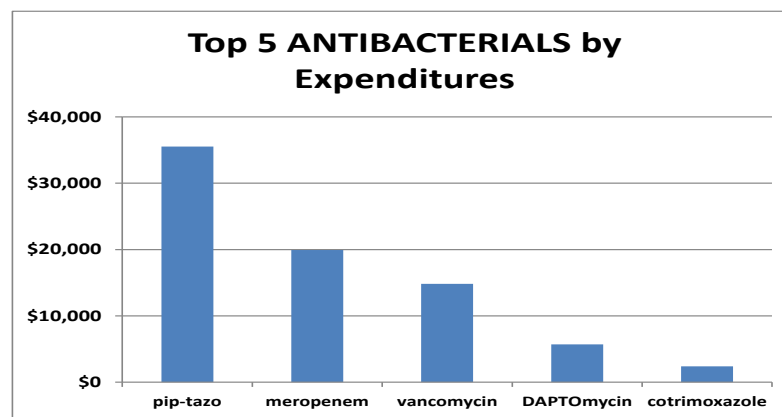
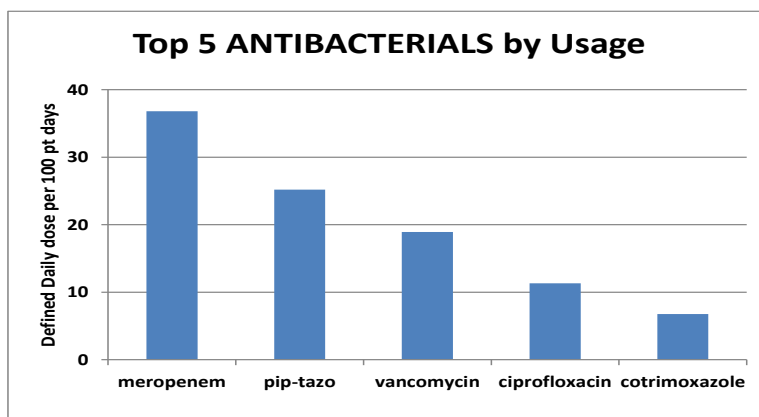
Princess Margaret Cancer Centre: Indications for All Antimicrobials in Five Rolling Quarters: 15/16 Q2-4 and 16/17 Q1-2

Prophylaxis
 Pre-emptive
 Empiric
 Targeted



Note: Drug indications were reported for leukemia patients only.

Table 19: Princess Margaret Cancer Centre: Leukemia FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 patient days) and Expenditures



Princess Margaret Cancer Centre: Allogeneic Bone Marrow Transplant

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) increased (↑) by 1.8% compared to YTD last year.
- Antimicrobial costs per patient day increased (↑) by 5.6% compared to YTD last year.
- Antibacterial costs per patient day decreased (↓) by 2.5% compared to YTD last year.
- Antifungal costs per patient day increased (↑) by 7.0% compared to YTD last year.

Princess Margaret Cancer Centre: Allogeneic Bone Marrow Transplant Antimicrobial Consumption and Costs Per Patient Day

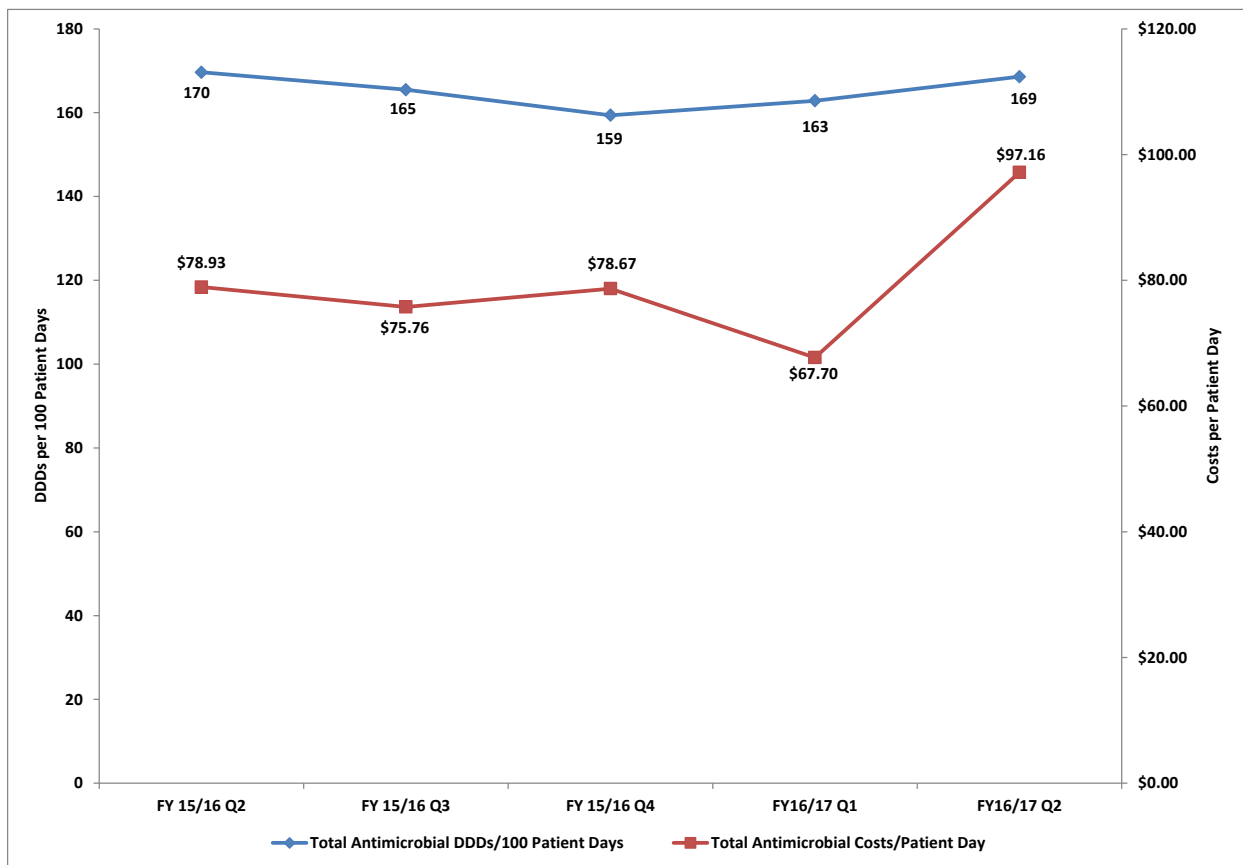


Table 20: Yeast Species Isolated in Blood – Princess Margaret Cancer Centre: Allogeneic Bone Marrow Transplant

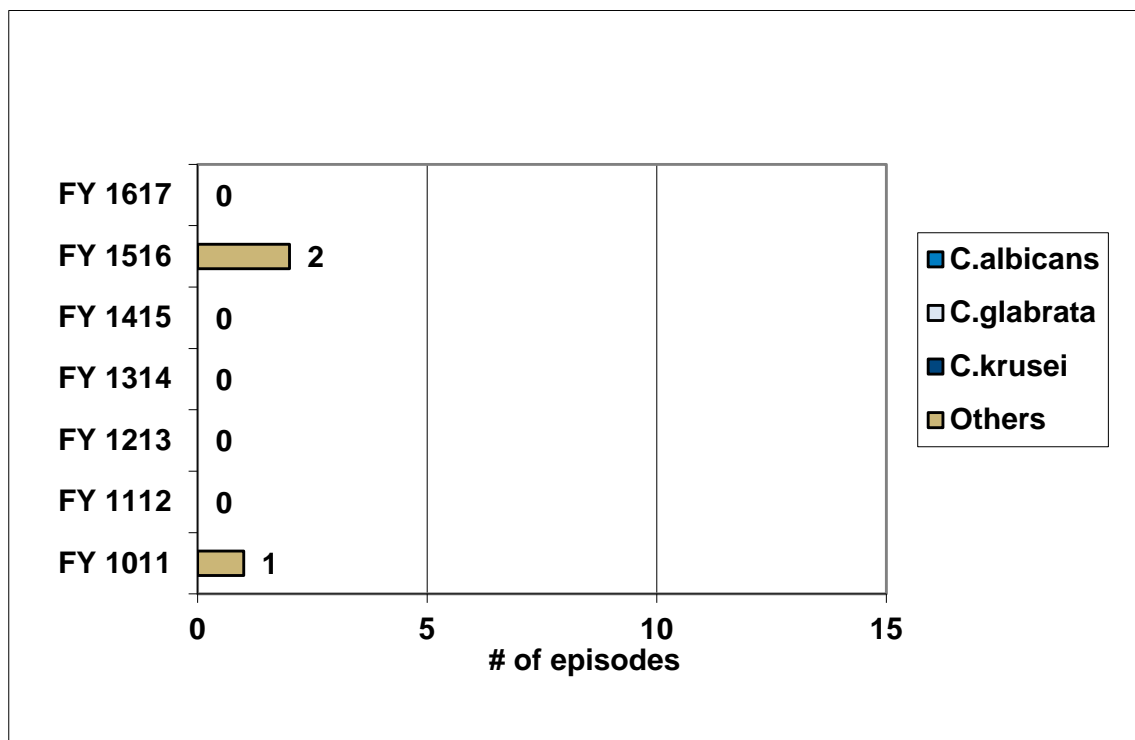


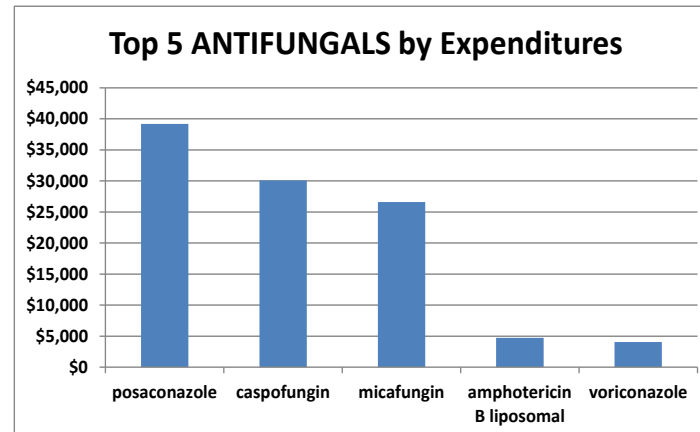
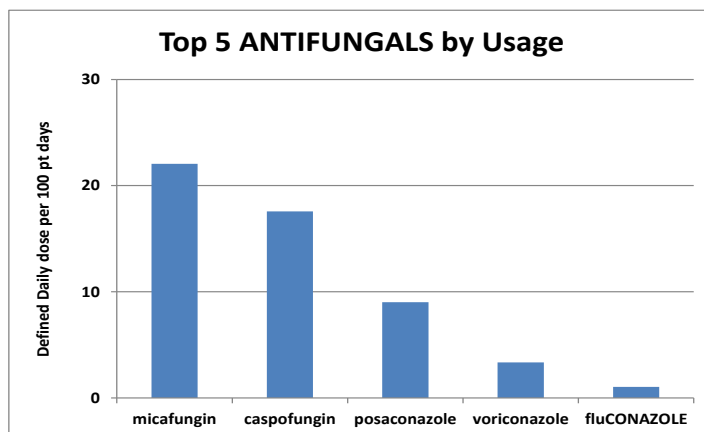
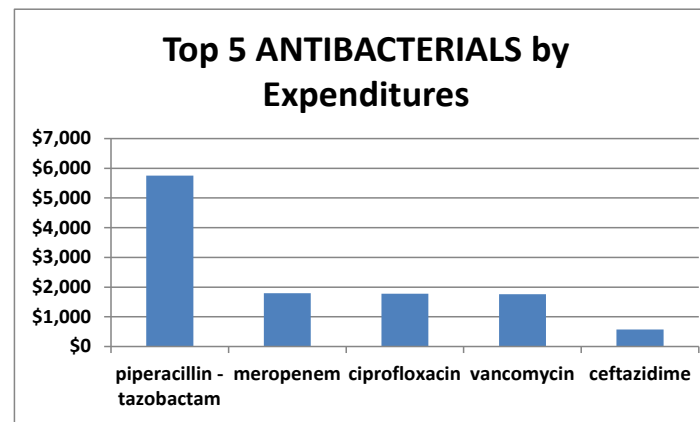
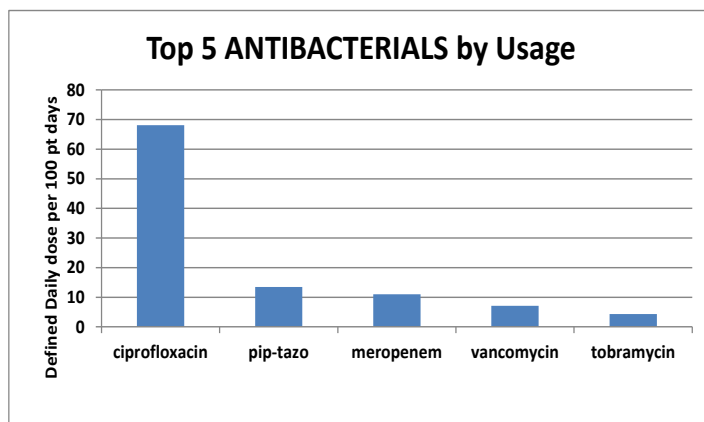
Table 21: Princess Margaret Cancer Centre: Allogeneic Bone Marrow Transplant

Indicators	FY 13/14	FY 14/15	FY 15/16	FY16/17 Performance					YTD of Previous Year
				Q1	Q2	Q3	Q4	YTD	
Antimicrobial Usage and Costs									
Total Antimicrobial DDDs/100 Patient Days	172	171	163	163	169			166	163
Systemic Antibacterial DDDs/100 Patient Days	114	104	107	121	115			118	107
Systemic Antifungal DDDs/100 Patient Days	59	67	56	42	54			48	56
Total Antimicrobial Costs	\$416,614	\$512,300	\$381,633	\$82,396	\$117,181			\$199,577	\$192,350
Total Antimicrobial Costs/Patient Day	\$85.65	\$106.13	\$77.62	\$67.70	\$97.16			\$82.37	\$78.03
Systemic Antibacterial Costs	\$75,219	\$78,038	\$60,088	\$15,066	\$12,535			\$27,601	\$28,812
Systemic Antibacterial Costs/Patient Day	\$15.46	\$16.17	\$12.22	\$12.38	\$10.39			\$11.39	\$11.69
Systemic Antifungal Costs	\$341,395	\$434,261	\$321,545	\$67,330	\$104,646			\$171,976	\$163,539
Systemic Antifungal Costs/Patient Day	\$70.19	\$89.97	\$65.39	\$55.32	\$86.77			\$70.98	\$66.34
Patient Care Outcomes									
Hospital-Acquired C. difficile Cases (rate per 1,000 patient days)	4 (0.82)	12 (2.49)	7 (1.42)	2 (1.64)	2 (1.66)			4 (1.65)	5 (2.03)

Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs; non-systemic antimicrobials and antivirals are excluded.

Data Sources: Antimicrobial DDD and Costs (Centricity). *An error in DDD calculation for Pip-tazo was detected in Q3 2013; all historical data prior to this was rerun, resulting in minor changes to antibacterial DDDs.

Table 22: Princess Margaret Cancer Centre: Allogeneic Bone Marrow Transplant 16/17 Q2 Top 5 Antimicrobials by Usage (DDD per 100 patient days) and Expenditures



Toronto General Hospital: Multi-Organ Transplant Program (MOTP)

FY 16/17 Q2 highlights include:

- Antimicrobial consumption (using defined daily doses (DDDs) per 100 patient days) increased (↑) by 1.4% compared to YTD last year.
- Antimicrobial costs per patient day increased (↑) by 15.2% compared to YTD last year.
- Antibacterial costs per patient day decreased (↓) by 2.5% compared to YTD last year.
- Antifungal costs per patient day increased (↑) by 36.7% compared to YTD last year*.

* Several cases of invasive candidiasis may explain the increase in antifungal cost.

Toronto General Hospital: Multi-Organ Transplant Program (MOTP) Antimicrobial Consumption and Costs Per Patient Day

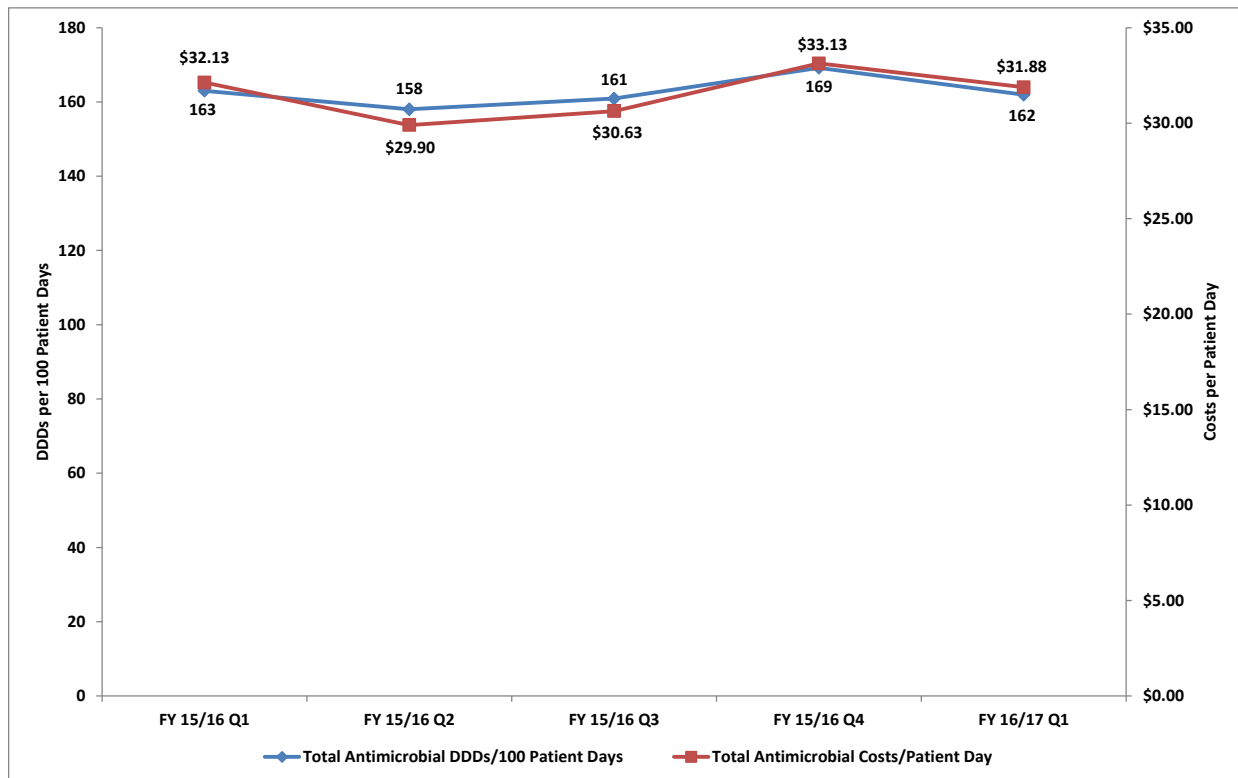


Table 23: Toronto General Hospital: Multi-Organ Transplant Program (MOTP)

Indicators	FY 13/14	FY 14/15	FY 15/16	FY16/17 Performance				YTD	YTD of Previous Year
				Q1	Q2	Q3	Q4		
Antimicrobial Usage and Costs									
Total Antimicrobial DDDs/100 Patient Days	136	143	211	162	165			163	161
Systemic Antibacterial DDDs/100 Patient Days	93	98	112	109	116			113	114
Systemic Antifungal DDDs/100 Patient Days	43	45	99	53	49			51	47
Total Antimicrobial Costs	\$837,263	\$725,411	\$709,892	\$221,447	\$282,753			\$504,200	\$348,803
Total Antimicrobial Costs/Patient Day	\$39.16	\$32.69	\$31.47	\$31.88	\$39.51			\$35.75	\$31.04
Systemic Antibacterial Costs	\$327,831	\$379,748	\$342,941	\$110,803	\$123,064			\$233,867	\$191,223
Systemic Antibacterial Costs/Patient Day	\$15.33	\$17.11	\$15.20	\$15.95	\$17.20			\$16.58	\$17.01
Systemic Antifungal Costs	\$509,433	\$345,664	\$366,951	\$110,644	\$159,689			\$270,333	\$157,580
Systemic Antifungal Costs/Patient Day	\$23.82	\$15.58	\$16.26	\$15.93	\$22.32			\$19.17	\$14.02
Patient Care Outcomes									
Hospital-Acquired C. Difficile Cases (rate per 1,000 patient days)	14 (0.65)	18 (0.81)	11 (0.49)	4 (0.58)	6 (0.84)			10 (0.71)	6 (0.53)

Due to a calculation error in Centricity, Antifungal and Total DDD/100pt days for Q1, Q2 and FYTD have been corrected.

BEST PRACTICE GUIDELINES AND ALGORITHMS

- Dr. Shahid Husain and Miranda So have completed the Draft ASP MOT Common Infections Management Guidelines For Solid Organ Transplant Patients. The guidelines will undergo consultative reviews by content experts in MOT and Transplant Infectious Diseases in the coming months.
- Dr. Shahid Husain and Miranda So began prospective audit and feedback rounds for the MOT units in November 2015 after consulting key stakeholders on their plan to implement antimicrobial stewardship interventions. Nurse Practitioners, clinical pharmacists, transplant infectious diseases fellows, and kidney transplant fellows are active participants at ASP rounds. Participants reported ASP rounds enhance their knowledge and decision making skills in antimicrobial use.
- The ASP-Allogeneic BMT Working Group was formed to update the antimicrobial prophylaxis guideline for allogeneic bone marrow transplant recipients, with support from Judy Costello, Dr. Andre Schuh, and Dr. Hans Messner. The working group will continue to meet to address any update as needed moving forward.
- Miranda So is the recipient of the Canadian Society of Hospital Pharmacists Ontario Branch Information Technology Award, for the interactive High-Risk Febrile Neutropenia Protocol and the Solid Tumor Febrile Neutropenia Protocol.
- Clinical summaries continue to be available on the [ASP website](#) and on [mobile device web browsers](#) for a series of common and important conditions. Whiteboard animation videos continue to be available on [our program's YouTube channel](#).
- The ASP collaborated with multiple key stakeholders across MSH and UHN on standardizing care related to the diagnosis and management of patients with *Clostridium Difficile* infection (CDI). The algorithm was launched and involved extensive consultation, development, and revision with interdisciplinary stakeholders. An e-learning module was developed, as well as electronic order sets to support the algorithm. The CDI algorithm was reformatted based on clinician and project stakeholders' feedback and can be found [here](#) on our ASP website. The revised formatting is based on Human Factors Engineering and will be easier to navigate and print for frontline clinicians.

RESEARCH

Multiple research projects continue, with many important projects nearing completion and being prepared for submission to key medical journals.

Publications

The following articles were published or accepted for publication in peer reviewed medical journals:

- Bai A, Showler A, Burry L, Steinberg M, Tomlinson G, Bell CM, Morris AM. Clinical prediction rules in *Staphylococcus aureus* bacteremia demonstrates the usefulness of reporting likelihood ratios in infectious diseases. *Eur J Clin Microbiol Infect Dis*. 2016 Sept. 35(9): 1393–1398
- Vallipuram J, Dhalla S, Bell CM, Dresser L, Han H, Husain S, Minden MD, Paul NS, So M, Steinberg M, Vallipuram M, Wong G, Morris AM. Chest CT Scans are Frequently Abnormal in Asymptomatic Patients with Newly Diagnosed Acute Myeloid Leukemia. *Leuk. Lymphoma*. 2016 Sept. Epub ahead of print. DOI: 10.1080/ 10428194. 2016. 1213825
- Hughes JS, Hurford A, Finley RL, Patrick DM, Wu J, Morris AM. Empiric therapy indices: novel measures of the impact of antibiotic resistance on populations. *BMJ Open*. 2016 Nov [in press].

There are currently an additional three manuscripts that have been submitted to medical journals and are undergoing peer review.

Abstracts

The following abstracts were presented at an international meeting by ASP team members:

- Valbuena V, Bai A, Showler A, Burry L, Steinberg M, Bell C, Morris AM. *Clinical Outcomes Of Staphylococcus aureus Bacteremia Following Introduction of Mandatory Infectious Disease Specialist Consultation: A Retrospective 12-month Study*. Poster presentation at ID Week 2016, Oct. 26-30, 2016. New Orleans, LA.
- Silverberg S, Jamal A, Zannella V, Damji A, Lee JA, Morris AM. *The Students for Antimicrobial Stewardship Society: A Novel, Grass-roots Educational Approach to Growing a Culture of Antimicrobial Stewardship*. Poster presentation at ID Week 2016, Oct. 26-30, 2016. New Orleans, LA.

Research Studies

The following grant-funded studies are progressing according to timelines:

- ASP-SUSTAIN: Building Capacity to Improve and Sustain Antimicrobial Stewardship Programs in ICUs. Canadian Institutes of Health Research, Knowledge to Action. Principal Investigators: Lianne Jeffs, Andrew Morris. Co-investigators: Chaim Bell, Madelyn Law, Jonathan Mitchell, Susan Straus
- FRAMING-LTC: Frailty and Recognizing Appropriate Medications IN Geriatrics and Long-Term Care. Technology Evaluation in the Elderly Network (CFN). Principal Investigator: Andrew Morris. Co-Investigators: Chaim Bell, Susan Bronskill, Colleen Maxwell, Lianne Jeffs

- Designing an Effective Outpatient Antimicrobial Stewardship Program to Reduce Unnecessary Antibiotic Use in Primary Care using a Mixed-Methods Collaborative Model. AHSC AFP Innovation Fund. Principal Investigators: Warren McIsaac, Andrew Morris. Co-investigators: Chaim Bell, Lianne Jeffs, Jeff Bloom, David Tannenbaum
- Development of an Antimicrobial Resistance Diversity Index (ARDI) to guide initiatives and investment in public health, antimicrobial stewardship and infection control. CIHR NSERC Grant. Principal Investigators: Jainhong Wu, Andrew Morris. Co-investigators: Troy Day, Amy Hurford, Allison McGeer, David Patrick, Gerry Wright.

In addition to these funded projects, multiple unfunded research projects continue, led by various members of the MSH-UHN ASP team.

EDUCATION

- As part of our General Internal Medicine (GIM) initiative, the ASP team has been providing ongoing education and support to GIM Pharmacists at both MSH and UHN. The ASP team provides education to physicians and medical trainees through several means, including ASP/ID case-based noon rounds, ASP pocket cards for medical trainees, and a mobile ASP web application (m.antimicrobialstewardship.com) to provide efficient access to resources.
- Twice a month the ASP team meets with all Nurse Practitioners from the Malignant Hematology programs for case rounds.
- The Leslie Dan Faculty of Pharmacy at the University of Toronto is the first institution to offer an elective in Antimicrobial Stewardship in the Entry-to-Practice Doctor of Pharmacy Curriculum. Miranda So (ASP Pharmacist) is the course coordinator, with contribution from other ASP team members.

PROVINCIAL ROLE

Expert Consultation

The ASP continues to provide expert advice and consultation to various hospitals throughout the province. We are currently assisting Huron Perth Healthcare Alliance (Clinton Public Hospital, St. Mary's Memorial Hospital, Seaforth Community Hospital, and Stratford General Hospital), and Alexandra Marine and General Hospital.

Our team has partnered with Public Health Ontario in hosting an Ontario Antimicrobial Stewardship Roundtable. This roundtable meeting included a cross-section of experts in antimicrobial stewardship, including primary care, long-term care, acute care, and perspectives from the Assistant Deputy Minister, Health Systems Quality and Funding, and Strategy and Policy Advisor and Infectious Disease Policy and Programs Sections. A follow-up meeting will have this group reconvene in Q3.

The ASP team has also been providing expert guidance to SASS (Students for Antimicrobial Stewardship Society) to create awareness and promote antimicrobial stewardship principles to the next generation of prescribers. SASS is now a national initiative, with chapters in eight medical schools and one pharmacy school.



NATIONAL ROLE

HealthCareCAN, Public Health Agency of Canada, and the National Collaborating Centre for Infectious Diseases

The SHS-UHN ASP has also been working closely with HealthCareCAN, the National Collaborating Centre for Infectious Diseases (NCCID), and the Public Health Agency of Canada (PHAC) to inform our national health leaders on Antimicrobial Stewardship and Resistance. The SHS-UHN ASP was on the steering and program committee for the Pan-Canadian Action Round Table, which took place in Toronto on June 16 and 17, 2016. The outcome of the Pan-Canadian Action Round Table led to the development of a National Action Plan on antimicrobial stewardship (AMS) with a focus on the human health context as part of a “One Health” approach. The Action Plan was circulated for review and comments by key influencers and stakeholders and will be finalized in Q3. A post-Action Round Table Steering Committee “AMS Canada” has been formed with SHS-UHN ASP team members included (Dr. Andrew Morris and Yoshiko Nakamachi).

United Nations General Assembly

On September 21, 2016, Dr. Andrew Morris was invited to New York to attend the 71st Session of the UN General Assembly to attend meetings on antimicrobial resistance. This was only the fourth time in the history of the UN that a health topic was discussed at the General Assembly. Heads of State and Heads of Delegations acknowledged and addressed the seriousness and scope of the situation, and member states agreed to commit efforts towards sustainable, multi-sectoral approaches to addressing antimicrobial resistance.

Accreditation Canada

The SHS-UHN ASP has partnered with Accreditation Canada to assist hospitals across Canada in setting up an ASP. The partnership involves the development and delivery of an on-line course and a series of interactive group webinars. This online course offering is in its second year.

HealthCareCAN CHA Learning

Our program has also partnered with CHA Learning, the professional development branch of HealthCareCAN, to develop materials for a course in change leadership in the healthcare setting.

Public Health Agency of Canada

Dr. Andrew Morris is an invited member of EAGAR (Expert Advisory Group on Antimicrobial Resistance), chaired by the Federal Chief Medical Officer of Health, Dr. Gregory Taylor.

Antimicrobial Resistance (AMR) Federal, Provincial, Territorial (F/P/T) Task Group

Yoshiko Nakamachi is an official member of the AMR Stewardship Task Group, which provides F/P/T advice and recommendations on priority human health activities in health care, community, agriculture settings.

Association of Medical Microbiology and Infectious Diseases Canada

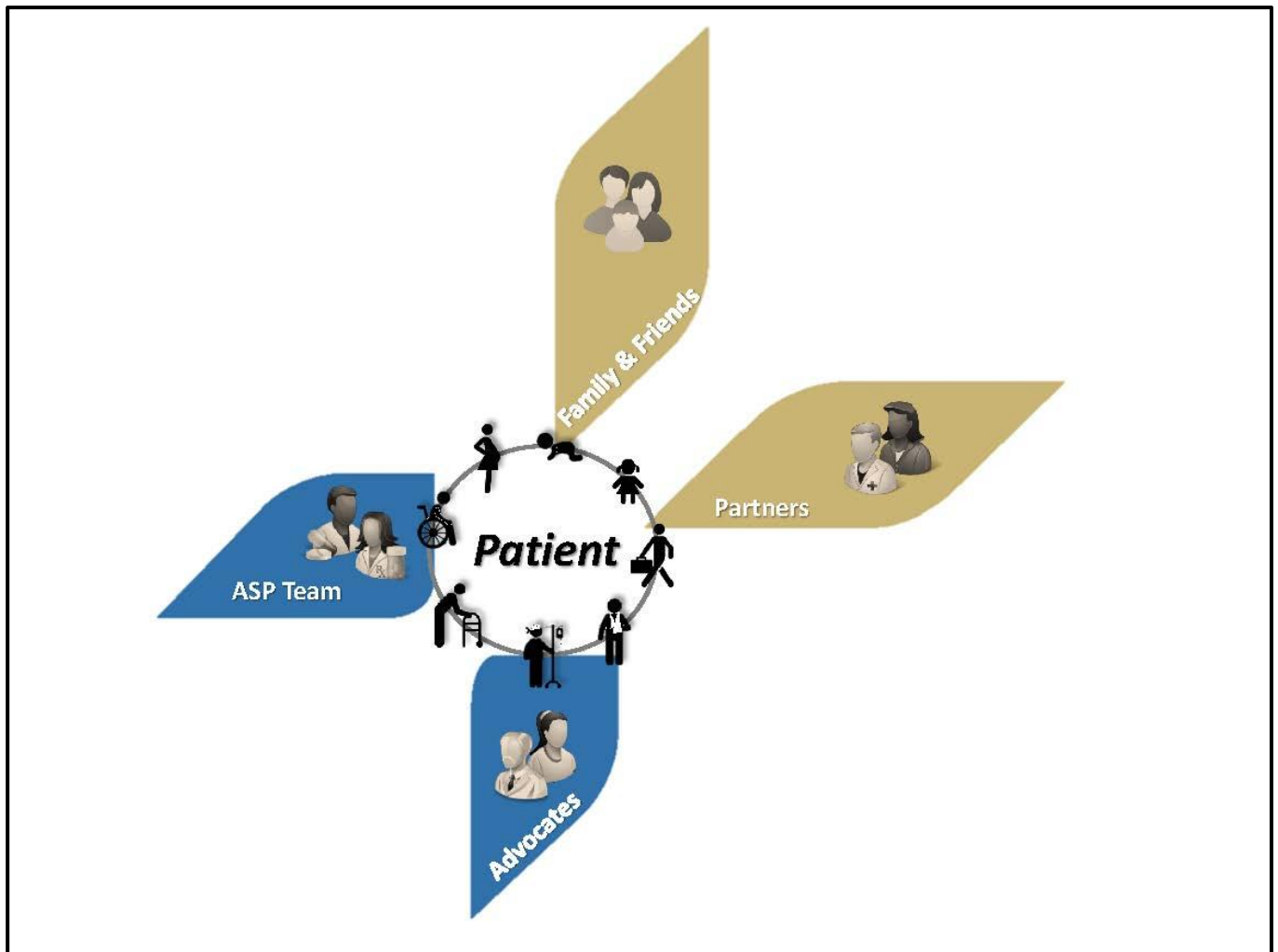
Dr. Andrew Morris is the chair of AMMI Canada's Antimicrobial Stewardship and Resistance Committee. Dr. Linda Dresser is a pharmacist member of this committee.

ASP Rotations at SHS and UHN

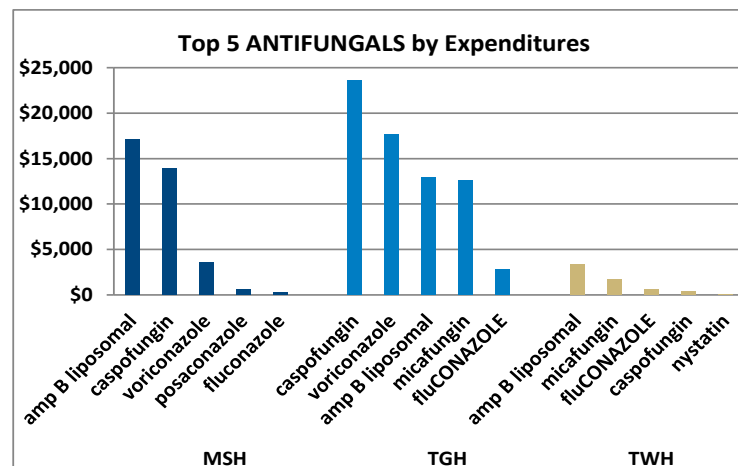
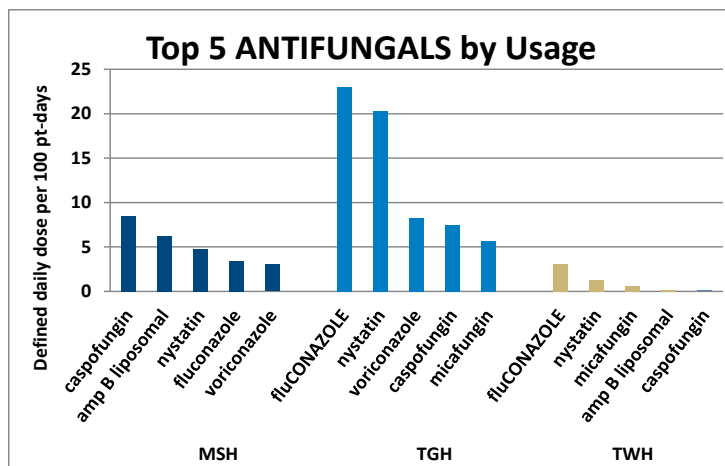
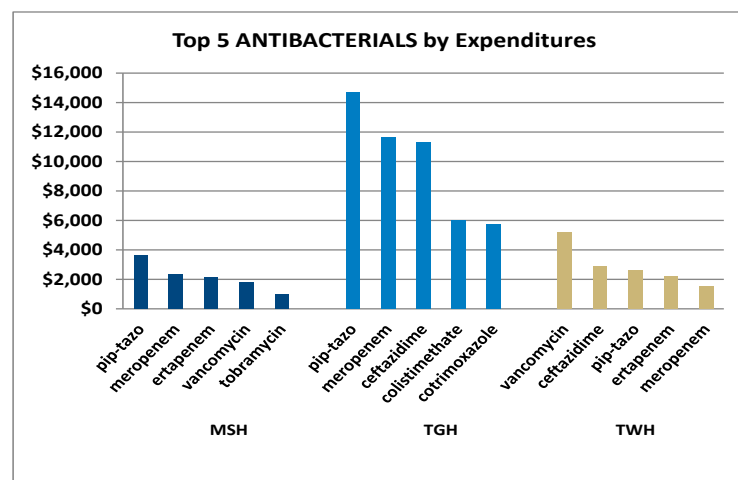
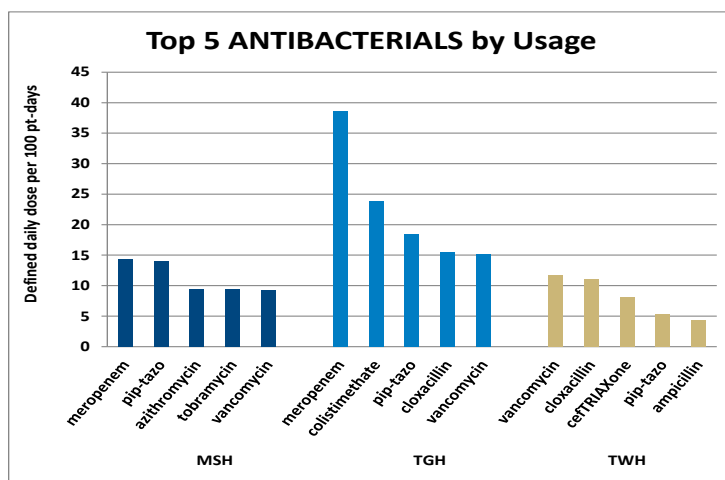
The SHS-UHN ASP continues to provide ASP rotations for residents and fellows from across the country and internationally.

STRATEGIC PLANNING

The ASP team developed the SHS-UHN ASP Strategic Plan 2016-2019. Please contact Yoshiko Nakamachi (Yoshiko.Nakamachi@uhn.ca) if you would like a copy.



Appendix 1: FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 Patient Days) and Expenditures by ICU Site



Appendix 2: General Internal Medicine FY 16/17 Q2 Top 5 Antimicrobials by Usage (DDDs per 100 patient days) and Expenditures

