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Antimicrobial Stewardship

Annual Report 2017-2018

Prepared by the Fraser Health Antimicrobial Stewardship Program

July 2018

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Executive Summary

The Fraser Health Antimicrobial Stewardship Program (ASP) is a small but highly skilled team. We work closely with other clinical staff members who are already championing antimicrobial stewardship on the front line. We have continued to grow as a program, currently comprised of five specialized pharmacists and one Infectious Diseases consultant.

Our purpose is to promote appropriate antimicrobial use within Fraser Health. To accomplish this, we have set three goals which guide all of our program activities: to optimize patient care through appropriate antimicrobial use, to slow the emergence of antimicrobial resistance, and to improve health care efficiency. These goals are consistent with the patient safety mandate to minimize preventable harm to patients.

With our team of ASP clinicians, we are routinely reviewing patient cases involving targeted antibiotics and interacting with prescribers in a systematic fashion at multiple acute care sites. Over the past year, our team has reviewed 10,434 patient cases and made specialized clinical interventions in 3,191 patient cases. Our recommendations were accepted in 90% of cases.

We have continued to expand our FH specific ASP Handbook, which is a consolidated, evidence-based reference for treatment of common infections. This year we have released chapters to support and guide clinicians in management of skin and soft tissue infections, diabetic foot infections, intra-abdominal infections, hospital-acquired pneumonia, and ventilator-associated pneumonia. Our guidance for community-acquired pneumonia was also updated.

The ASP is involved in development and revision of pre-printed order sets that include antimicrobials. Pre-printed orders (PPO) help standardize care across Fraser Health in line with best practices. This year, we revised the community-acquired pneumonia PPO to reflect our updated ASP Handbook guidance and user feedback from last year. We developed antimicrobial treatment recommendations for sepsis in the emergency department pre-printed orders. We are also collaborating with multiple clinical groups on updating antimicrobial prophylaxis recommendations on peri-operative order sets.

Our program's activities have shown a positive impact on antimicrobial usage trends. Usage of our targeted restricted antimicrobials (carbapenems, linezolid, daptomycin) has been reduced. Usage of fluoroquinolones has also dropped, and we have concurrently seen the lowest *C. difficile* infection rates in over a decade.

Improving health care efficiency is one of our three goals to ensure taxpayer money is used wisely and effectively. Fraser Health has seen a \$384,370 reduction in antimicrobial expenditure in FY2017-18 compared to FY2016-17 – a 4.2% reduction.

Our first ever satisfaction survey showed positive responses from Fraser Health leadership, pharmacists, and medical staff towards the ASP. Excellent feedback was also captured to assist the ASP going forward.

This report provides further details on our program's initiatives, as well as the various performance measures we follow. We've learned a great deal from our clinicians and staff, and have been tremendously fortunate to have such broad support. We look forward to any comments or questions regarding this report. As we strive to use antimicrobials wisely in today's patients, we hope to prolong their effectiveness for tomorrow's patients.

Background

The rise of antimicrobial resistance is a significant threat to patient care and public health. An estimated 18,000 Canadians every year develop drug-resistant infections within our hospitals.¹ The emergence of antimicrobial resistance impacts patient morbidity and mortality, leading to increased healthcare costs. Major problems include the rise of methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus faecium* (VRE), and multidrug-resistant gram-negative organisms, including *Pseudomonas*, *Acinetobacter*, and carbapenem-resistant Enterobacteriaceae (CRE). Unchecked, mortality attributable to antimicrobial resistance is estimated to increase to over 300,000 annually in North America by 2050.²

Concurrently, the healthcare system has had to manage the rise of *Clostridium difficile* infection (CDI). Concerted efforts at reducing CDI include improving infection prevention and control practices, as well as promoting appropriate use and selection of antimicrobials through an antimicrobial stewardship program (ASP).

ASP has been shown to improve antimicrobial usage, improving the quality of patient care through more appropriate selection and dosing of antimicrobials. Patient safety is also improved through reduced toxicity and adverse events from antimicrobial misuse. Institution of an effective ASP can decrease CDI, as well as put downward pressure on the rise of antimicrobial resistance. Furthermore, all of these benefits can be realized while saving the healthcare system money.

The ASP purpose and goals are as follows:

Purpose:

The ASP promotes appropriate use of antimicrobials within Fraser Health (FH).

Goals:

The goals of the program are threefold:

- a. To optimize patient care through appropriate selection and use of antimicrobials, while minimizing adverse events
- b. To slow the emergence of antimicrobial resistance by limiting selection pressure from antimicrobial misuse
- c. To improve health care efficiency by reducing unnecessary antimicrobial use

¹ Public Health Agency of Canada. Antimicrobial resistance and use in Canada: A federal framework for action. Can Commun Dis Rep. 2014;40 Suppl 2:2-5.

² Review on Antimicrobial Resistance. Antimicrobial resistance: tackling a crisis for the health and wealth of nations. 2014. Available from <http://amr-review.org/Publications>.

ASP Team Members

Clinical Team

The clinical team conducts the daily activities of the ASP. This includes performing audit and feedback of antimicrobial prescribing, providing education for clinicians, undertaking quality improvement initiatives, and liaising with stakeholders and leaders across the health authority.

Members of the clinical team include:

Dr. Kevin Afra	<i>ASP Medical Director & ID Consultant</i>
Dr. Vivian Leung	<i>Pharmacy Coordinator, Antimicrobial Stewardship</i>
Dr. Colin Lee	<i>Interim Pharmacy Coordinator, Antimicrobial Stewardship</i>
Dr. Ivy Chow	<i>Clinical Pharmacy Specialist, Antimicrobial Stewardship</i>
Dr. Tim Leung	<i>Clinical Pharmacy Specialist, Antimicrobial Stewardship</i>
Dr. Kieran Shah	<i>Clinical Pharmacy Specialist, Antimicrobial Stewardship</i>
Dr. Maggie Wong	<i>Clinical Pharmacy Specialist, Antimicrobial Stewardship</i>

Note: An equivalent of 1.5 FTE of ASP staff were away during FY2018.

Administrative support for the program is provided by Julie Reynolds.

Executive Oversight

Dr. Kevin Afra, medical director of the ASP, is accountable to Linda Dempster (VP Patient Experience) and Dr. Roy Morton (VP Medicine) who provide executive-level guidance and oversight for the program. They also inform the Fraser Health Executive, the Board of Directors, and provincial stakeholders on the status of the ASP.

Drs. Vivian Leung and Colin Lee (Interim Pharmacy Coordinator) are accountable to Dr. Adil Virani (Manager, Pharmacy Services), who reports to Spencer Tuttle (Director, Pharmacy Services).

Regional ASP Committee

The Regional ASP Committee is an inter-disciplinary group of clinicians and leaders within the health authority. The Committee discusses, develops, promotes, and evaluates strategies utilized by the ASP to meet its program goals.

Members of the Regional ASP Committee include:

Dr. Kevin Afra (chair)	<i>ASP Medical Director & ID Consultant</i>
Dr. Yasemin Arikan	<i>ID Consultant, RCH</i>
Wendy Bowles	<i>NP & Regional Department Head, Nurse Practitioners</i>
Dr. Elizabeth Brodtkin	<i>Executive Medical Director, Infection Control & MHO</i>
Dr. Michael Chapman	<i>ID Division Head & ID Consultant, SMH</i>
Dr. John Diggle	<i>Regional Department Head, Medicine</i>
Dr. Colin Lee	<i>ASP Interim Pharmacy Coordinator</i>
Dr. Vivian Leung	<i>ASP Pharmacy Coordinator</i>
Dr. Shazia Masud	<i>Medical Microbiologist</i>
Dr. Neil Mina	<i>Medical Microbiologist</i>
Dr. Laurenna Peters	<i>ID Consultant, BH</i>
Julie Reynolds	<i>Administrative Assistant</i>
Dr. Steven Reynolds	<i>Program Medical Director, Critical Care</i>
Dr. Adil Virani	<i>Manager, Pharmacy Services</i>
Dr. Vandad Yousefi	<i>Regional Department Head, Hospitalists</i>

Acknowledgements

The ASP would like to thank the countless individuals who have supported our program. We have been encouraged by our growing collaboration with the FH Executive Team, Site Medical Directors, and Site Executive Directors. We are fortunate to enjoy a strong partnership with Pharmacy Services. It is a privilege to support our front-line Physicians, Nurse Practitioners, and Pharmacists as we strive towards excellence in patient care.

Our special thanks also goes to:

- Regional ASP Committee members who have moved on or changed to ad hoc roles: Sarah Derman, Dr. Sayeeda Hudani, Dr. Anurag Markanday.
- Division of Infectious Diseases
- Medical Microbiology
- Infection Prevention and Control
- Medication Use and Evaluation Team (Elissa Aeng, Dr. Angus Kinkade and Dr. Aaron Tejani)
- Our colleagues from other antimicrobial stewardship programs, including the Antimicrobial Stewardship Programs of Providence Health Care and Vancouver Coastal Health.
- The Provincial Antimicrobial Stewardship Clinical Expert Group (PACE)

Program Activities

Audit and Feedback

Prospective audit and feedback is one of the core activities of an ASP. It involves case-by-case assessment of antimicrobial use with direct feedback to the prescribing physician. Patients receiving targeted antimicrobials are identified prospectively. One of our team members will review the patient's medical record and investigation results to identify opportunities to optimize antimicrobial use, namely:

- Optimal drug (appropriate spectrum for identified infection and investigation results)
- Optimal dosing
- Optimal route (encouraging oral therapy when safe and appropriate)
- Optimal duration

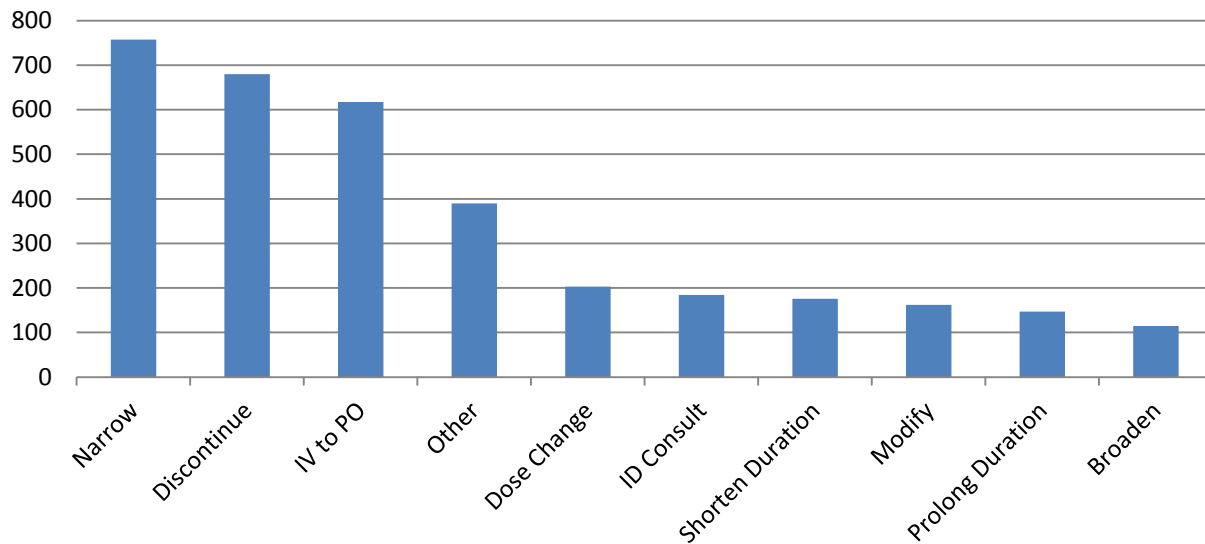
If an opportunity for optimization is identified, a note with our suggestions is left in the medical record. We also strive to discuss the case with the prescribing physician. Our audit and feedback service does not change medication orders without the express permission of the most responsible provider.

For fiscal years 2016-2017 and 2017-2018, our team performed the following:

Fiscal Year	Patient Cases Reviewed	Patient Cases Intervened Upon	Acceptance Rate
FY2017	6,241	3,173	82 %
FY2018	10,434	3,191	90 %

Beginning FY2018, we began to capture specific intervention data using a routine sampling methodology. A total of 3,431 interventions were captured for 2,589 patient cases (**Figure 1**).³

Figure 1. ASP audit and feedback interventions by type



³ A patient case may have had more than one concurrent intervention, e.g., narrowing therapy plus IV to PO step-down

Quality Improvement (QI) Projects

The ASP has become involved in a number of quality improvement projects in partnership with others throughout the Health Authority.

Community Acquired Pneumonia

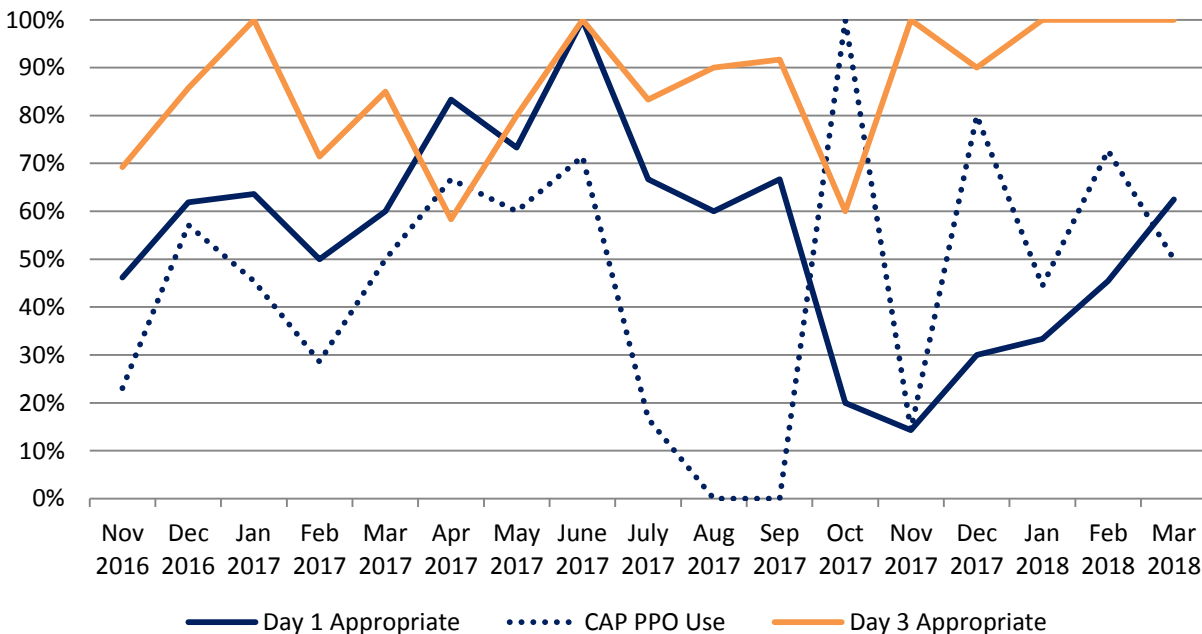
We have partnered with the Hospitalist group at BH for the past year to focus on antimicrobial prescribing for patients admitted with community acquired pneumonia. Our goal is to improve the appropriateness of antimicrobial prescribing at three time points:

1. Admission
2. Day 3, where many patients can switch to oral therapy.
3. Day 5, where many patients can have antibiotics discontinued.

The project encourages guideline-concordant therapy, improved communication, timely step-down to oral therapy, and appropriate durations of therapy. Feedback is provided to individual prescribers through prospective audit and feedback. Aggregate statistics are also shared with each group regularly.

Appropriateness of therapy on Day 1 increased from 60% at baseline to over 80% (**Figure 2**). A drop-off in Oct 2017 occurred when updated treatment guidance was released by the ASP. Day 1 appropriateness is once again trending upwards, as clinicians have become aware of the updated treatment guidance. Appropriateness of therapy on Day 3 is now nearly always at 100%.

Figure 2. Selected quality improvement metrics for community acquired pneumonia QI project



Similarly, Day 5 appropriateness has been at 100% since data collection started in Jan 2018.

Building on our efforts at BH, we are now proceeding with similar QI projects at ARH, MMH, and DH in collaboration with local clinical and administrative champions.

***Clostridium difficile* Infection**

We have been collaborating with Infection Prevention and Control and Pharmacy on a QI process to identify patients with *Clostridium difficile* infection (CDI) who may have guideline-discordant care. This

process will expedite involvement of Pharmacy or Infectious Diseases specialists in patient care. Our goal is to improve the treatment of patients with *Clostridium difficile* infection, which also reduces the risks of transmission to other vulnerable patients.

We developed an algorithm for Infection Prevention and Control Practitioners to identify patients who would benefit from escalation to Pharmacy for review. A pilot phase at three hospitals ran from April to August 2017. Treatment for CDI trended towards higher appropriateness at pilot sites, but due to small numbers this was not statistically significant.

In early 2018, the Infectious Diseases Society of America released new treatment guidelines for CDI. In combination with learnings from our pilot project, a second iteration of the CDI QI process is now being undertaken. A more direct link between Infection Prevention and Control Practitioners and the ASP team members is being developed to more rapidly review guideline-discordant cases. Another evaluation of this revised process is planned during FY2019. The CDI PPO is also being revised to further support best-practices.

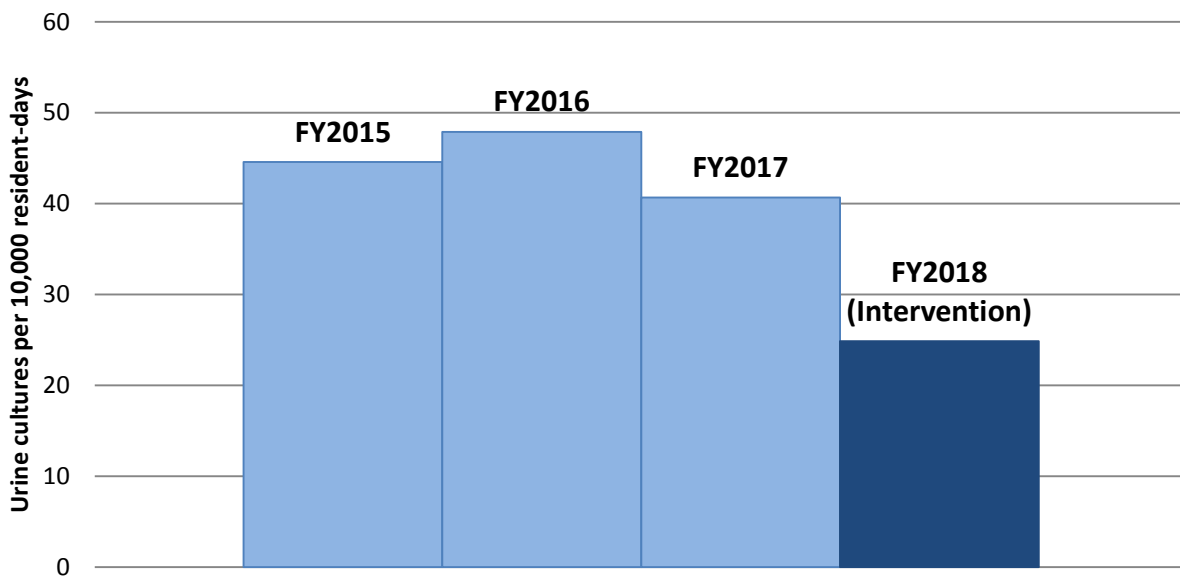
Urinary Tract Infection in Residential Care

In an effort to expand the role of ASP beyond acute care, we have partnered with Residential Care on a project targeting asymptomatic bacteriuria. Asymptomatic bacteriuria is common in residential care, and in the vast majority of cases antimicrobial therapy is unnecessary, may result in side effects, *Clostridium difficile* infection, or emergence of antimicrobial resistance.

Our working group has developed an algorithm to differentiate symptomatic from asymptomatic bacteriuria and guide appropriate collection of urine cultures. A form has been developed to standardize the clinical algorithm and aid communication between care staff and prescribers. Treatment recommendations for prescribers are provided in our ASP Handbook chapter on Urinary Tract Infections. Building on our positive experience with audit and feedback in acute care, a similar process is also being trialed with this QI project.

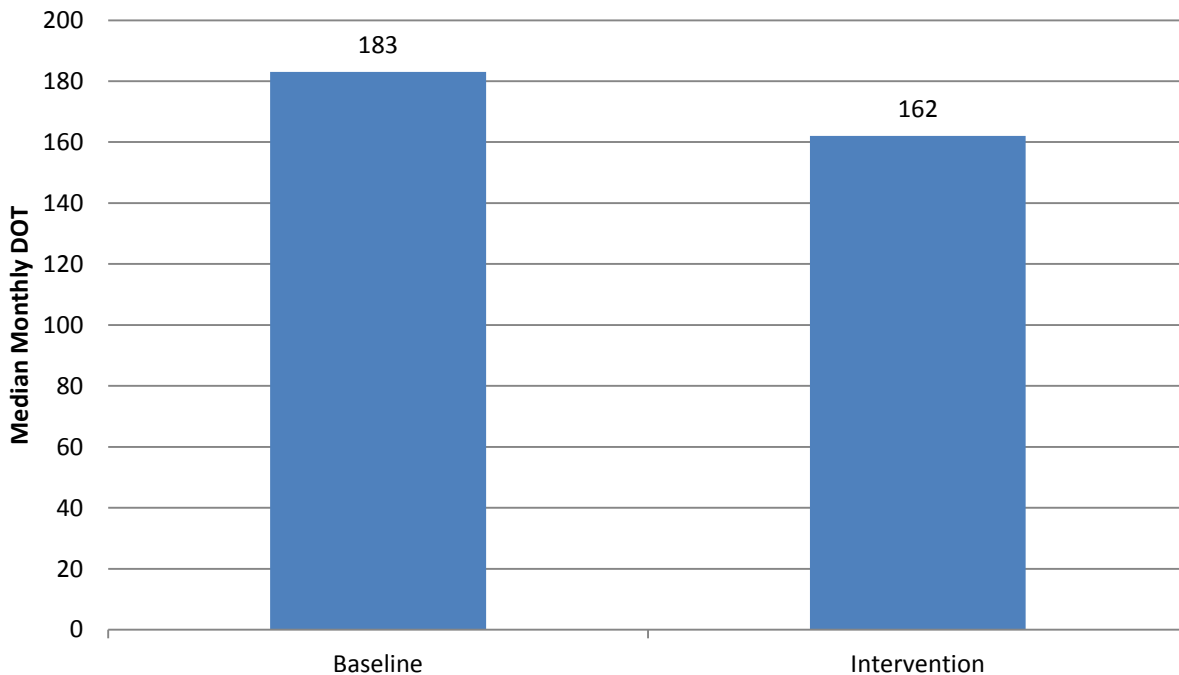
Phase 1 of this project has been successful. The number of urine cultures per 10,000 resident days at our pilot site was reduced by nearly 50% (**Figure 3**).

Figure 3. Urine cultures per 10,000 resident days at pilot site



Similarly, median monthly days of therapy (DOT) for common UTI antibiotics at the pilot site were reduced by over 10% (**Figure 4**).

Figure 4. Median monthly DOT for UTI antibiotics at pilot site



A second phase of the project is now underway, with expansion of the project to approximately 15 residential care sites. Evaluation of the second phase is planned in October 2018.

ASP Handbook

The ASP has created a Handbook to consolidate in a single reference our guidance on treatment of common infectious conditions and important antimicrobial use issues. This inter-disciplinary collaboration is created by the ASP in conjunction with the Regional ASP Committee, the Division of Infectious Diseases, Medical Microbiology, and our clinicians. The Handbook integrates best available medical literature, recommendations from professional organizations, regional antimicrobial resistance (our antibiogram), and regional formulary.

This fiscal year, we have continued to develop and publish content:

- Skin and soft tissue infections
- Diabetic foot infections
- Intra-abdominal infections
- Hospital-acquired pneumonia
- Ventilator-associated pneumonia

This adds to our previously released content on:

- Community-acquired pneumonia
- Aspiration pneumonia
- Inpatient sepsis
- Urinary tract infections
- Pediatric infections

- Vancomycin dosing and therapeutic monitoring

Multiple new chapters are planned for the coming fiscal year. Existing chapters will be reviewed annually for updates taking into account evolving practice standards, local antimicrobial resistance, and formulary.

ASP Website

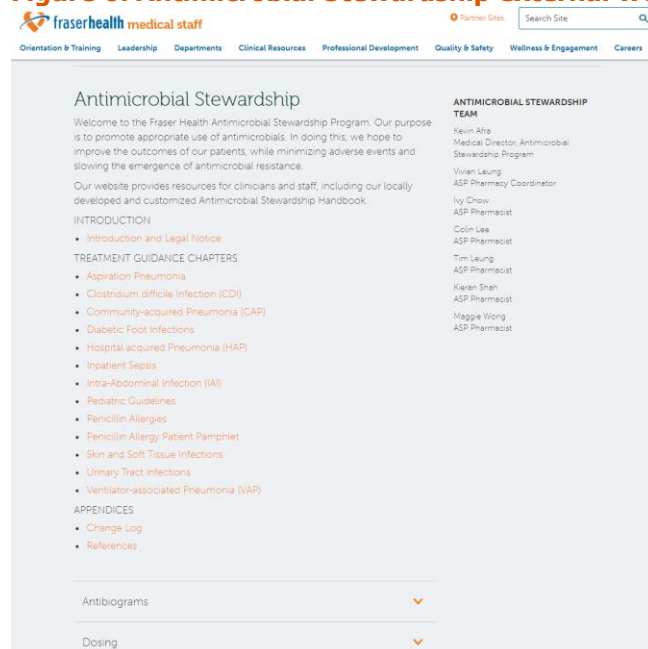
The ASP created a website on the Fraser Health intranet in order to improve visibility of our program and consolidate all our communication and reports in a single location (**Figure 5**). Our website includes our ASP Handbook, local antibiograms, our reports, and contact information for our clinical teams across the region.

Check out our internal website [here](#). In order to improve accessibility for clinicians, we have mirrored our content on the externally accessible Fraser Health Medical Staff website (**Figure 6**). Click [here](#) to take a look.

Figure 5. Antimicrobial Stewardship intranet website



Figure 6. Antimicrobial Stewardship external website



Pre-Printed Order Revisions

The ASP acts as a regional resource and reviewer for antimicrobials on pre-printed orders (PPO's) undergoing development or revision. Some of these are initiated by the ASP, while others are at the request of other clinical departments or divisions within the Fraser Health. We collaborate with representatives from relevant specialties and stakeholder groups to review the best available medical literature, recommendations from professional organizations, regional antimicrobial resistance, and local resource availability.

This fiscal year, we have been involved in revision/development of the following PPO's:

- Community Acquired Pneumonia
- Sepsis in the Emergency Department
- Pancreatic and Whipples Peri-operative
- Pediatric Orthopedic surgery peri-operative
- Hip-Knee arthroplasty peri-operative
- Spine Surgery peri-operative
- Craniotomy peri-operative
- Cardiac Surgery peri-operative
- Gynecologic surgery peri-operative
- Urologic surgery peri-operative
- Vascular surgery peri-operative

Program Satisfaction

The ASP is a unique clinical program in so far as the direct recipients of its services are other members of the health care team. Services are not generally provided directly to patients and families. The ASP works to support front-line medical staff and pharmacists use antimicrobials appropriately. Therefore, the ASP remains cognizant of the satisfaction of its direct users with ASP services.

The “Triple Aim” first developed by Berwick and colleagues in 2008 provided a framework of high value health care as three complementary goals: improving the individual experience of care, improving the health of populations, and reducing the per capital cost of health care.⁴ Sikka and colleagues expanded this to the “Quadruple Aim” in 2015 by adding a fourth goal: improving the experience of providing care.⁵ Clinicians who find joy and meaning in the work of health care are more likely to remain engaged and successful.

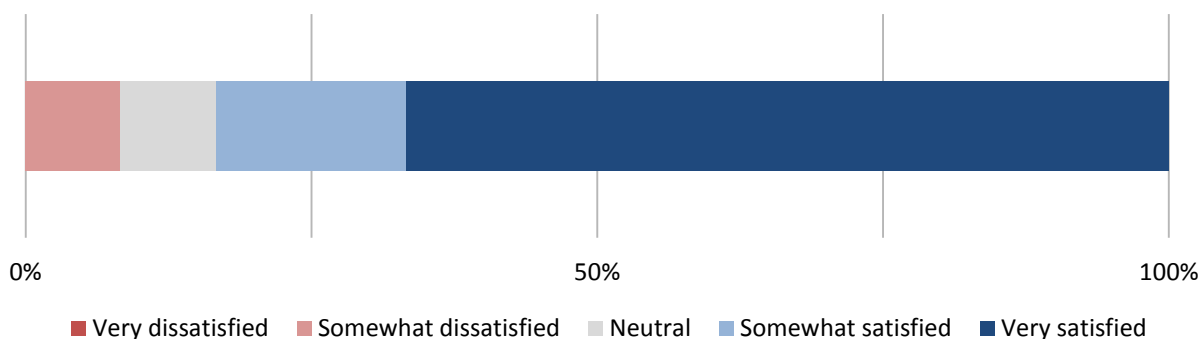
Receiving adequate support to meet work challenges is an important aspect of the fourth goal. The ASP works to support front-line staff, and thus improve the experience of providing care. In order to evaluate the extent to which this occurs, and ASP performed a satisfaction survey of its direct users and important stakeholders.

Two user satisfaction surveys were developed with the assistance of the Fraser Health Department of Evaluation and Research Services. One survey was targeted to Fraser Health administrative and clinical leadership. The second survey was targeted to front-line medical staff (physicians and nurse practitioners) and pharmacists. Both surveys were designed to collect satisfaction with the ASP as well as identify areas for improvement. Surveys were conducted in August 2017.

Fraser Health Leadership

The survey for administrative and clinical leadership received 12 responses (20% response rate). Overall satisfaction with the ASP was high (83% very or somewhat satisfied) – **Figure 7**.

Figure 7. ASP satisfaction amongst FH administrative and clinical leadership.



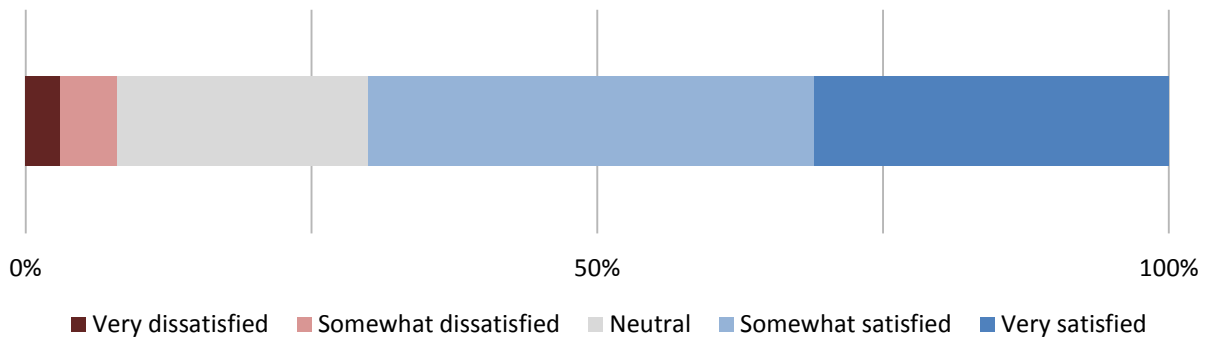
Fraser Health Medical Staff and Pharmacists

The survey for front-line medical staff and pharmacists received 136 responses. The majority of respondents (70%) were satisfied that the ASP had improved knowledge about antimicrobial prescribing and resistance – **Figure 8**.

⁴ Berwick DM et al. The triple aim: care, health, cost. *Health Aff* 2008;27:759.

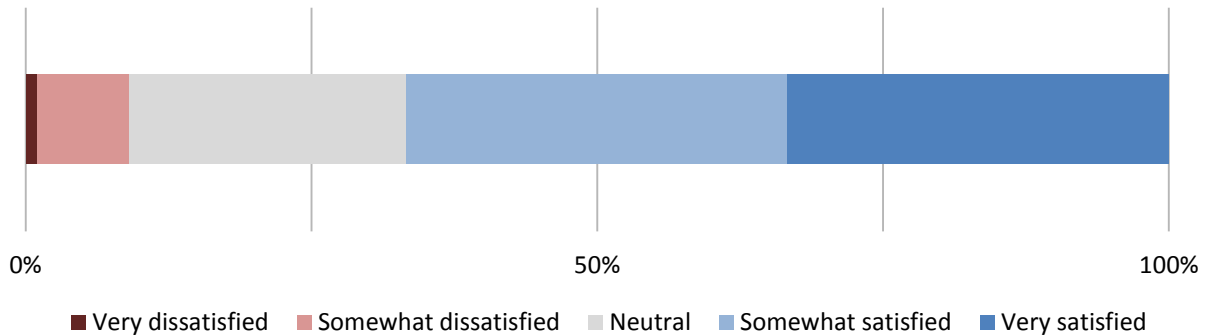
⁵ Sikka R et al. *BMJ Qual Saf* 2015;24:608.

Figure 8. Improved knowledge about antimicrobial prescribing and resistance amongst FH medical staff and pharmacists.



Overall satisfaction with the ASP was also high (67%) – **Figure 9.**

Figure 9. ASP satisfaction amongst FH medical staff and pharmacists.



Many aspects of the ASP were valued when asked about recently provided services in the last 6 months. Respondents appreciated collaboration and discussion around individual patient cases as part of the audit & feedback service. Resource materials were also highlighted, including the ASP Handbook, Antibigrams, and Spectrum App.

A number of common themes emerged when participants were asked about areas the ASP could improve. One theme was to expand ASP services by providing more regular and routine coverage. This was particularly the case at hospitals that had rotational ASP Pharmacist coverage one day every two weeks. This response is understandable due to the small size of the ASP, yet is encouraging to support further service expansion.

In summary, the surveys showed high levels of satisfaction with the ASP amongst both leaders and front-line staff. However, just as importantly, it has provided a valuable means of feedback to the ASP on how the program is perceived and service gaps that can continue to be improved.

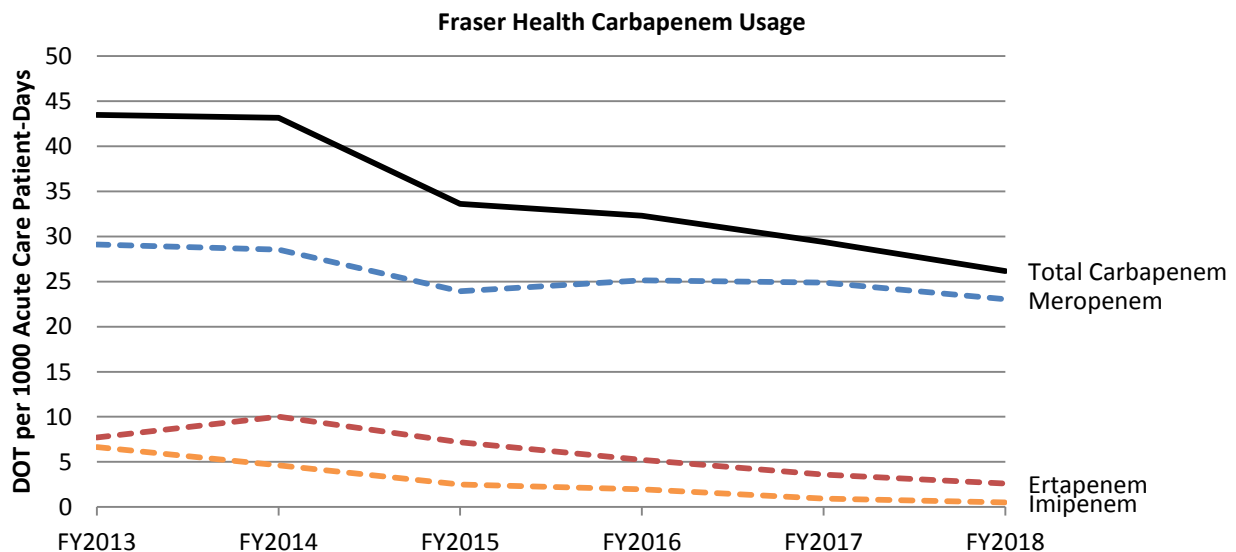
Antimicrobial Usage Trends

The ASP reviews usage trends of targeted antimicrobials on an ongoing basis. This year, we have converted our primary drug usage metric to days of therapy (DOT). DOT is the number of days that a patient receives an antimicrobial agent regardless of dose. This is the most accurate and preferred measure of antimicrobial use, endorsed by the Centers for Disease Control and the US National Healthcare Safety Network.⁶ Total DOT is then normalized to the common denominator of 1,000 patient-days. The resulting unit of measure, "DOT per 1,000 patient-days", does not account for interhospital differences in case mix and patient acuity. However, it is a metric that accounts for hospital size and patient volume, and is used by many other institutions.

Usage data reflects admitted inpatients only. It does not reflect treatment of non-inpatients through emergency departments, day-medicine/infusion centres, or the home IV program.

Carbapenems are one of our most potent class of antimicrobials. Resistance to carbapenems in gram-negative infections is a serious public health threat and a strong impetus for antimicrobial stewardship. Carbapenem usage has dropped by 40% since FY2013 (**Figure 10**), and by 11% compared with FY2017. Furthermore, meropenem comprises a greater proportion of our carbapenem usage, which the ASP views favourably given its lower daily cost compared to imipenem and ertapenem.

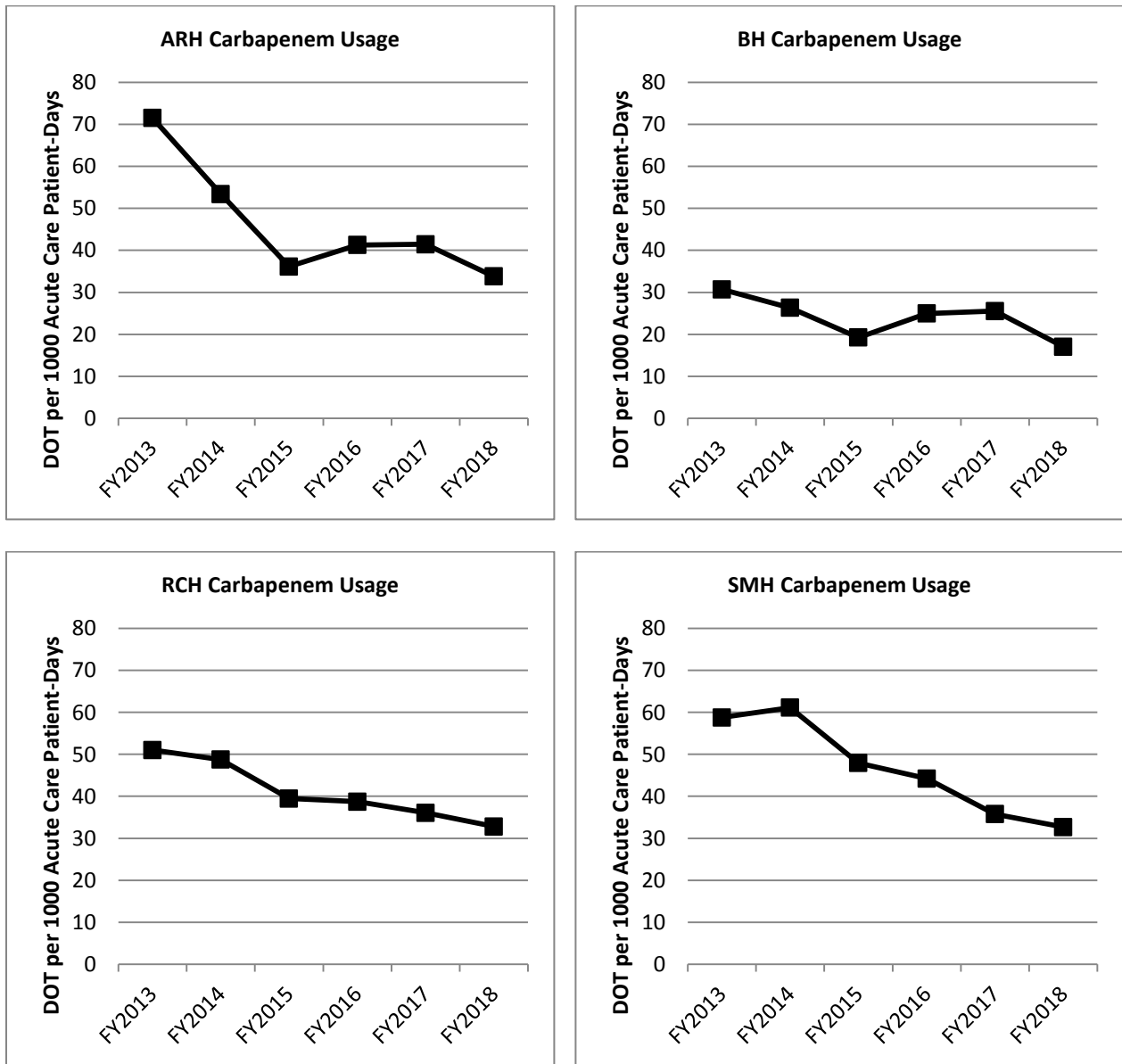
Figure 10. Inpatient carbapenem usage.



On-site regular audit and feedback service is well established at the four largest FH hospitals: ARH, BH, RCH, and SMH. Through these efforts, carbapenem usage has been reduced at all four sites (**Figure 11**). Our experience continues to show the importance of regular, on-site, audit and feedback in order to see reductions in antimicrobial usage.

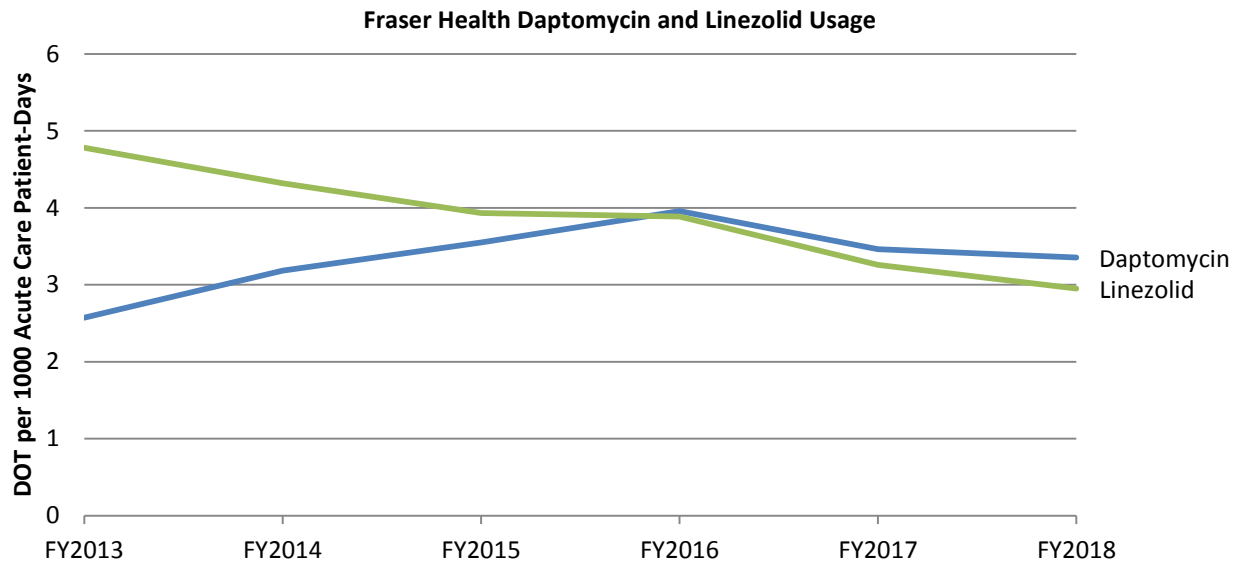
⁶ https://www.publichealthontario.ca/en/eRepository/Antimicrobial_Stewardship_Metrics_Evaluation_2014.pdf

Figure 11. Inpatient carbapenem usage at selected sites.



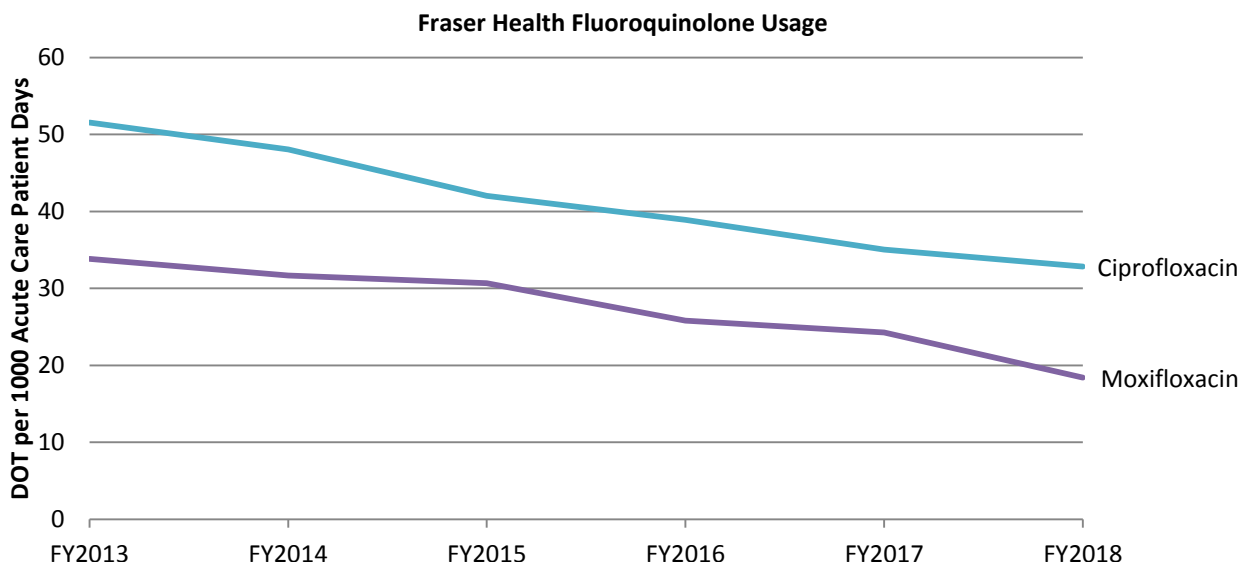
The ASP also tracks usage of two restricted drugs used for resistant gram-positive organisms: linezolid and daptomycin. For the second consecutive year, we have seen concomitant reductions in daptomycin and linezolid usage by 3% and 10% respectively (**Figure 12**).

Figure 12. Inpatient linezolid and daptomycin usage.



Fluoroquinolones are under heightened scrutiny due to increased appreciation of their side-effects⁷ and strong epidemiological association with *Clostridium difficile* infection.⁸ The ASP has utilized education, guidelines, and pre-printed orders to guide appropriate use of fluoroquinolones. Ongoing reduction in fluoroquinolone usage is viewed favourably (Figure 13).

Figure 13. Inpatient fluoroquinolone usage.



Please refer to the statistical appendix for hospital-specific usage of targeted antimicrobials.

⁷ See <https://www.fda.gov/Drugs/DrugSafety/ucm511530.htm> and <http://www.hc-sc.gc.ca/dhp-mps/medeff/reviews-examens/fluoroquinolones2-eng.php>.

⁸ Dingle KE et al. Effects of control interventions on *Clostridium difficile* infection in England: an observational study. *Lancet Infect Dis.* 2017;17:411-421.

Financials

Antimicrobial expenditures are presented for combined inpatient and outpatient antimicrobial usage based on pharmacy data. The expenditures exclude some home IV program patients as they are supplied by the vendor Calea.

Daptomycin continues to be our agent with the highest expenditure (**Table 1**). Only a slight reduction in daptomycin expenditure was seen compared to the prior fiscal year. Daptomycin is mostly used in the outpatient setting, where the ASP is not providing regular prospective audit and feedback service. Lower usage overall has contributed to a net reduction in the combined cost of five restricted antimicrobials drugs compared to the prior fiscal year.

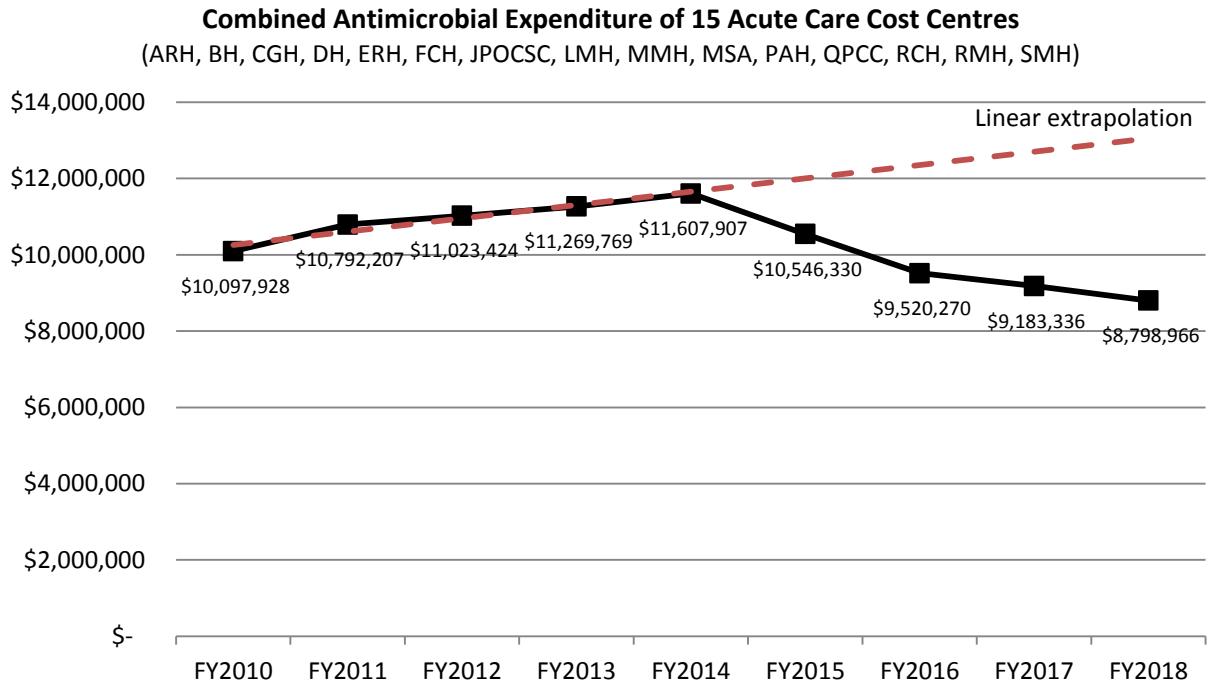
Combined antimicrobial expenditure across 15 acute care cost centres has continued a strong downward trend over the past four fiscal years (**Figure 14**). Antimicrobial expenditures in Fraser Health have been reduced by \$2,808,941 from their peak in FY2013-14, a 24.2% reduction. Over the past year, antimicrobial expenditures have been reduced by \$384,370, a 4.2% reduction.

Table 1. Combined cost of five restricted antimicrobial drugs.

Restricted Antimicrobials	Total Inpatient & Outpatient Expenditure (excluding Home IV supplied by Calea)			Difference (FY2018 vs. FY2017)
	FY2017	FY2018		
Daptomycin	\$1,500,454	\$1,500,182	↓	\$272
Ertapenem*	\$1,170,249	\$1,001,890	↓	\$168,359
Meropenem*	\$354,610	\$338,444	↓	\$16,166
Linezolid	\$59,817	\$55,106	↓	\$4,711
Imipenem*	\$22,226	\$12,724	↓	\$9,502
Total	\$3,107,356	\$2,908,346	↓	\$199,010
*Carbapenems	\$1,547,085	\$1,353,058	↓	\$194,027

Note: Data for Table 1 are from LMPS Datamart and are not directly comparable to figures from prior ASP Annual Reports due to differing sources used.

Figure 14. Combined antimicrobial expenditure of 15 acute care cost centres.



Statistical Appendix

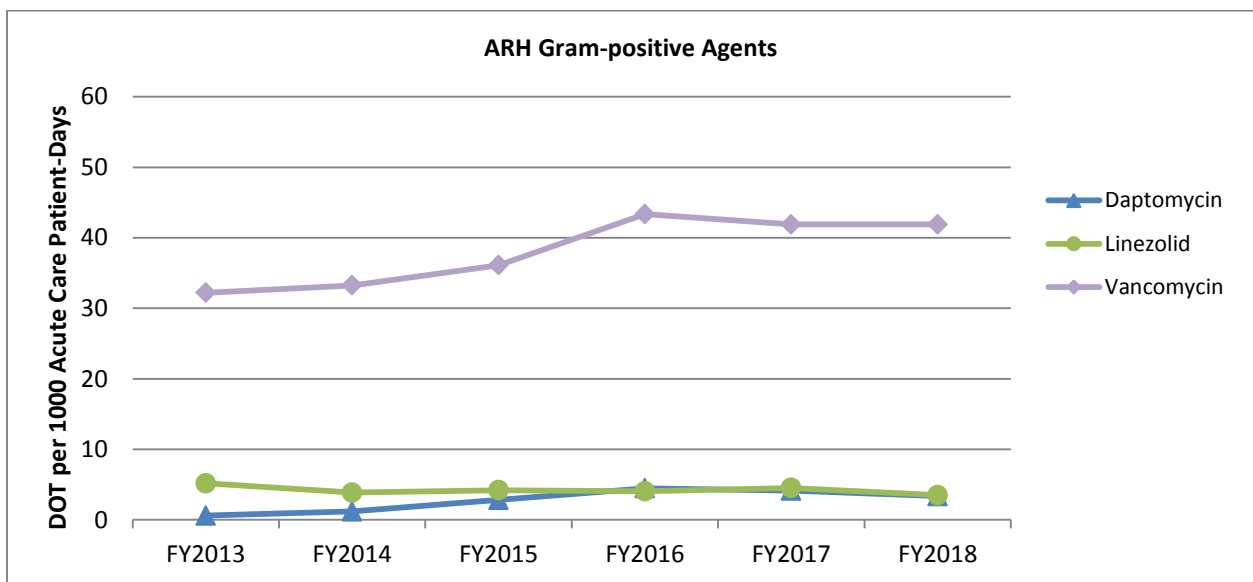
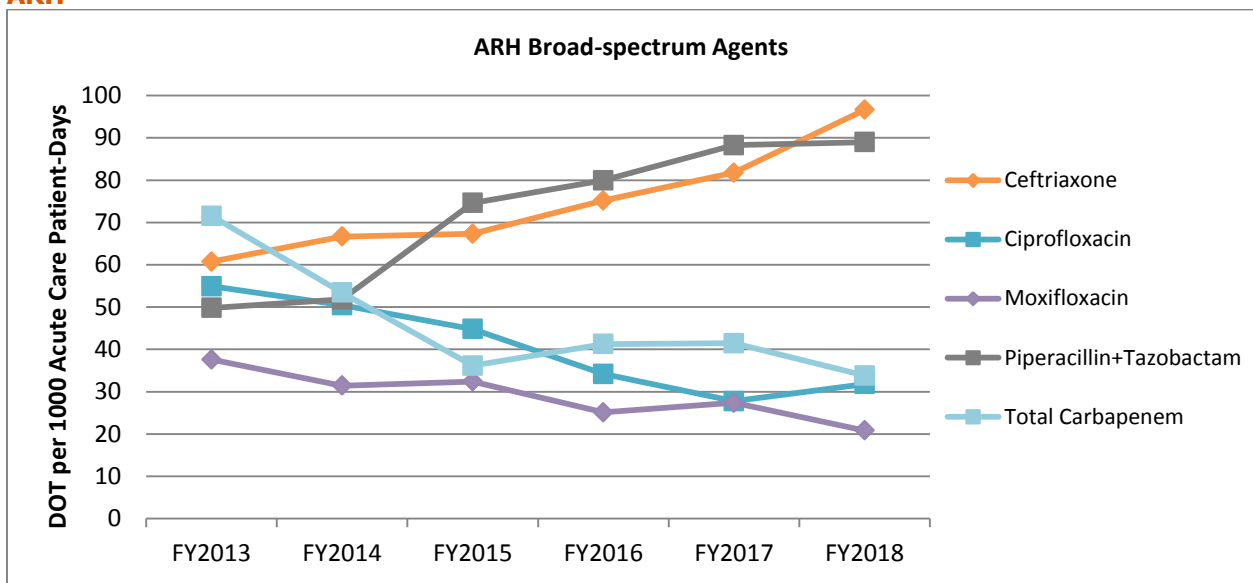
Notes to Interpretation

Antimicrobial usage data is expressed in days of therapy (DOT) per 1,000 acute care patient-days. Usage data reflects admitted inpatients only. It does not reflect treatment of non-inpatients through emergency departments, day-medicine/infusion centres, or the home IV program.

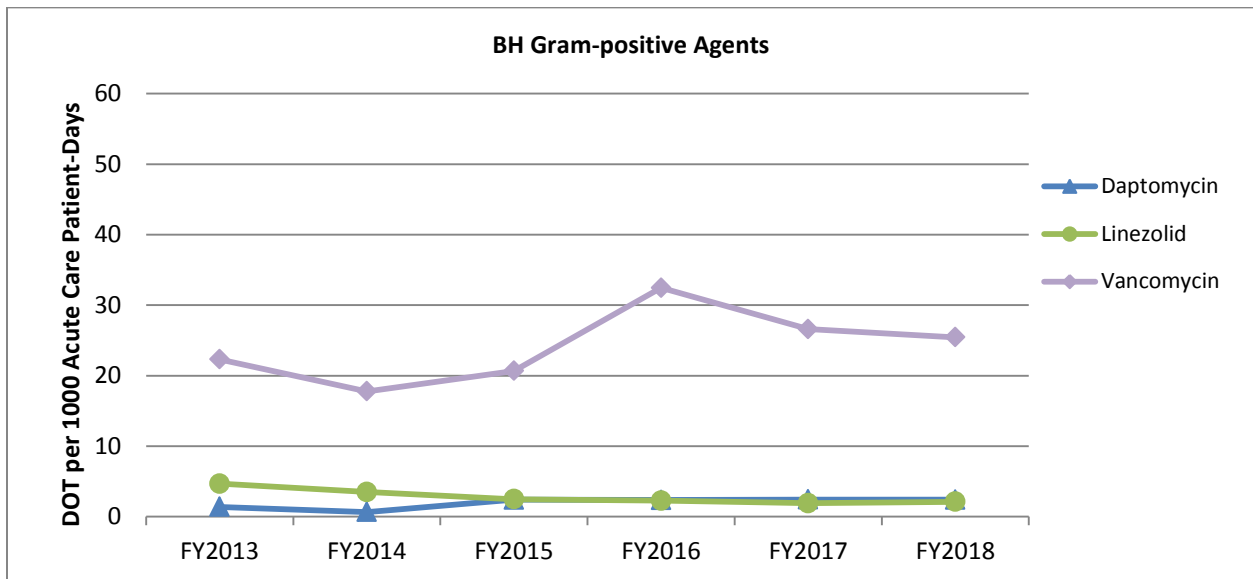
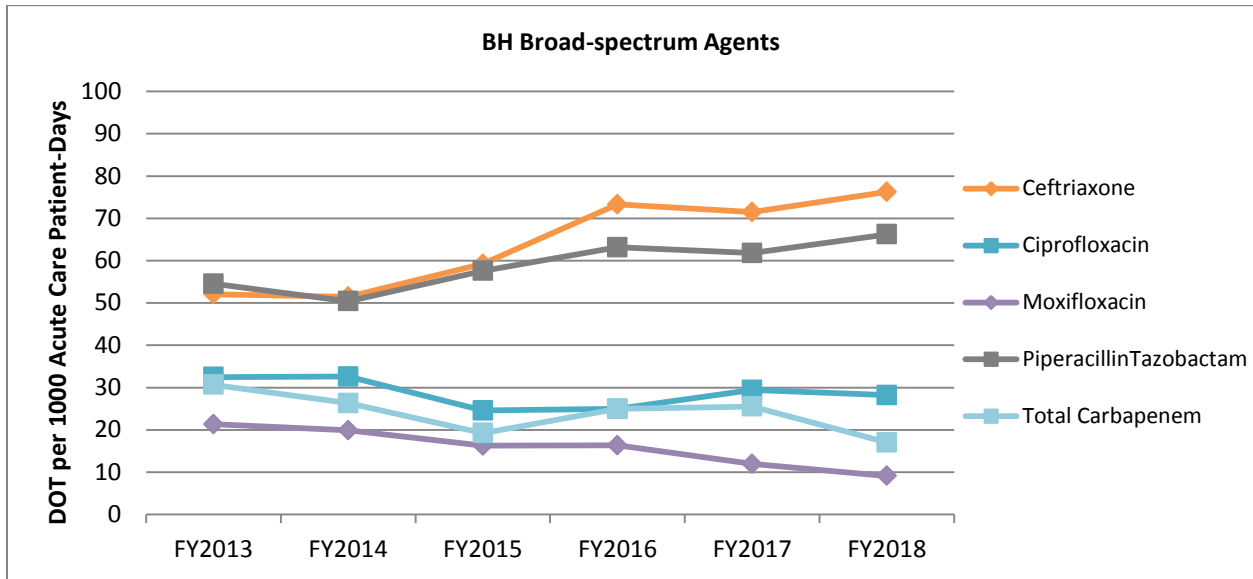
The vertical axis for all graphs has been set to the same scale to provide consistency between sites. Broad-spectrum agents active against gram-negative infections are shown separately from gram-positive agents.

Targeted Antimicrobial Usage by Site

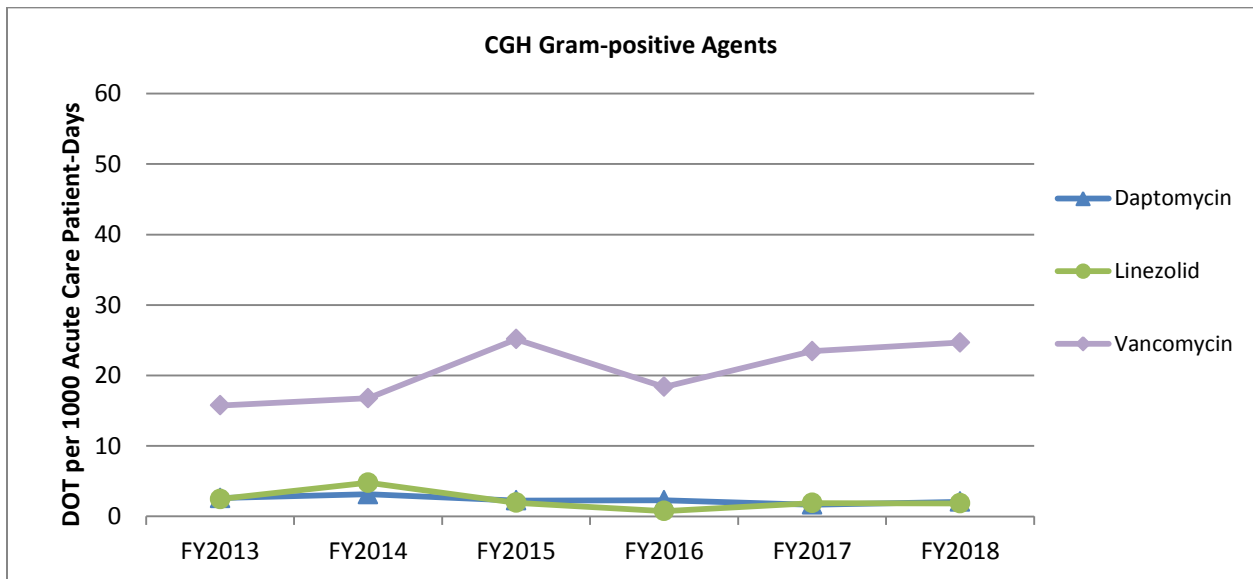
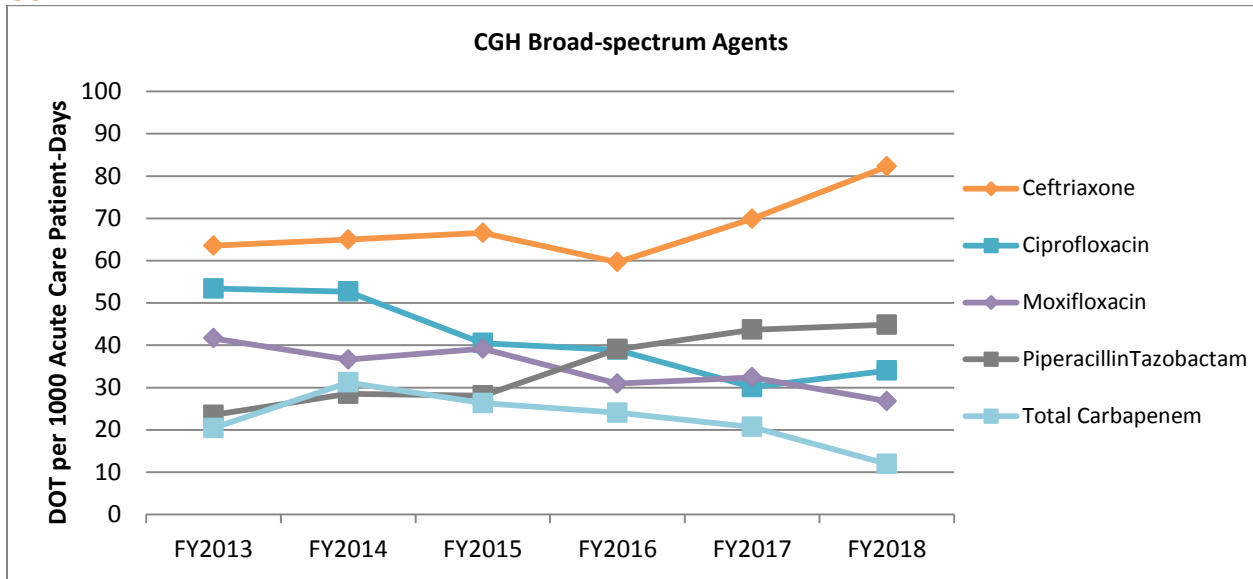
ARH



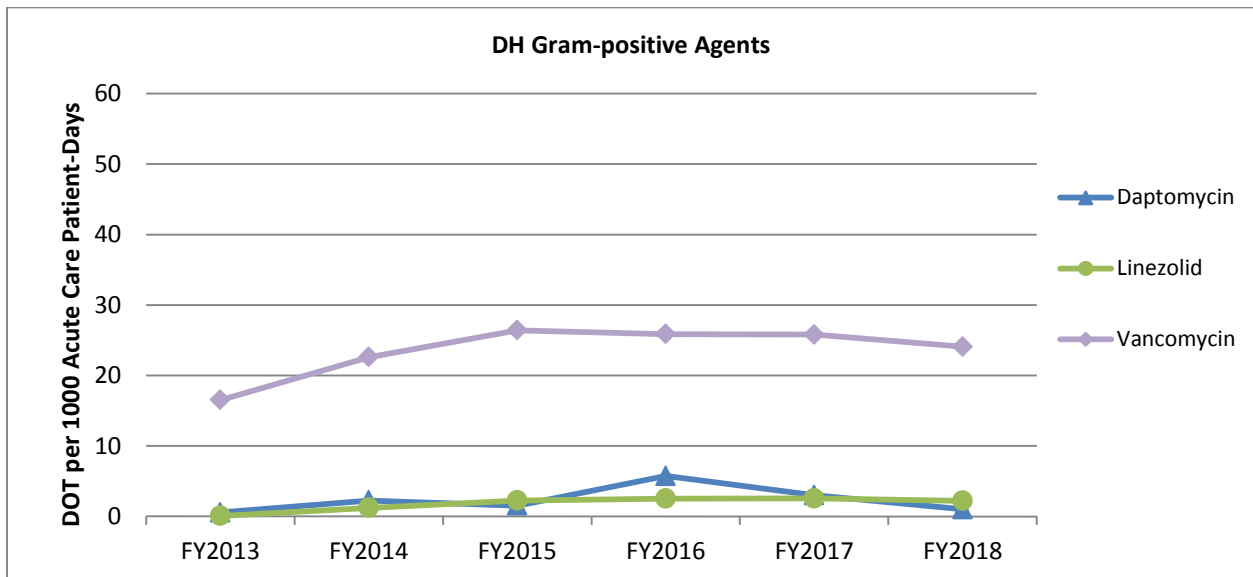
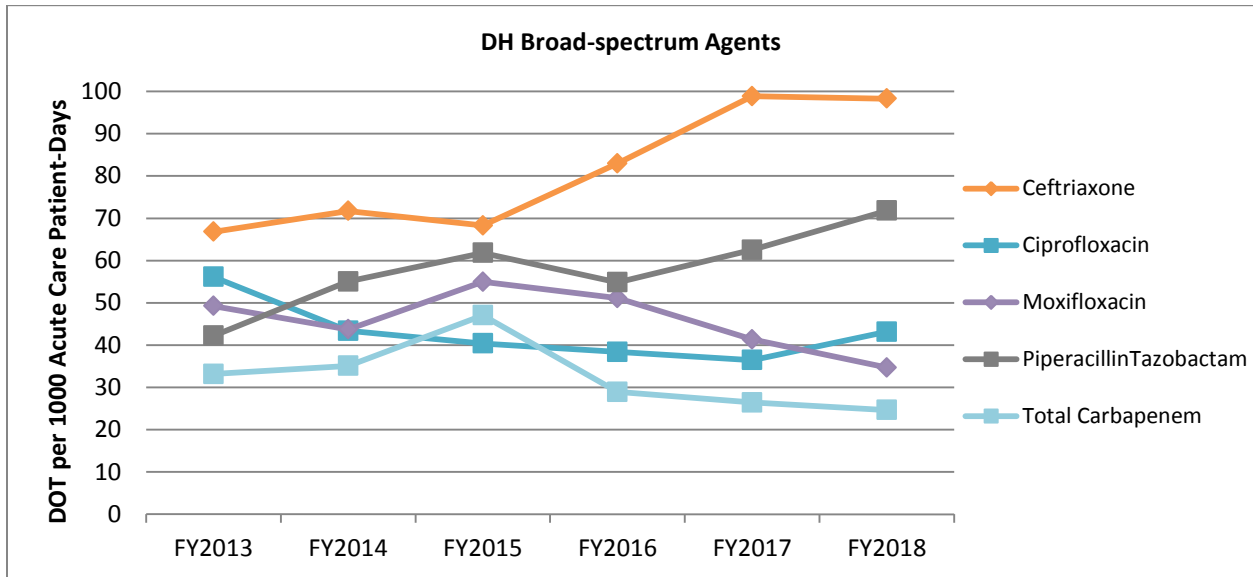
BH



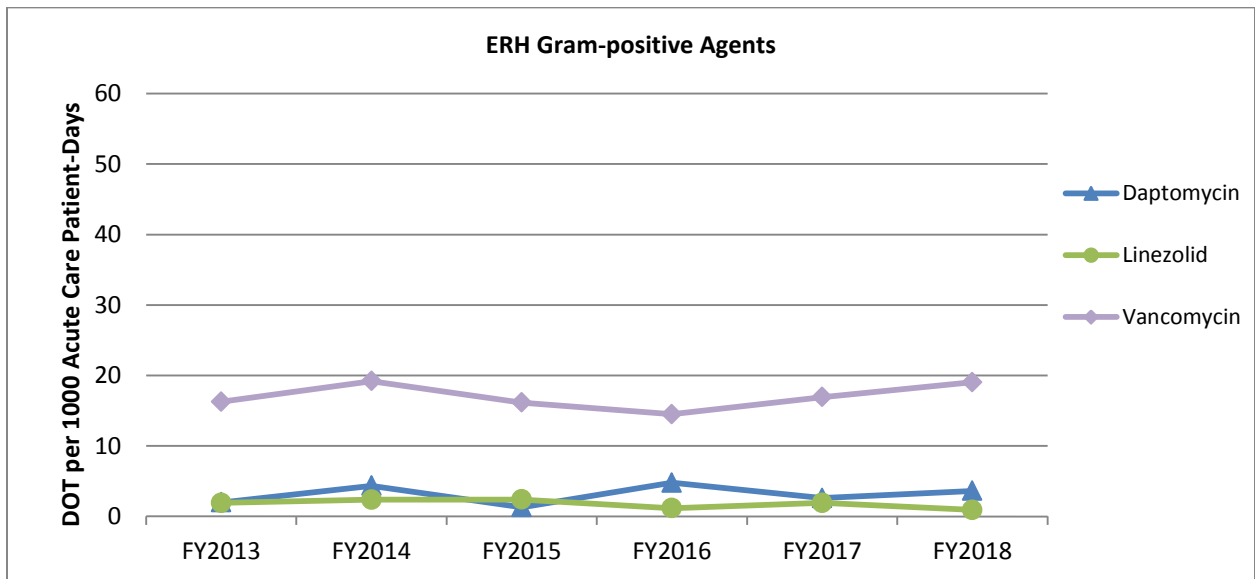
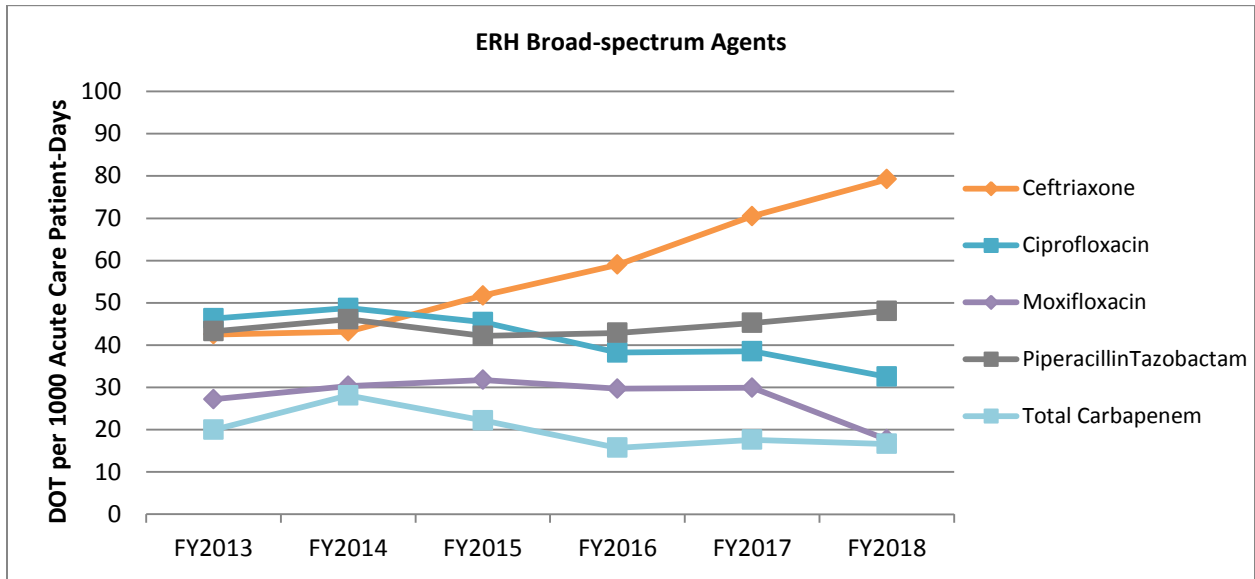
CGH



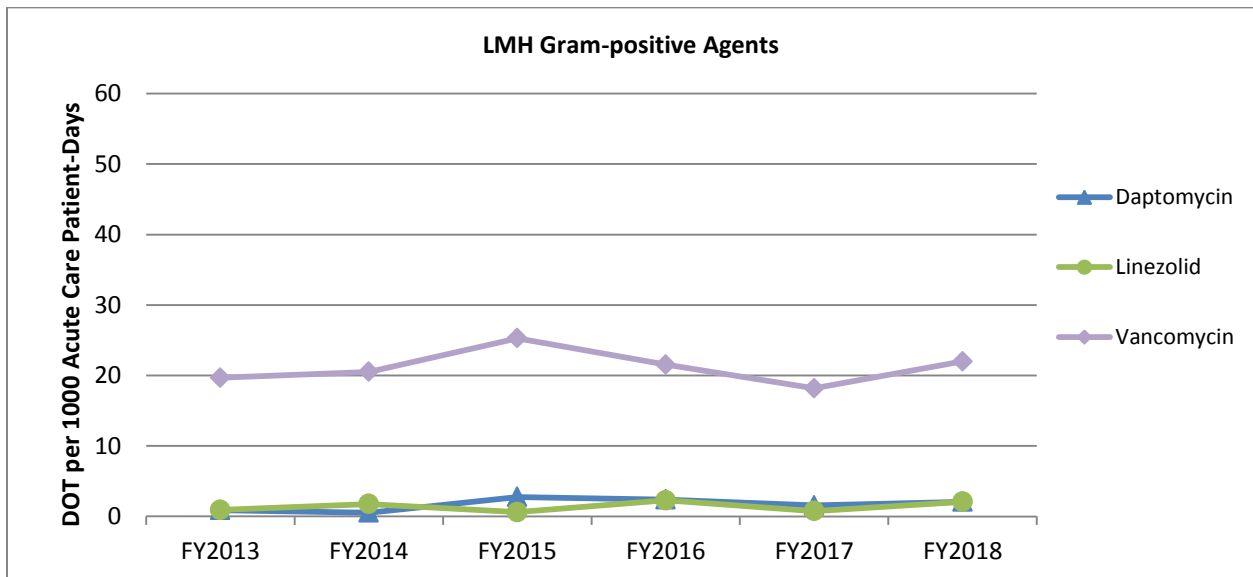
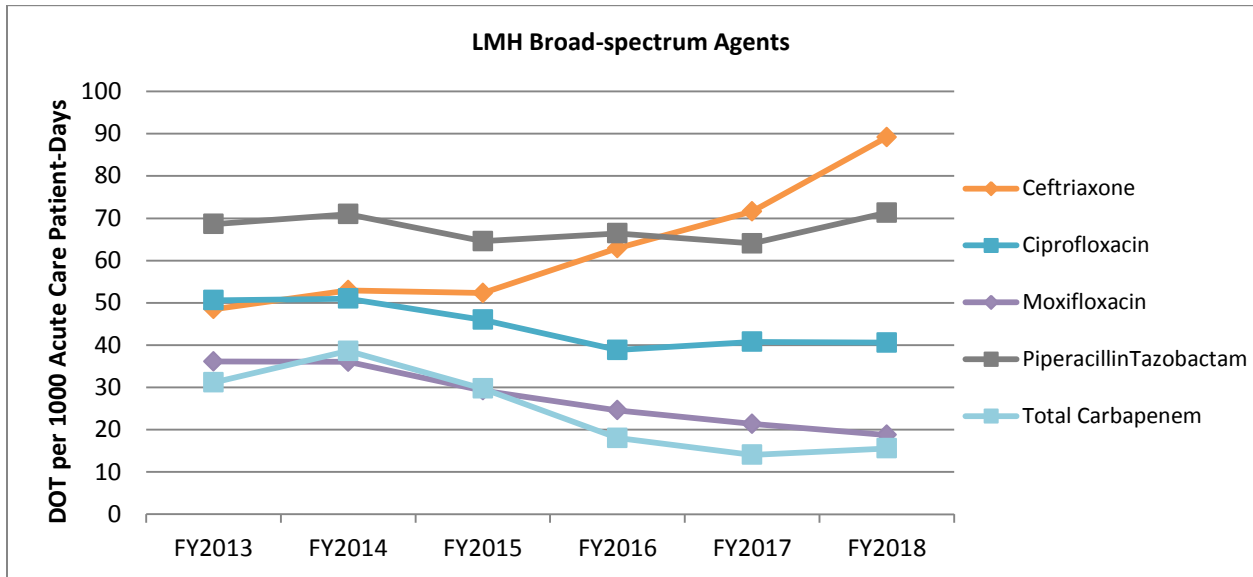
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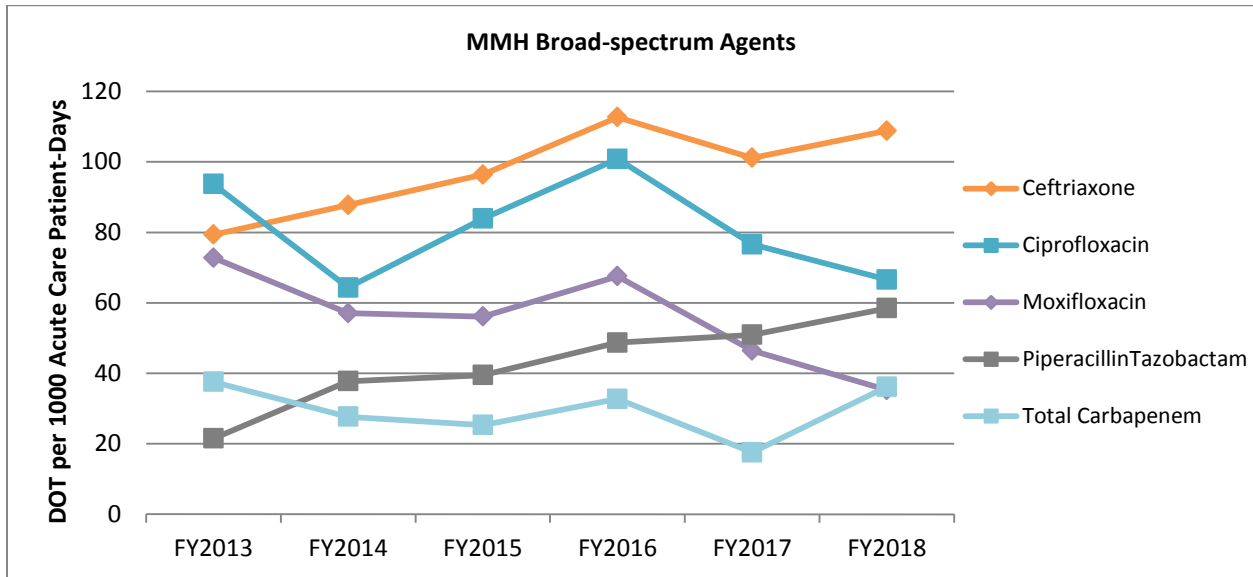
ERH



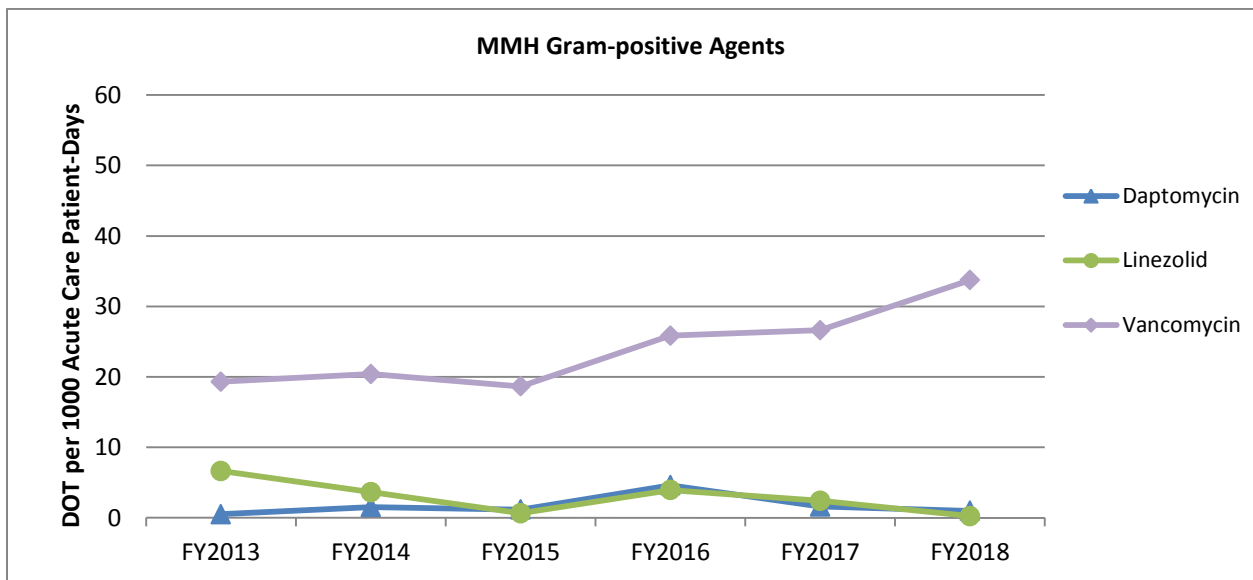
LMH



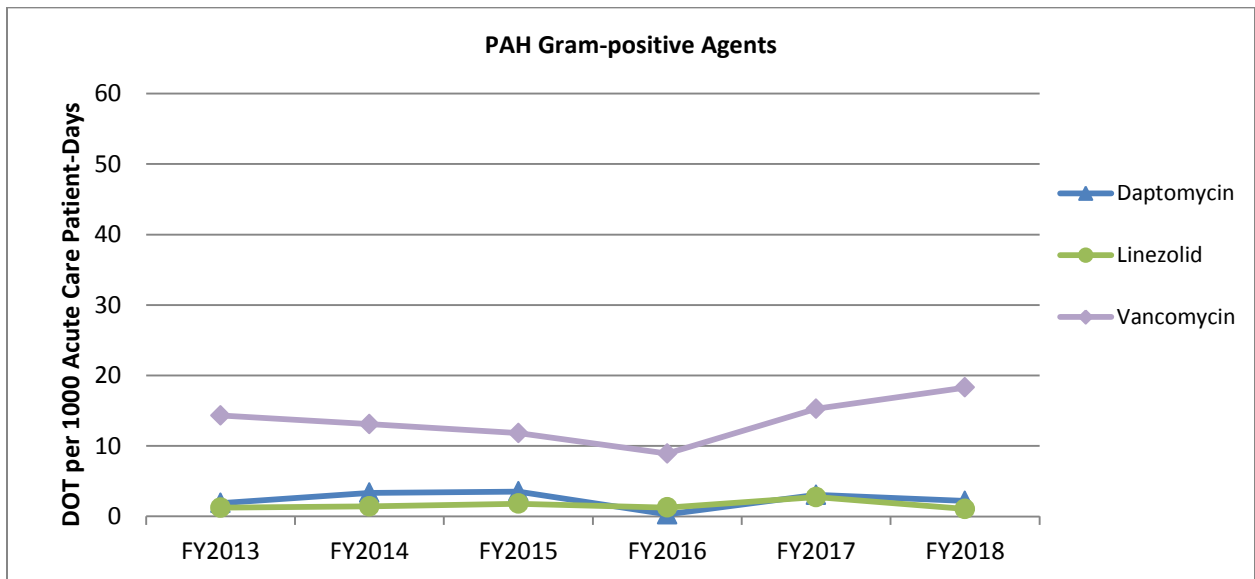
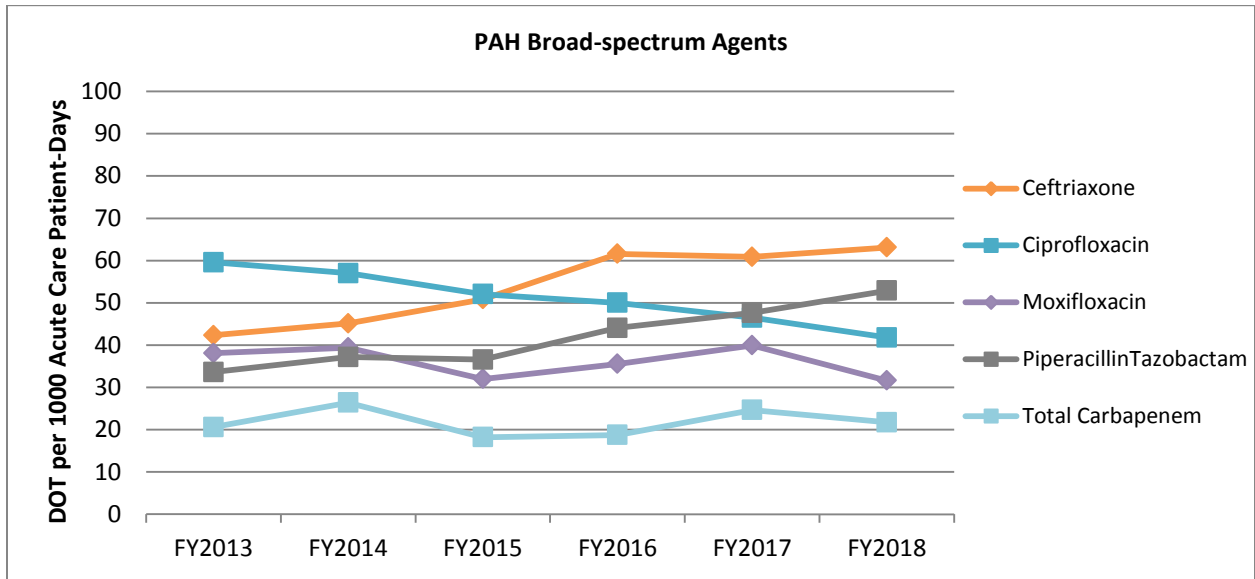
MMH



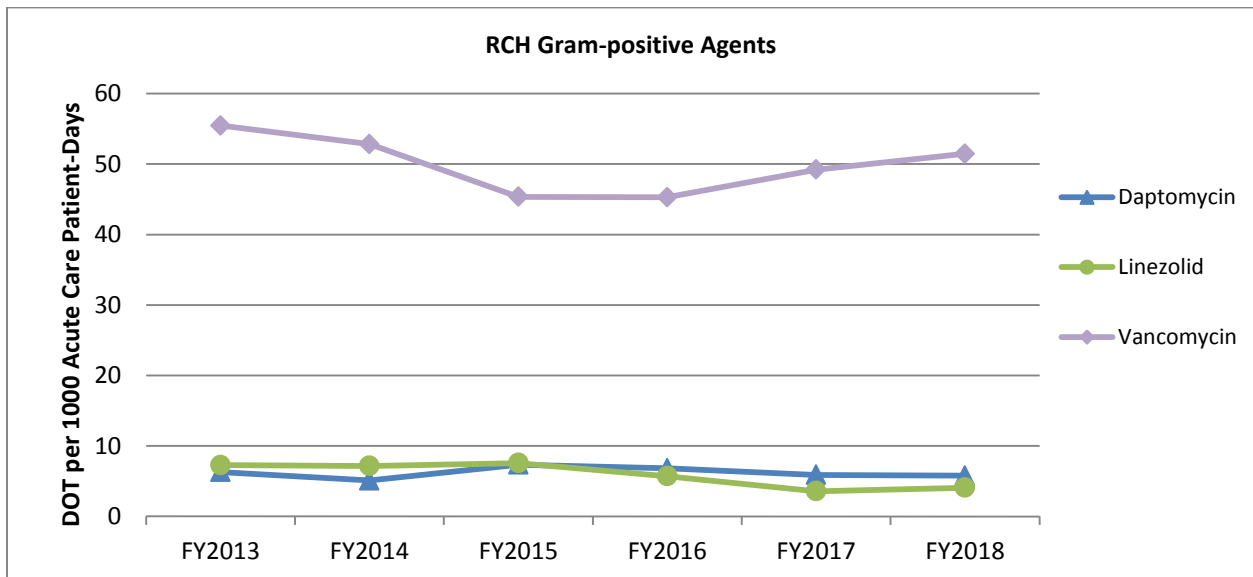
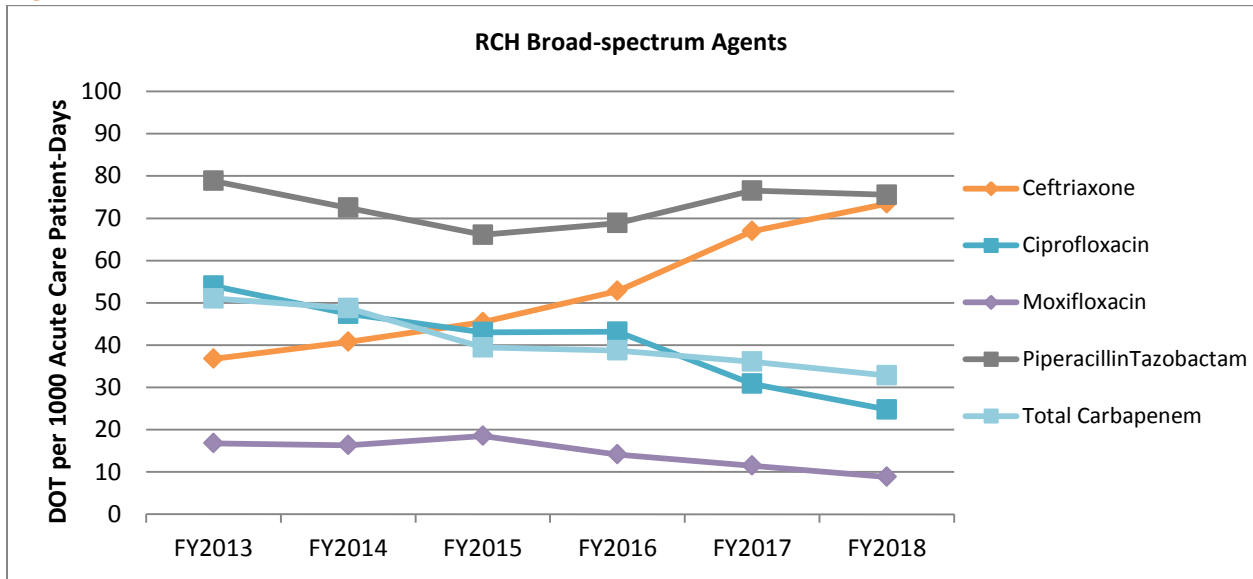
Note: Vertical axis scaled to 120 DOT per 1000 acute care patient-days.



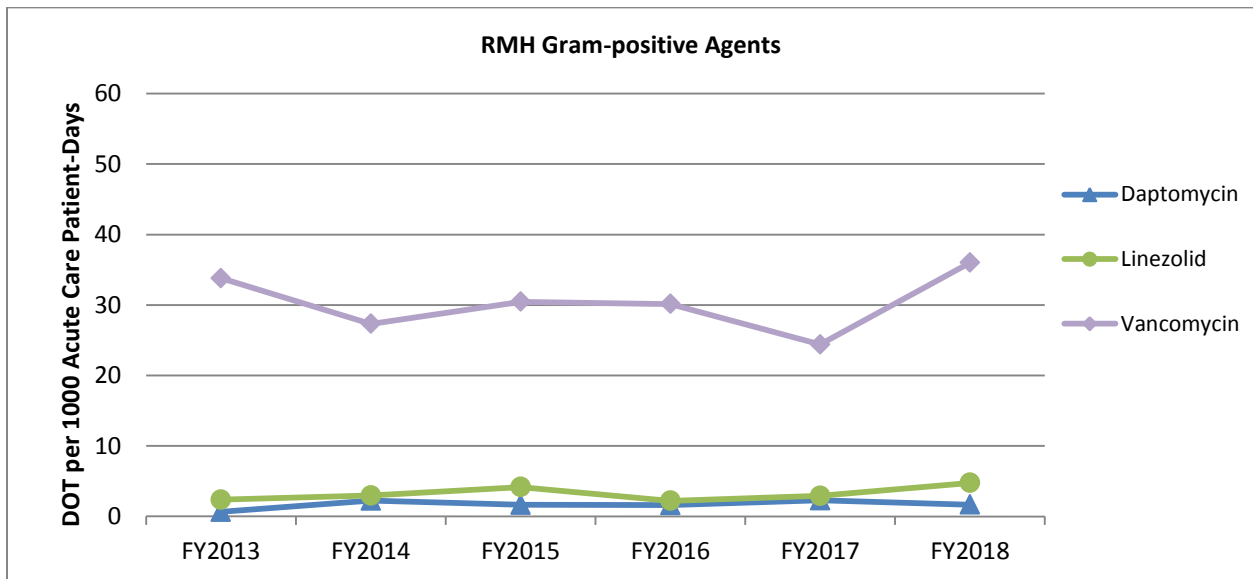
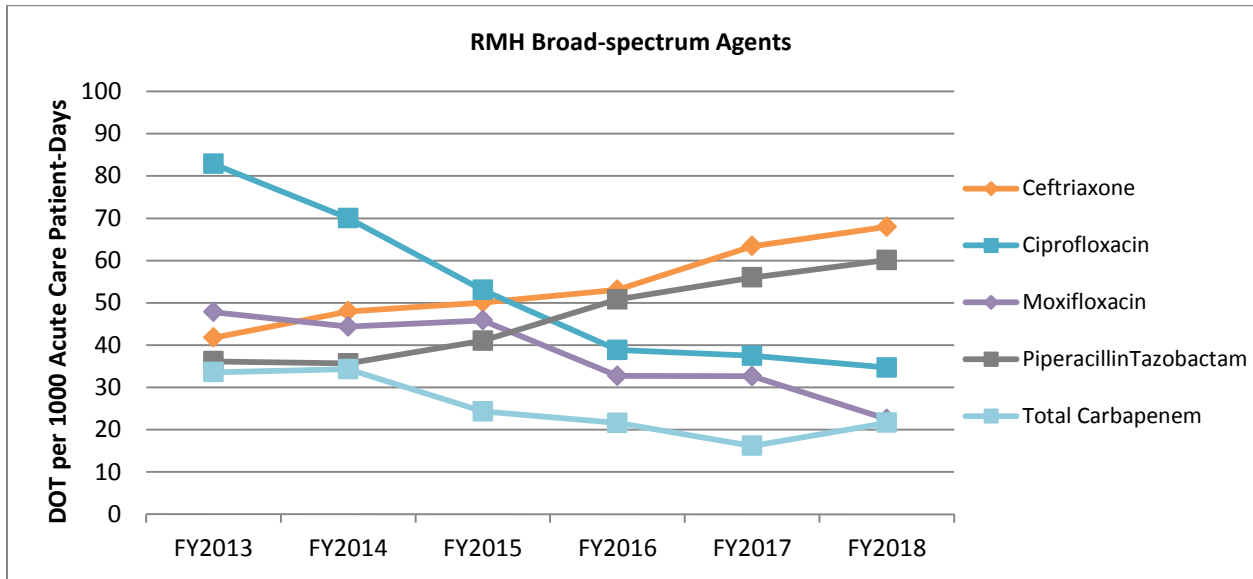
PAH



RCH



RMH



SMH

