

MSH + UHN

ASP ANTIMICROBIAL
STEWARDSHIP
PROGRAM



Q2 REPORT

FISCAL YEAR 2010 | 2011

MOUNT SINAI HOSPITAL
Joseph and Wolf Lebovic Health Complex



University Health Network
Toronto General Hospital | Toronto Western Hospital | Princess Margaret Hospital



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

EXECUTIVE SUMMARY

The Antimicrobial Stewardship Program (ASP) has been active at Mount Sinai Hospital (MSH) since February 2009, and at University Health Network (UHN) since December 2009. The MSH-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 PDSA (Plan-Do-Study-Act) quality improvement methodology to pursue the best possible clinical outcomes for its patients, relying heavily on patient-centred data.



The MSH-UHN ASP uses research and education (facilitated by Pfizer Canada’s financial support), alongside clinical care, to take a leadership role in increasing antimicrobial stewardship capacity and improving the quality of health care.

The following table summarizes the activities of the MSH-UHN ASP, recognizing that the ASP has had the benefit of collaborating with numerous colleagues:

SUMMARY OF CURRENT ASP ACTIVITIES AND RESULTS

LOCATION/ STAKEHOLDERS	METHODS	START DATE	HIGHLIGHTS
MSH Intensive Care Unit	Prospective audit and feedback	February 2009	Further reduction in antimicrobial use in the second year of the program, accompanied by sustained improvements in antimicrobial resistance and reduction in candidemias. This has resulted in antimicrobial costs that are now 40% lower than prior to the introduction of the ASP.
MSH/ Obstetrical and Paediatrics Programs	Quality improvement; Before-and-after study	November 2009	Recruitment for the first phase of the cesarean-section antimicrobial prophylaxis project is completed, although has not been completely analyzed. Results are anticipated early in the 3 rd quarter, with a plan to further refine the approach to preventing infections post-C section.
MSH 14 th Floors/ General Surgery	Prospective audit and feedback	March 2010	Antimicrobial consumption has been reduced since the introduction of the ASP by approximately 15%. This has been accompanied by a 9% increase in costs.
Outpatient Parental Antimicrobial Therapy (OPAT) Program	Capture-and-follow	December 2009	The OPAT program continues its expansion, providing outpatient care to an increasing number of patients at TGH and TWH. OPAT has seen rapid growth, with over 30 new patient referrals in the month of September. Two recently completed surveys show a high degree of patient and healthcare provider satisfaction. OPAT has implemented a variety of new practices to improve efficiency into their practice, and a new database has been developed by the ASP Team to link hospital data with OPAT records.
PMH 14A & 15B/ Leukemia and Immunocompromised Host Service	Prospective audit and feedback	February 2010	The ASP ceased performing prospective audit-and-feedback in July 2010. With a renewed mandate to improve antimicrobial care at PMH, the ASP hopes to work with the Leukemia service in the latter part of the 3 rd Quarter.
TWH Intensive Care Unit	Prospective audit and feedback	December 2009	Antimicrobial consumption has been reduced since the introduction of the ASP by approximately 13%. This has been accompanied by a 34% reduction in antimicrobial costs.

Greater Toronto Area/ Toronto Central LHIN, Teaching Hospitals,	Quarterly meetings; electronic communication	January 2010	The Toronto Antimicrobial Stewardship Corridor (TASC) remains active, with rapid growth in membership. There are now over 10 member hospitals in TASC, with members sharing best practices for antimicrobial stewardship.
Hospital for Sick Children, MSH, St. Michael's, Sunnybrook Health Sciences Centre, UHN	Research collaboration	September 2010	The first research collaboration among TASC members is the <i>Staph. aureus</i> bacteremia (SAB) study. This study will retrospectively analyze clinical features, diagnostic methods, clinical outcomes and resource utilization among over 1000 patients diagnosed with SAB. Its data will be used to plan for clinical trials and/or quality improvement projects in the future.
Toronto/ Healthcare professionals throughout Canada	Education Course on Antimicrobial Stewardship	April 2010	Planning continues for the 1 st Toronto Course on Antimicrobial Stewardship, June 2-4 2011. This course promises to help hospitals and their healthcare providers increase the capacity and efficacy of ASPs throughout Canada.

LOOKING FORWARD

CLINICAL

The ASP has seen fairly rapid growth over the past year, with introduction of the ASP onto the General Surgery services at MSH, the Intensive Care Unit at TWH, the Leukemia Service at Princess Margaret Hospital, and opening of the OPAT program. The 3rd quarter of the 2010-11 fiscal year will see:

- introduction of the ASP in the Intensive Care Unit at TGH
- re-introduction of the ASP on the Leukemia Service at PMH

It is hoped that planning to expand OPAT services to MSH will commence before the end of this fiscal year. Additionally, we hope to offer more prospective audit-and-feedback to other services, including the stem cell transplantation program at PMH, and some of the other medical and surgical services within the 4 hospitals served by the ASP. Finally, we hope to begin the development of best practices for initial treatment of common conditions initially managed in the Emergency Department (e.g. skin and soft tissue infections, pneumonia, urinary tract infections, and sepsis).

An ongoing challenge (mentioned in all prior Quarterly Reports) is the growing need for readily accessible patient-specific information, which forms the basis for our audit-and-feedback interventions. Such a solution needs to be coupled with the ability to analyze the information in aggregate, to facilitate the generation of reports such as this one.

RESEARCH

The ASP's research agenda remains ambitious and aggressive. Final outcomes for the C-section project at MSH are anticipated shortly. The majority of chart reviews for the *S. aureus* bacteremia project will occur over the next 6-9 months, with 2 medical residents and 2 infectious diseases fellows involved in the project. Additionally, with the inclusion of the TGH ICU into the ASP's prospective audit-and-feedback, the 3 ICUs currently served by the ASP will be analyzable from the perspective of the efficacy of an ASP in improving antimicrobial use and patient care; the ASP is involved in the study of this, using a "stepped wedge" design. The ICU project and the *S. aureus* bacteremia project resulted in two submissions for resident research funding from PSI (Drs. Brian Minnema and Dan Ricciuto, respectively.)

The ASP has also submitted an application for CIHR funding for a Delphi panel on antimicrobial stewardship measures and outcomes.

Finally, there are several student and resident research projects about to be underway, involving the OPAT program, the ICU projects, and the Leukemic population.

EDUCATION

The ASP has been working on the 1st Toronto Course on Antimicrobial Stewardship, to be held June 2-4, 2011. All members of the ASP are involved in various aspects of education, and will continue to do so.

An ASP website is in the developmental stages. This process will take several months but, it is hoped, result in an online resource for physicians, pharmacists and other healthcare providers and administrators both nationally and internationally.

The ASP is also considering funding fellowships for a clinical pharmacist and an infectious diseases physician for the next academic year. We hope to have details clarified over the next quarter.

MOUNT SINAI HOSPITAL (SUPPORTED BY PFIZER CANADA INC.)

INTENSIVE CARE UNIT

The Antimicrobial Stewardship Program (ASP) began working in the MSH ICU in February 2009. Please see prior quarterly reports for more details. Currently, Dr. Nelson rounds with the ICU team 4 days a week; Dr. Morris is present on two of those days. Rounds take approximately 10 minutes. Drs. Morris and Nelson do not discuss immunocompromised patients (primarily from Princess Margaret Hospital (PMH)), but the Immunocompromised Host Service has recently been invited to participate in Antimicrobial Stewardship Rounds. Full results are in the [Appendix](#), but are summarized below:

- Quarter 1/Quarter 2 (Q1/Q2) Fiscal Year (FY) 2010-11 antimicrobial usage per quarter (using defined daily doses (DDDs) per 100 patient days) has decreased by 2.4% compared to FY 09-10 and is now at 164 DDDs/100 Patient Days. The decrease in usage was most substantial with systemic antifungals, where the usage/100 patient days decreased by 29%, although usage of systemic antibacterials also decreased by 9%.
- Mean antimicrobial costs per quarter have also continued to decrease since beginning the program and for Q1/Q2 FY 10-11 have decreased by 36% (decrease of \$26,143) compared to FY 09-10. Substantial decreases were seen with both systemic antifungals and systemic antibacterials, whereby the mean costs/quarter decreased by 45% and 31%, respectively.
- **Important Note - Patients originating from PMH:** Following the release of the last Quarterly Report, actual FY 2009-10 antimicrobial utilization data regarding patients originating from PMH was received, with marked discrepancies from the annualized data. MSH Data Analyst, **Melanie Thomson**, investigated and confirmed a data quality error in the annualized data, resulting in an over-inflation of the costs attributed to patients originating from PMH (and only those originating from PMH). Actual results have been reviewed and can be found in the Appendix. A new process is now in place for collecting and collating this data, outlined in our Standard Operating Procedures (SOP) in the Appendix.
- The antimicrobial cost for PMH patients is 53% of the total ICU costs in fiscal 09-10. Since PMH patients make up 12% of ICU visits, this represents a cost per visit of \$1,467 for PMH (vs \$180 for MSH) and \$201 per patient day (vs \$32 for MSH)

	2009/10 Total Cost	% of total	Total ICU Visits	Cost per visit	Total ICU Days	Cost per ICU day
Total All Antimicrobial Costs	\$288,154		849	\$ 339	4,962	\$58
Non-PMH Patients	\$134,140	47%	744	\$ 180	4,194	\$32
PMH Patients	\$154,013	53%	105	\$ 1,467	768	\$201

- The number of cases of yeast isolated in blood so far in FY 10-11 has been 5, none of which has been resistant to fluconazole. In FY 09-10, the total number of cases was 8. Of interest, there has not been a case of Fluconazole resistant yeast isolated from blood since FY 07-08 (1 case of *Candida krusei*). **Use of antifungal agents other than fluconazole for empiric treatment of yeast is currently unnecessary based on this data.**
- *Pseudomonas aeruginosa* resistance rates continue to remain steady and low compared to historical values. For April-September 2010, Ps. aeruginosa susceptibilities were (with April-September 2009 shown in parentheses):

ceftazidime was 85% (78%)
 ciprofloxacin 70% (53%)
 meropenem 93% (69%)
 piperacillin-tazobactam 90% (98%)
 tobramycin 89% (97%)

The rise in ciprofloxacin susceptibility is particularly noteworthy.

- Two abstracts were presented at the European Society of Critical Care Medicine (ESICM) this month in Barcelona:

Lisa Burry (ASP Research Pharmacist) presented:

Evaluation of the introduction of an antimicrobial stewardship program to a medical-surgical ICU.
Burry L, Howie S, Khory T, Lapinsky S, Minnema B, Christian M, Stewart T, Wax R, Mehta S, Thomson M, Bell C, Morris A. *Intensive Care Medicine* 2010;36**:S199.**

Christina Katsios (research performed while an elective medical student) presented:

An antimicrobial stewardship program improves the quality of antimicrobial prescribing in an ICU.
Katsios C, Khory T, Howie S, Burry L, Lapinsky S, Wax R, Christian M, Mehta S, Bell C, Stewart T, Morris A. *Intensive Care Medicine* 2010;36**:S245.**

CESAREAN SECTIONS

The ASP began working with Obstetrical and Neonatal Teams at MSH in the fall of 2009. Please see prior Quarterly Reports for more details. In response to a study by **Dr. Allison McGeer** from July-October 2008 (whereby post-C-section infection rates were 11.2%), the ASP worked collaboratively with Nursing, Obstetrics, Anaesthesia and Neonatology to change the timing of antibiotic prophylaxis from post-cord clamping to pre-incision in order to reduce postoperative infections. (Giving antibiotics prior to cord clamping had concerned some because of its theoretical effect on infant flora, and so was not been widely adopted.) Changing the surgical prep from povidone-iodine to chlorhexidine was also part of the C-section "bundle". Ms. **Jennifer Teng**, a Pharmacy Resident supervised by **Sandra Nelson**, carried out this study as a before-and-after research protocol. The total number of patient successfully recruited is 282, meeting the target recruitment of 280 patients (for 80% power to detect a 50% difference in total post c-section infection with $\alpha=0.05$), however there are still approximately 20 patients that have been recruited that still require follow-up. **Mr. Lucas Currah**, an undergraduate health sciences student at Queens University, was a summer student supervised by Andrew Morris and was helpful with patient recruitment. Completion of this project is anticipated shortly (i.e. during the next quarter), although the obstetrical team (including anesthesia and nursing) will be working with the ASP on a second cycle of the PDSA (Plan-Do-Study-Act) methodology, to further improve patient outcomes.

Of note, subsequent to the implementation of this quality improvement project and study, the American College of Obstetrics and Gynecology issued a statement recommending the very practice we had implemented a year prior. (Committee Opinion No. 465: Antimicrobial Prophylaxis for Cesarean Delivery: Timing of Administration. *Obstetrics & Gynecology.* 2010;**116**:791-2.)

GENERAL SURGERY (14TH FLOOR)

The ASP began working with the General Surgery Teams at MSH in March 2010 after meeting with **Dr. Carol Swallow**. **Dr. Nelson** performs prospective audit and feedback, and meets with one or more surgical residents from each surgical team 2-3 times a week. Pre-implementation chart audit suggested that up to 45% of antimicrobial courses were inappropriate. Medical Informatics (Analyst: **Yoshiko Nakamachi**, Programmer: **Predrag Tisma**) performed significant database customizations, to allow full data capture for the 14th floor. Outcome data are available in the [Appendix](#), but are summarized below:

- 14th floor Q1/Q 2 FY 2010-11 antimicrobial usage (using defined daily doses (DDDs) per 100 patient days) has dropped by 15% compared to FY 09-10, and is now at 57 DDD/100 patient-days.
- 14th floor Q1/Q 2 FY 10-11 mean antimicrobial costs have not changed significantly compared to FY 2009-10 (\$23,032 FY 10-11 vs \$22,942 FY 09-10). Mean systemic antibacterial costs remained constant. However, there was a large increase in the costs of systemic antifungals for Q1/Q2 FY 10-11 (76%) compared to the previous year, and a large decrease in the use of all other antimicrobials (68% decrease) (“other antimicrobials” includes everything that is neither a systemic antibacterial nor systemic antifungal)
- The number of cases of yeast in the blood remains low. There has only been 1 case of yeast in the blood for Q1/Q2 FY 10-11 which is the same number for the entire FY 09-10. Of note, similar to the MSH ICU, not since FY 07-08 has there been a Fluconazole resistant yeast grown in the blood on 14th floor (*Candida krusei*)

SURGICAL PROPHYLAXIS

Because of increased Group A streptococcus and *S. aureus* resistance to clindamycin, the ASP decided to change the second-line agent for gram-positive surgical prophylaxis (for penicillin allergic patients) from clindamycin to vancomycin. Although this makes MSH's practice consistent with UHN's², it also posed a logistical challenge, as vancomycin requires a prolonged infusion that must commence considerably earlier (almost 1 hour) than any other antibiotic infusion.

Dr. Nelson worked with **Nursing**, **Pharmacy**, and **Anaesthesia** to ensure that the necessary systems changes were in place prior to this high-risk implementation. She is collecting data on patients that are receiving vancomycin prophylaxis to assess the process.

Drs. Morris and **Nelson** have contributed to the 2010-11 version of the General Surgery Resident's Handbook, recommending evidence-based changes to the section on surgical antibiotic prophylaxis in collaboration with **Drs. Alexandra Easson**, **Robin McLeod**, and **Carol Swallow**.

HOSPITAL FORMULARY

Dr. Nelson continues to work on harmonizing the MSH antimicrobial formulary with the UHN antimicrobial formulary. This included bringing ertapenem on formulary, which should prove cost-saving when replacing meropenem for the treatment of ESBL-producing organisms. When completed, it will also minimize the potential errors from inter-institutional transfer of patients and physicians.

OUTPATIENT PARENTERAL ANTIMICROBIAL THERAPY (OPAT) PROGRAM

EXECUTIVE SUMMARY

The OPAT service continues to accrue patients at the rate of 20-30 per month. As of September 30, 2010, OPAT had accrued 174 patients and was actively following 45. Surveys of patients and users regarding the OPAT program have been overwhelmingly positive. The medical diagnoses and services using OPAT are similar to the last report and are shown graphically in the Appendix.

A new Microsoft Access-based database, which is a great improvement on the current Microsoft Excel-based spreadsheet, and has the capability to auto-populate data directly from the Enterprise Data Warehouse (EDW) and the Electronic Patient Record (EPR) is being rolled out in the coming weeks. We expect that this will improve efficiency for data entry and communication with family and attending physicians. In addition it will make outcome analysis much more efficient. A detailed analysis of outcomes will be highlighted in the next report.

OPAT PATIENT CARE ACTIVITIES

The OPAT service continues to accrue patients at the rate of 20-30 per month. As of September 30, 2010, OPAT had accrued **174 patients** and was **actively following 45**. The medical diagnoses and services using OPAT are similar to the last report and are shown graphically in the Appendix.

OPERATIONAL EFFICIENCY

OPAT has secured clearance for a pharmacist to view and edit discharge information in the Resource Matching & Referral (RM&R) homecare order instrument and to access patient lab results from private labs.

OPAT has met with the Toronto Central Community Care Access Centre (TOCCAC) to improve the process of communication; TOCCAC's own procedures necessitate exclusive fax-based communication. The process is being made more efficient by acquiring a dedicated OPAT fax line and accessing the TOCCAC's computer-fax system so that faxes can be sent directly from a computer: saving paper, time, and providing an audit trail.

TOCCAC has created an OPAT reference code which can readily identify OPAT patients and improve communication infrastructures between all involved care providers. With the reference code in place, it will be possible in the future to run reports through the TOCCAC internal electronic charting system on clients identified as OPAT. This will also enable us to post-code all current or past TOCCAC clients for audits and quality monitoring purposes.

USER SATISFACTION SURVEYS

Patients:

Over the summer a patient satisfaction survey was conducted on the first 100 patients. 88% felt that the OPAT service provided was excellent.

UHN professional staff:

92% - Think the OPAT service has improved patient care

92% - Stated that OPAT service improved their confidence that antibiotics will be delivered safely

50% - OPAT service helped to allow earlier discharge

86% - Stated they had no difficulty reaching the OPAT team by telephone when needed.
 96% - Think that quality of patient care would be poorer if the OPAT service was discontinued

SURVEYS

1) Patient Survey

A telephone client satisfaction survey was conducted in July 2010 as part of a quality assurance audit to better understand the current performance of the OPAT program and learn ways to improve it.

A summer student, Gabi Jacob, was hired to conduct this survey independent of the OPAT or Antimicrobial Stewardship teams. Patients were encouraged to be completely honest with their answers as the goal of the survey was to improve the care that is provided to all patients. Patients were informed that their responses will be kept confidential, with no identifying information recorded.

Method: Our first 100 patients (or their next of kin who served as a translator) in the OPAT program who had completed or were nearing completion of their parenteral antimicrobial therapy were contacted. The overall response rate was 65%.

Results:

86% - The OPAT team taught them what they needed to know before they left the clinic/hospital (i.e. good education)

86% - No difficulty reaching the OPAT team by telephone when needed (i.e. good availability)

88% - Overall care received from the OPAT team was excellent (i.e. good service)

Patient Testimonials:

- 1) Easy to get a hold of. I had questions sometimes and I would call and they would answer.
- 2) I was very satisfied with the care I received.
- 3) I liked the whole team. They were very clear.
- 4) I liked that when I had a problem they were there and they took care of it.
- 5) They have shown a lot of interest with me. They kept an interest in me even when I was done in the hospital. They followed up. I felt like I was treated properly.
- 6) No recommendations. They were the best team I have ever met.
- 7) I liked how everything was ordered for me and so I didn't have to worry about it.
- 8) They really care and they work together as a unit very well.
- 9) When they got involved they really tried to make me feel better. They won't stop until they find out what is going on. They really cared about making me better.
- 10) When they got involved they got to the bottom of it.
- 11) I liked Mr. Ron Fung and Dr. Brunton. The whole team was excellent.
- 12) They were excellent. I was scared and they calmed me down just by their confidence and their knowledge and ultimately also through their ability.

2) Services Survey

The OPAT team conducted a survey to assess the effectiveness of the OPAT program from the eyes of the various services at UHN.

Method: A SurveyMonkey™ link containing survey questions were distributed to various physicians, pharmacists, nurses who have used the OPAT service in the past (as well as those currently using the service).

Results:

96% - Think that it would make a difference (i.e. to patient care) if the OPAT service was disbanded/discontinued

92% - Think the OPAT service has improved patient care

92% - OPAT service helped to improve their confidence that antibiotics will be delivered safely

50% - OPAT service helped to allow earlier discharge

86% - No difficulty reaching the OPAT team by telephone when needed (i.e. good availability)

Testimonials:

- 1) An excellent service. Consulting on EPR is easy, and patients are seen quickly. Eliminates the need to arrange drug monitoring prior to discharge.
- 2) The OPAT service is an absolute necessity in providing safe out-patient care for IV antibiotic therapy. The community simply does not have the resources or the collaborative capability to provide these patients with the close monitoring that they require. In having this service, OPAT allows for these patients to discharge from hospital sooner safely. In addition, OPAT is working so well in that the people running the program are doing an incredible job and are highly specialized and competent in this field. The only suggestion that I have would be that OPAT link even further (directly) with CCAC.
- 3) I think this is a great service and allows for continuity of care into the community. I am much more comfortable with discharges on IV antibiotics knowing that the patient will be followup in the community.
- 4) This service is extremely beneficial for our patients ensuring a safe discharge with appropriate follow up.
- 5) Close monitoring of adverse effects and well as titration of therapy will fall back on the service responsible for discharge the patient to titrate dosages and keep tabs on lab work as most family physicians decline to do this.
- 6) I strongly believe the program has helped improve patient care. Knowing a patient will be followed by the OPAT program makes me feel much more comfortable sending patients home on antibiotics, especially IV antibiotics that require levels and may be used for a prolonged period of time.
- 7) Thanks for the prompt response when a patient is referred to OPAT - your quick assessment improves patient care.
- 8) My suggestions is that the OPAT team size should increase so we can make more referrals to them
- 9) Excellent service

Next Steps: Analyze the survey results to look at our current processes and find ways to improve them with the goal of optimizing patient-centered care pertaining to outpatient use of antimicrobials.

OPAT UPDATES

- OPAT is working closer with the Toronto Central CCAC (TOCCAC)
- A “lunch and learn” session is in the works to share best practices and further improves communications and efficiencies across the two organizations
- Subsequent to that session, the TOCCAC has created an OPAT reference code which can readily identify OPAT patients and improve communication infrastructures between all involved care providers. With the reference code in place, it will be possible in the future to run reports through the TOCCAC internal electronic charting system on clients identified as OPAT. This will also enable us to post-code all current or past TOCCAC clients for research purposes.
- Partnership with the TOCCAC enables our program to reduce paper consumption and personnel time by faxing directly from a computer using the system established for this purpose by TOCCAC. This also allows electronic copies to be saved.
- **Dr. James Brunton, Mr. Ron Fung, and Mr. Lucas Thung** were invited to attend a bimonthly meeting with the TOCCAC and its nursing service providers in the community. At that meeting, an overview of the OPAT program was provided. Each organization will be compiling a “wish” list for dissemination to the other with the mutual goal of optimizing outpatient antimicrobial therapy.
- OPAT is utilizing the newly purchased “Huddle” system to collaborate and share documents online. This improves the turn around time for collaborations and makes it easier to access our documents from virtually anywhere via the internet.
- OPAT aims to expand its service to the Mount Sinai Hospital sometime next year (Spring / Fall 2011)
- OPAT will be meeting with Calea, the main pharmacy service provider in the Greater Toronto Area for intravenous admixtures, in mid-to-late November 2010 to gain a better understanding of their workflow processes and work towards collaborative research initiatives.
- **Ms. Brittany Weber**, a fourth year pharmacy student at the University of Waterloo currently working with the OPAT program, has created an OPAT Patient Information Handout. Once reviewed and approved by other members of the UHN ASP, the handout will be available for general dissemination to patients and other service providers. It is our goal that this handout will serve to enhance communication(s) with our very diverse and multilingual patient population at UHN.

OPAT database:

Led by **Ms. Lopa Naik**, with valuable input from **Dr. James Brunton, Mr. Lucas Thung, and Mr. Ron Fung**, a new and improved Microsoft Access-based database has been successfully created. This was truly a team-based effort and required multiple meetings with many of the Information Technology departments affiliated with UHN over many months. Being a relational database, this will enable us to store all patient health records in normal form (a database term, meaning “without redundant information”) for ease of analysis. It is our immediate goal to test the new database to ensure 100% accuracy and hope to have it fully functional in the coming weeks.

Previously, a major limitation to the expansion of the OPAT program was the labour-intensive nature of the data entry required by the clinical team members. One significant upgrade with the new database is that the majority of the information can now be auto-populated with data from EDW. With the expertise of **Ms. Naik**, a connection between our new OPAT database and EDW has been created which will act as an interface allowing data extraction from EDW. The database has been further automated using various programming skills and incorporation of macros to make it more user-friendly. Furthermore, our new database will also be helpful in generating introductory and follow-up physician letters directly from the data within.

Moving forward, we will be investigating the possibility of changing the platform of the database from MS Access to Oracle® to minimize the number of connections required to directly extract the patient data and to improve its overall robustness in terms of data and outcome analysis.

PRINCESS MARGARET HOSPITAL

LEUKAEMIA SERVICE

The Antimicrobial Stewardship Program (ASP) suspended their once weekly rounds with the 3 clinical associates. The reasons for this were complex however the decision was made primarily because the potential benefit of the ASP's involvement was minimized by the diminishing number of patients not being followed by the Infectious Diseases consult service (at PMH).

Currently we are working together with the PMH administration, physicians, and nurses to gather together data that we have agreed to monitor and use in the future.

ASP aims to re-introduce regular rounds with the **clinical associates** and **other key members of the Leukemia service (attending physicians and pharmacists)** multiple times per week for approximately 10-15 minutes (the exact frequency to be determined) to review patients not being followed by the Immunocompromised Host Infectious Diseases Consultation Service in December 2010.

TORONTO GENERAL HOSPITAL

MEDICAL-SURGICAL INTENSIVE CARE UNIT

The ASP worked with its colleagues in the TGH Medical-Surgical ICU in preparation for introducing daily prospective audit and feedback for the beginning of the 3rd quarter of this fiscal year. An agreement was reached to conduct ASP rounds daily at 9 am (for about 10-25 minutes) prior to the daily ICU bedside rounds. This "method" contrasts slightly with the approach the ASP takes at Mount Sinai and Toronto Western Hospitals (MSH and TWH), where we meet after the ICU team has completed daily bedside rounds, around the noon hour. **Dr. Laura Hawryluck** is the ICU physician-lead for this project. The ASP is very excited to be working closely with yet another excellent ICU team, and anticipate that the process will be as enjoyable and as successful as it has been in the other intensive care units.

TORONTO WESTERN HOSPITAL

MEDICAL-SURGICAL INTENSIVE CARE UNIT

The ASP group continues to round with the ICU team on a regular basis. (Of note, audit-and-feedback with the TWH ICU started almost 1 year ago.) Dr. Dresser rounds with the ICU team on weekdays at noon and also gives a noon-hour teaching session to the ICU team on Fridays; Dr. Morris is present for ASP rounds on Mondays and Thursdays. Rounds take approximately 10 minutes. Full results are in the [Appendix](#), but are summarized below:

- January-August 2010 antimicrobial usage (using defined daily doses (DDDs) per 100 patient days) has decreased by 13% compared to January-August 2009, and is currently at 83 DDD/100 patient days.
- Antimicrobial costs have also decreased since beginning the program and January-August 2010, and are \$10.14/patient day, representing a 37% year-over-year reduction in costs. This represents an approximately \$27K cost savings, or roughly \$3 400/month.

TORONTO ANTIMICROBIAL STEWARDSHIP CORRIDOR

The Toronto Antimicrobial Stewardship Corridor (TASC) is a relatively new collaboration between the ASP and like-minded individuals in around the Greater Toronto Area. Along with Mount Sinai Hospital and University Health Network, the group currently includes antimicrobial stewardship representatives from: Hospital for Sick Children, North York General Hospital, St. Joseph's Health Centre, St. Michael's, Sunnybrook Hospital, Toronto East General Hospital, Trillium Health Centre and William Osler Health Centre. Chaired by **Drs. Morris** and **Nelson**, TASC aims to share best practices and educational tools, while developing a research agenda. Each of these hospitals either has the beginnings of an ASP or will be starting one up shortly. We feel strongly that the MSH-UHN ASP needs to help these programs in whatever manner possible to be strong and successful, which will help all hospitals in the long run.

Monique Pitre, a TASC member, will be leading an effort to develop a standardized antimicrobial stewardship handbook (or electronic guide) that is applicable to all sites. The first area to examine is community acquired pneumonia.

Dr. Morris has purchased the web-based solution Huddle™ to meet the need to share documents and resources and gives members of various groups the ability collaborate online. A significant portion of the generous donation from Pfizer Canada was used for this purpose, with the hopes of allowing other "stewards" of antimicrobials around Canada and internationally to tap into the expertise which we are rapidly developing and facilitating at **Mount Sinai Hospital** and **University Health Network**.

ANTIMICROBIAL STEWARDSHIP PROGRAM RESEARCH

From the time the ASP was initiated, it has pursued the model that all of its activities should be based on the best available evidence, should be studies to observe real-world outcomes, and should contribute to modern medical practice with knowledge translation. For this reason, the ASP has asked for Research Ethics Board approval for evaluating almost every project it undertakes (with the intention to publish). Some of this research has been listed above.

In addition, the ASP used a significant portion of its funds generously donated by Pfizer Canada Inc. to pursue a formal, investigator-initiated research agenda that focuses on patient outcomes: mortality, length of stay (in the hospital or intensive care unit), and quality of life. Antimicrobial resistance and superinfections (e.g. *C. difficile* and candidaemia) are also important outcomes. Drs. Chaim Bell and Lisa Burry have led this research agenda. In particular, Dr. Burry has made many important contributions in her short time with us to establish the MSH-UHN ASP as a growing research program. It is therefore bittersweet that we wish her well as she has decided to return to her first love, the Intensive Care Unit.

ANTIMICROBIAL STEWARDSHIP IN THE ICU

The first research project will be using the data accrued from the clinical activities of the ASP (**Drs. Dresser, Morris and Nelson**). Supported by **Drs. Burry and Morris**, Infectious Diseases and Critical Care fellow **Dr. Brian Minnema** will be looking at clinical, microbiological and antimicrobial utilization outcomes in a "step-wedge" trial design. (That is, looking at the effects of sequentially introducing the ASP at each of the 3 MSH-UHN intensive care units.)

Much of the data has already been collected, although the study will be looking at data from all ICUs as far back as 2007, and following it forward to 2012.

STAPHYLOCOCCUS AUREUS BACTERAEMIA

The second such project involves examining the management and outcomes of patients with *S. aureus* bacteraemia at all TASC member hospitals. It is an ambitious project being led by **Dr. Burry**, hoping to capture approximately 1000 episodes of *S. aureus* bacteraemia at the teaching hospitals. It will look at how patients are investigated and managed (including resource utilization such as echocardiography and length of stay), and will also be examining outcomes. Because *S. aureus* bacteraemia is such an important disease, the ASP hopes to use this study to springboard clinical trials and quality improvement projects into the best management of *S. aureus* bacteraemia. The study is anticipated to take 15-18 months to complete, although there are numerous logistical challenges (e.g. REB approvals at all sites, data-sharing agreements, standardizing methods, privacy issues, etc.) that need to be addressed. An infectious diseases fellow (**Dr. Dan Ricciuto**) and two medical residents (**Drs. Bryan Coburn and Adrienne Showler**) have contributed significantly in the development of this project. In addition they will each be conducting sub-projects as their major research projects for their 2010-11 residency research blocks. **Lopa Naik** has been instrumental in the development of the electronic database to support this project.

The study protocol and data collection forms have been submitted to the respective Research Ethics Boards for approval, and Drs. Coburn (Supervisor: **Dr. Matt Muller**, St. Michael's) and Showler (Supervisor: Dr. Andrew Morris) have had their research blocks approved for this coming academic year.

DELPHI PANEL

Drs. Andrew Morris, Chaim Bell, and Lisa Burry have submitted a Meeting Grant application to the Canadian Institute of Health Research (CIHR) for funding to organize an expert Delphi consensus panel focused on defining indicators for antimicrobial stewardship in acute care settings. The focus will be to determine the most appropriate measures used for evaluating antimicrobial stewardship initiatives. Knowledge generated during this process is planned to be shared with Accreditation Canada, Ontario Ministry of Health and Long-Term Care, ISMP Canada, AMMI Canada and Public Health Agency of Canada.

OPAT PRE- AND POST-IMPLEMENTATION

Ms. Anjie Yang, a UHN Pharmacy Resident supervised by **Ron Fung** with valuable input from other members of the MSH-UHN ASP team (primarily **Drs. Brunton and Dresser**), will be conducting a residency project looking at the clinical impact of the OPAT program. The main goal of the study will be to compare the clinical outcomes of patients discharged under the care of the OPAT team (intervention group) versus patients discharged with the standard of care prior to OPAT implementation in February 2010 (control group). The study population will consist of patients referred to the four main surgical services at UHN (namely cardiovascular, neurosurgery, orthopedics and vascular). The study methodology will be a retrospective chart review looking at the primary endpoint of cure rate, and a composite of secondary endpoints (treatment-related adverse effects, re-hospitalizations, vascular access device complications). These end points are contingent on our sample size calculations and may be modified after consultation with a hospital statistician. Once the study protocol has been finalized, it is our hope that data collection will begin in December 2010 pending REB approval.

ANTIMICROBIAL STEWARDSHIP PROGRAM EDUCATION

One of the ASP's mandates is to increase the antimicrobial stewardship capacity locally, provincially, and nationally. All of the clinical members of the ASP play a role in stewardship education, giving one-on-one advice to healthcare providers, having teaching sessions within the hospitals, supervising trainees, giving rounds to colleagues at other institutions, or developing educational curricula.

Drs. Dresser and Nelson recently published an article about the pharmacist's role in an antimicrobial stewardship program. (Dresser L., Nelson S. Practice Spotlight: Pharmacists in an Antimicrobial Stewardship Program. *Canadian Journal of Hospital Pharmacy* 2010; **63**:328-329)

TORONTO COURSE ON ANTIMICROBIAL STEWARDSHIP

“TAKING IT TO THE NEXT LEVEL”

Members of the ASP (**Tanaz Khory, Linda Dresser, Sandra Nelson, Melanie Thomson, Lucas Thung, Lopa Naik**) have been planning this course (slated for June 2-4, 2011) that will target pharmacists, physicians, infection control personnel and hospital administrators. Its purpose is to help healthcare providers and hospital leaders develop, implement and optimize their antimicrobial stewardship programs. Unlike some courses which focus on antimicrobial and infectious diseases content, this course will be focusing on developing the skills and knowledge required to get a stewardship program up off the ground and functioning. It will include a hybrid of interactive sessions and facilitated workshops for hands on learning and case studies will be discussed regarding different aspects of an antimicrobial stewardship program. This course will be the first and only one of its kind in Canada, and will highlight the **MSH-UHN ASP**.

OPAT PHARMACY STUDENT INVOLVEMENT

As part of her co-operative placement with the OPAT program, **Ms. Brittany Weber**, a fourth year pharmacy student at the University of Waterloo will be helping to develop clinical practice competencies which may be used for the future training of pharmacy students. Once reviewed by members of the UHN ASP team, it is our goal that the UHN ASP program will be a leader in experiential education for the year-round involvement of pharmacy students through physician, pharmacist and peer mentoring.

APPENDIX

Mount Sinai Hospital - University Health Network Antimicrobial Stewardship Program

Standard Operating Procedures (SOP)

The following are the standard operating procedures for the Mount Sinai Hospital-University Health Network Antimicrobial Stewardship Program (MSH-UHN ASP) and have been approved by Dr. Andrew Morris, Director, MSH-UHN ASP:

1. Quarterly Report
2. Communication
3. Huddle
4. Antibigram
5. Branding
6. Terms of Reference
7. Antibiotic Advisory Committee

1. Quarterly Report

Quarterly Reports Process/Timeline for Completion

Quarterly Reports will be completed and distributed to members of the Oversight Committee 5-7 business days prior to the quarterly Oversight Committee meeting, at which the Quarterly Report may be discussed. The Quarterly Report will be shared with others, as requested.

A first draft will be posted on Huddle approximately 2 weeks prior to the distribution date by the Project Managers, allowing all team members time to go in and update content/data in the report.

Data Dictionary

The MSH-UHN ASP Data Dictionary contains the definition/calculation, source and responsible person for all indicators tracked and reported on by the MSH-UHN ASP. This is also shared on Huddle for all members of the team to refer to, as needed. As new indicators are tracked and reported, they should be added to the data dictionary. See **Appendix A** for complete **Data Dictionary**.

2. Communication (i.e. Memo to Medical Staff)

Members will work on content, appropriate to their expertise, and then sent out by the Project Managers on behalf of MSH-UHN ASP.

3. Huddle

Huddle Inc. (www.huddle.net) is a web-based platform acting as a shared drive between members of the MSH-UHN ASP and helps the team work collaboratively with other professionals on joint research projects. Each member has their individual log in and password.

Workspaces have been created for all clinical, research and education initiatives/projects. This includes the Toronto Antimicrobial Stewardship Corridor (TASC) and the Antimicrobial Stewardship Course. Individuals involved with the different initiatives/projects have been invited to become members of the respective workspace.

Project Managers and the Director of the MSH-UHN ASP team have administrative rights to the program. Team members should filter requests, invitations, and folder creation through the Project Managers.

4. Antibiogram

TBD

5. Branding

The MSH-UHN ASP team collaborated with Re-Generate Design Inc. (www.re-generate.ca) to create logos and presentation templates for the ASP and the TASC group.

The logos and templates are housed in Huddle, where they are accessible to all members for use.

6. Terms of Reference

MSH-UHN ASP has a Terms of Reference in place that includes purpose, objectives and key stakeholders. The Terms of Reference will be reviewed and updated annually.

MOUNT SINAI HOSPITAL

ICU

Mount Sinai Hospital ICU Antimicrobial Usage

Note: Defined Daily Dose (DDD) is an internationally accepted method to measure and compare antimicrobial usage, although it does have limitations. Example of a DDD: the DDD for cefazolin is 3 g since the standard daily dose is 1 g IV q8h.

Antimicrobial Usage Measure	FY 08-09	FY 09-10	Q1/Q2 FY 10-11	Difference between Q1/Q2 FY 10-11 and FY 09-10	
				% Change	Numerical Change
Total Antimicrobial DDDs*	8861	8128	3594		
Mean Antimicrobial DDDs/Quarter	2215	2032	1797	-11.6%	-235
Antimicrobial DDDs/100 Patient Days	185	168	164	-2.4%	-4
Systemic Antibacterial DDDs	6875	6058	2527		
Mean Systemic Antibacterial DDD/Quarter	1719	1515	1264	-16.6%	-251
Systemic Antibacterial DDDs/ 100 Patient Days/Quarter	143	126	115	-8.7%	-11
Systemic Antifungal DDDs	1478	1332	433		
Mean Systemic Antifungal DDDs/Quarter	370	333	216	-35.1%	-117
Systemic Antifungal DDDs/ 100 Patient Days/Quarter	31	28	20	-28.6%	-8
Other** Antimicrobial DDDs	509	738	634		
Mean Other Antimicrobial DDDs/Quarter	127	185	317	+71.4%	+132
Other Antimicrobial DDDs/ 100 Patient Days/Quarter	11	15	29	+93.3%	+14

Note: Hydroxychloroquine and chlorhexidine 0.12% oral rinse excluded

*Total Antimicrobial DDDs is the sum of systemic antibacterial DDDs + systemic antifungal DDDs + other antimicrobial DDDs

**Other Antimicrobial DDDs are the DDDs for any antimicrobial that is neither a systemic antibacterial or systemic antifungal

Mount Sinai Hospital ICU Antimicrobial Costs

Antimicrobial Cost Measure	FY 08-09	FY 09-10	Q1-Q2 10-11	Difference between Q1-2 10/11 and FY 09/10	
				% Change	Numerical Change
Total Antimicrobial Costs*	\$334,920	\$288,154	\$91,789		
Mean Antimicrobial Costs/Quarter	\$83,730	\$72,038	\$45,895	-36.3%	-\$26,144
Antimicrobial Costs/Patient Day	\$69.85	\$59.68	\$41.78	-30.0%	-\$18
Systemic Antibacterial Costs					
Systemic Antibacterial Costs	\$171,454	\$139,645	\$47,988		
Mean Systemic Antibacterial Costs/Quarter	\$42,864	\$34,911	\$23,994	-31.3%	-\$10,917
Systemic Antibacterial Costs/Patient Day	\$35.76	\$28.92	\$21.84	-24.5%	-\$7
Systemic Antifungal Costs					
Systemic Antifungal Costs	\$143,019	\$132,475	\$36,699		
Mean Systemic Antifungal Costs/Quarter	\$35,755	\$33,119	\$18,350	-44.6%	-\$14,769
Systemic Antifungal Costs/Patient Day	\$29.83	\$27.44	\$16.70	-39.1%	-\$11
Other Antimicrobial Costs**					
Other Antimicrobial Costs**	\$20,447	\$16,034	\$7,102		
Mean Other Antimicrobial Costs/Quarter	\$5,112	\$4,008	\$3,551	-11.4%	-\$457
Other Antimicrobial Costs/Patient Day	\$4.26	\$3.32	\$3.23	-2.7%	-\$0.09

Note: Hydroxychloroquine and chlorhexidine 0.12% oral rinse excluded

*Total Antimicrobial Costs is the sum of systemic antibacterial costs + systemic antifungal costs + other antimicrobial costs;

**Other Antimicrobial Costs are the costs of any antimicrobial that is neither a systemic antibacterial or systemic antifungal

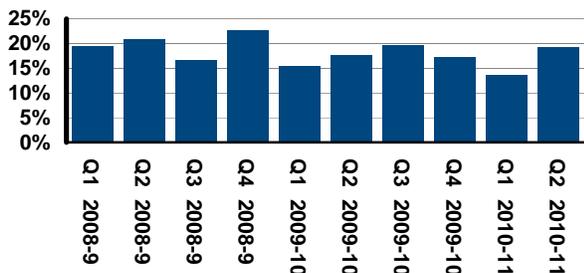
Antimicrobial Costs in MSH ICU FY 2007-8 to 2009-10, according to PMH or non-PMH origin

	2007-8	2008-9	2009-10	% Change 09/10 vs mean two prior years	\$ Change 09/10 vs mean two prior years
Total Antibacterial Costs	\$235,160	\$171,454	\$139,645	-31.3%	-\$63,662
Non-PMH Patients	\$183,835	\$123,272	\$76,677	-50.1%	-\$76,876
PMH Patients	\$51,325	\$48,182	\$62,968	26.6%	\$13,214
Total Antifungal Costs	\$184,213	\$143,019	\$132,475	-19.0%	-\$31,141
Non-PMH Patients	\$83,720	\$69,635	\$49,338	-35.7%	-\$27,339
PMH Patients	\$100,494	\$73,384	\$83,137	-4.4%	-\$3,802
Total Other Antimicrobial Costs	\$6,323	\$20,447	\$16,034	19.8%	\$2,649
Non-PMH Patients	\$4,617	\$10,704	\$8,126	6.1%	\$465
PMH Patients	\$1,705	\$9,743	\$7,908	38.2%	\$2,184
Total All Antimicrobial Costs (antibacterial + antifungal + other)	\$425,696	\$334,920	\$288,154	-24.2%	-\$92,154
Non-PMH Patients	\$272,172	\$203,610	\$134,140	-43.6%	-\$103,751
PMH Patients	\$153,524	\$131,310	\$154,013	8.1%	\$11,596

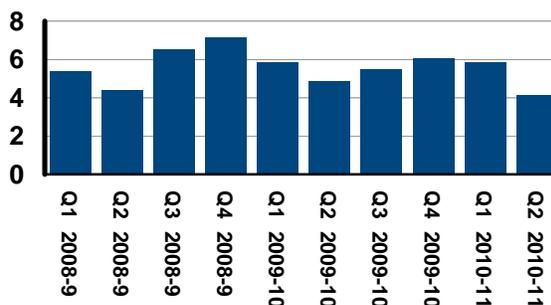
**Antimicrobial Costs in MSH ICU Q1-Q2 2009-10 vs Q1-Q2 10-11,
 according to PMH or non-PMH origin**

	Q1-2 2009-10	Q1-2 2010-11	% Change Q1-2 10/11 vs 09/10	\$ Change Q1-2 10/11 vs 09/10
Total Antibacterial Costs	\$66,412	\$47,988	-27.74%	-\$18,424
Non-PMH Patients	\$41,580	\$26,055	-37.34%	-\$15,525
PMH Patients	\$24,832	\$21,933	-11.68%	-\$2,900
Total Antifungal Costs	\$59,454	\$36,699	-38.27%	-\$22,755
Non-PMH Patients	\$25,621	\$8,608	-66.40%	-\$17,012
PMH Patients	\$33,834	\$28,091	-16.97%	-\$5,742
Total Other Antimicrobial Costs	\$10,828	\$7,102	-34.41%	-\$3,725
Non-PMH Patients	\$5,720	\$2,225	-61.10%	-\$3,495
PMH Patients	\$5,107	\$4,877	-4.51%	-\$230
Total All Antimicrobial Costs (antibacterial + antifungal + other)	\$136,694	\$91,789	-32.85%	-\$44,904
Non-PMH Patients	\$72,920	\$36,888	-49.41%	-\$36,032
PMH Patients	\$63,773	\$54,901	-13.91%	-\$8,872

MSH ICU Mortality

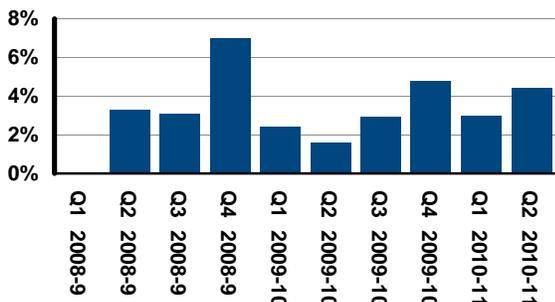


MSH ICU Mean Length of Stay (days)



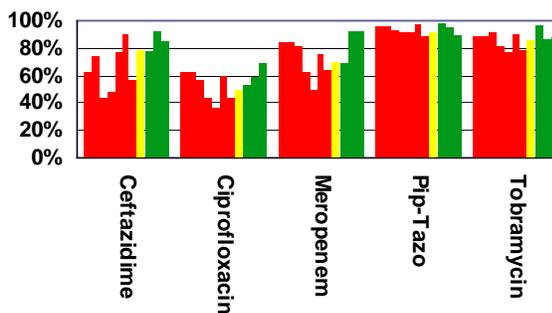
MSH ICU Readmission

(% Readmitted to ICU within 48h of discharge)

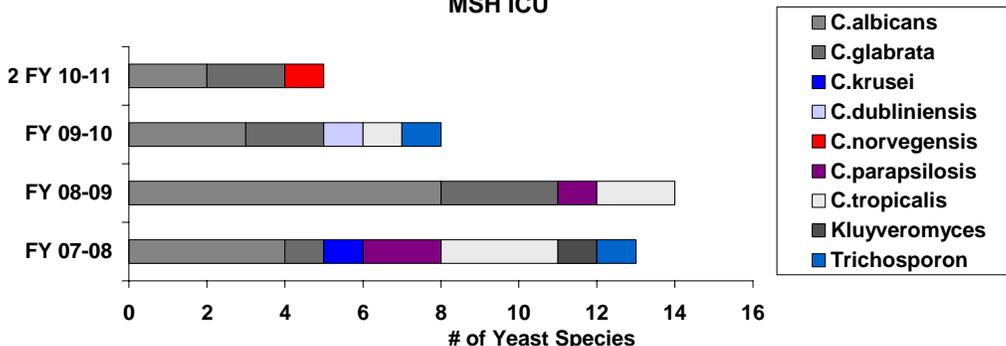


MSH ICU Pseudomonas Susceptibility

April 2005 - September 2010



Number of Yeast Species Isolated in Blood MSH ICU



14th Floor

Mount Sinai Hospital 14th Floor Antimicrobial Usage

Antimicrobial Usage Measure	FY 09-10	Q1/Q2 FY 10-11	Difference between Q1/Q2 FY 10-11 and FY 09-10	
			% Change	Numerical Change
Total Antimicrobial DDDs*	12740	4918		
Mean Antimicrobial DDDs/Quarter	3185	2459	-23%	-726
Antimicrobial DDDs/100 Patient Days	67	57	-15%	-10
Systemic Antibacterial DDDs	11366	4333		
Mean Systemic Antibacterial DDDs/Quarter	2841	2167	-24%	-674
Systemic Antibacterial DDDs/100 Patient Days	60	50	-17%	-10
Systemic Antifungal DDDs	217	241		
Mean Systemic Antifungal DDDs/Quarter	54	120	122%	66
Systemic Antifungal DDDs/100 Patient Days	1	3	200%	2
Other Antimicrobial DDDs	1157	344		
Mean Other Antimicrobial DDDs/Quarter	289	172	-40%	-117
Other Antimicrobial DDDs/100 Patient Days	6	4	-33%	-2

Note: Hydroxychloroquine and chlorhexidine 0.12% oral rinse excluded

*Total Antimicrobial Costs is the sum of systemic antibacterial costs + systemic antifungal costs + other antimicrobial costs;

**Other Antimicrobial Costs are the costs of any antimicrobial that is neither a systemic antibacterial or systemic antifungal

Mount Sinai Hospital 14th Floor Antimicrobial Costs

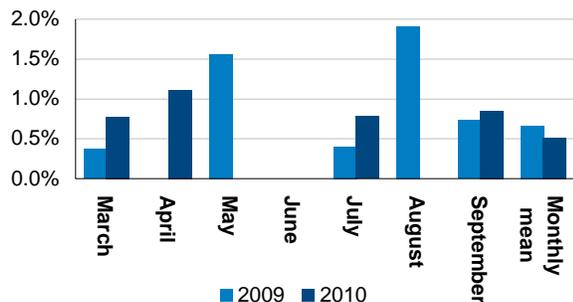
Antimicrobial Cost Measure	FY 09-10	Q1-Q2 10-11	Difference between Q1-2 10/11 and FY 09/10	
			% Change	Numerical Change
Total Antimicrobial Costs*	\$92,127	\$45,884		
Mean Antimicrobial Costs/Quarter	\$23,032	\$22,942	-0.4%	-\$90
Antimicrobial Costs/Patient Day	\$4.86	\$5.15	6.0%	\$0.29
Systemic Antibacterial Costs	\$83,358	\$41,709		
Mean Systemic Antibacterial Costs/Quarter	\$20,840	\$20,855	0.1%	\$15
Systemic Antibacterial Costs/Patient Day	\$4.39	\$4.68	6.5%	\$0.28
Systemic Antifungal Costs	\$3,853	\$3,397		
Mean Systemic Antifungal Costs/Quarter	\$963	\$1,699	76.3%	\$735
Systemic Antifungal Costs/Patient Day	\$0.20	\$0.38	87.6%	\$0.18
Other Antimicrobial Costs**	\$4,915	\$778		
Mean Other Antimicrobial Costs/Quarter	\$1,229	\$389	-68.3%	-\$840
Other Antimicrobial Costs/Patient Day	\$0.26	\$0.09	-66.3%	-\$0.17

Note: Hydroxychloroquine and chlorhexidine 0.12% oral rinse excluded

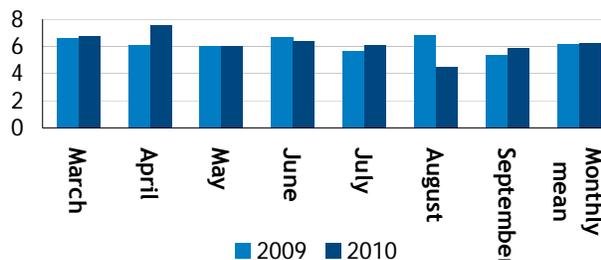
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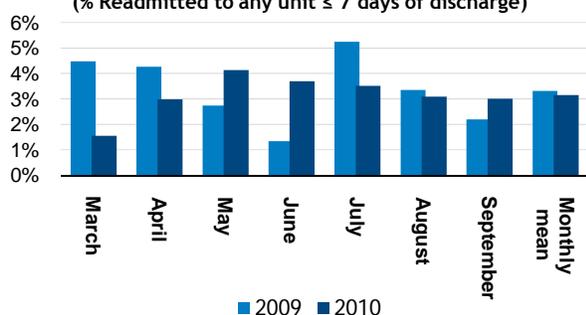
MSH 14th Floor Mortality



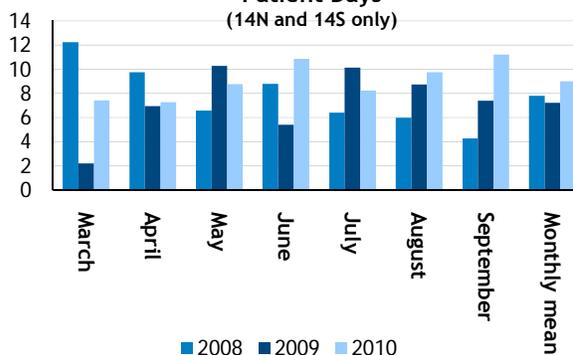
MSH 14th Floor Mean Length of Stay (days)



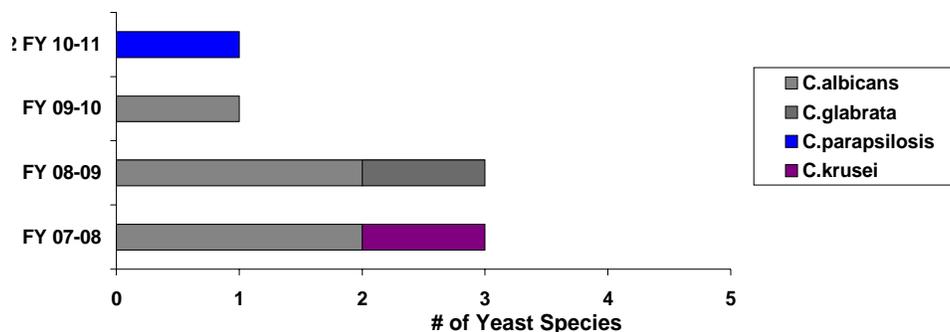
MSH 14th Floor Readmissions (% Readmitted to any unit ≤ 7 days of discharge)



MSH 14th Floor Isolation Days per 100 Patient Days (14N and 14S only)



Number of Yeast Species Isolated in Blood 14th Floor MSH



TWH ICU Antimicrobial Usage

Antimicrobial Usage Measure	Jan - Aug 2009	Jan - Aug 2010	Difference	
			% Change	Numerical Change
Total Antimicrobial DDDs*	4652	4232	-9.0%	-420.14
Mean Antimicrobial DDDs/Quarter	1744	1587	-9.0%	-157.55
Antimicrobial DDDs/100 Patient Days	95	83	-12.7%	-12.01
Systemic Antibacterials				
Systemic Antibacterial DDDs	4327	3830	-11.5%	-497.77
Mean Systemic Antibacterial DDDs/Quarter	1623	1436	-11.5%	-186.66
Systemic Antibacterial DDDs/100 Patient Days	88	75	-15.1%	-13.26
Systemic Antifungals				
Systemic Antifungal DDDs	225	316	40.2%	90.64
Mean Systemic Antifungal DDDs/Quarter	84	118	40.2%	33.99
Systemic Antifungal DDDs/100 Patient Days	5	6	34.6%	1.59
Other Antimicrobials				
Other Antimicrobial DDDs**	99	86	-13.1%	-13.00
Mean Other Antimicrobial DDDs/Quarter	37	32	-13.1%	-4.88
Other Antimicrobial DDDs/100 Patient Days	2	2	-16.6%	-0.34

Note:

*Total Antimicrobial Costs is the sum of systemic antibacterial costs + systemic antifungal costs + other antimicrobial costs;

**Other Antimicrobial Costs are the costs of any antimicrobial that is neither a systemic antibacterial or systemic antifungal



TWH ICU Antimicrobial Costs

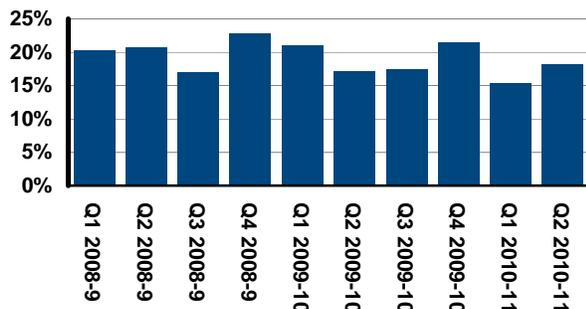
Antimicrobial Cost Measure	Jan - Aug 2009	Jan - Aug 2010	Difference	
			% Change	Numerical Change
Total Antimicrobial Costs*	\$79,129	\$51,955	-34.3%	-\$27,174.20
Mean Antimicrobial Costs/Quarter	\$29,673	\$19,483	-34.3%	-\$10,190.33
Antimicrobial Costs/Patient Day	\$16.10	\$10.14	-37.0%	-\$5.95
Systemic Antibacterial Costs	\$73,039	\$40,260	-44.9%	-\$32,778.31
Mean Systemic Antibacterial Costs/Quarter	\$27,390	\$15,098	-44.9%	-\$12,291.87
Systemic Antibacterial Costs/Patient Day	\$14.86	\$7.86	-47.1%	-\$7.00
Systemic Antifungal Costs	\$5,497	\$10,771	96.0%	\$5,274.54
Mean Systemic Antifungal Costs/Quarter	\$2,061	\$4,039	96.0%	\$1,977.95
Systemic Antifungal Costs/Patient Day	\$1.12	\$2.10	88.1%	\$0.98
Other Antimicrobial Costs**	\$593	\$923	55.6%	\$329.57
Mean Other Antimicrobial Costs/Quarter	\$222	\$346	55.6%	\$123.59
Other Antimicrobial Costs/Patient Day	\$0.12	\$0.18	49.3%	\$0.06

Note:

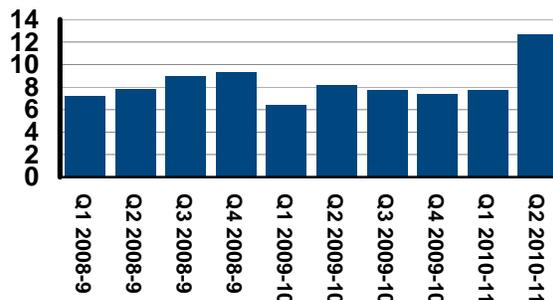
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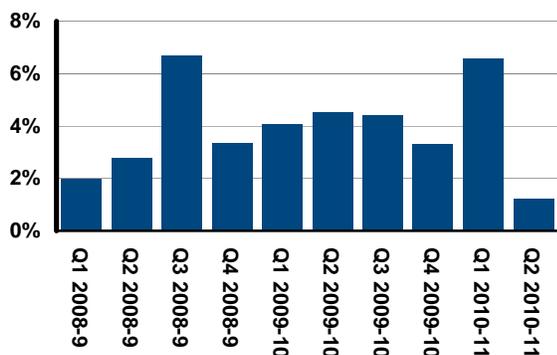
TWH ICU Mortality



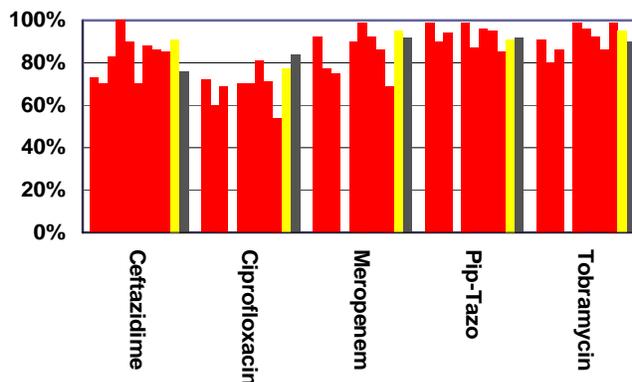
TWH ICU Mean Length of Stay (days)



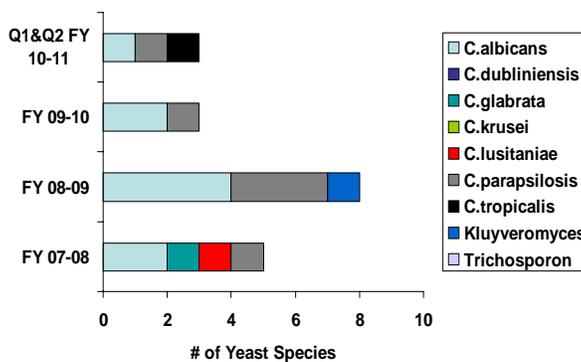
TWH ICU Readmission
 (% Readmitted to ICU within 48h of discharge)



TWH ICU Pseudomonas Susceptibility
 April 2005 - September 2010



Number of Yeast Species Isolated from Blood
 TWH ICU



TGH ICU Antimicrobial Usage

Antimicrobial Usage Measure	FY 09-10	FY 10-11 (April - Aug)	Difference	
			% Change	Numerical Change
Total Antimicrobial DDDs*	18209	6599		
Mean Antimicrobial DDDs/Quarter	4552	3959	-13.0%	-592.97
Antimicrobial DDDs/100 Patient Days	266	223	-16.1%	-42.75
Systemic Antibacterial DDDs				
Systemic Antibacterial DDDs	12527	4588		
Mean Systemic Antibacterial DDDs/Quarter	3132	2753	-12.1%	-379.28
Systemic Antibacterial DDDs/100 Patient Days	183	155	-15.2%	-27.79
Systemic Antifungal DDDs				
Systemic Antifungal DDDs	4268	1431		
Mean Systemic Antifungal DDDs/Quarter	1067	858	-19.6%	-208.75
Systemic Antifungal DDDs/100 Patient Days	62	48	-22.4%	-13.96
Other Antimicrobial DDDs**				
Other Antimicrobial DDDs	1413	580		
Mean Other Antimicrobial DDDs/Quarter	353	348	-1.4%	-4.94
Other Antimicrobial DDDs/100 Patient Days	21	20	-4.8%	-1.00

Note:

*Total Antimicrobial Costs is the sum of systemic antibacterial costs + systemic antifungal costs + other antimicrobial costs;

**Other Antimicrobial Costs are the costs of any antimicrobial that is neither a systemic antibacterial or systemic antifungal

TGH ICU Antimicrobial Costs

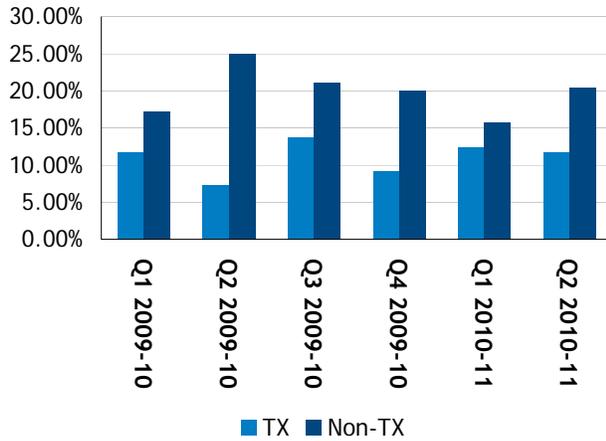
Antimicrobial Cost Measure	FY 09-10	FY 10-11 (April - Aug)	Difference	
			% Change	Numerical Change
Total Antimicrobial Costs*	\$701,451	\$301,843		
Mean Antimicrobial Costs/Quarter	\$175,363	\$181,106	3.3%	\$5,742.84
Antimicrobial Costs/Patient Day	\$102.52	\$102.18	-0.3%	-\$0.34
Systemic Antibacterial Costs				
Systemic Antibacterial Costs	\$387,823	\$152,725		
Mean Systemic Antibacterial Costs/Quarter	\$96,956	\$91,635	-5.5%	-\$5,320.82
Systemic Antibacterial Costs/Patient Day	\$56.68	\$51.70	-8.8%	-\$4.98
Systemic Antifungal Costs				
Systemic Antifungal Costs	\$310,274	\$148,483		
Mean Systemic Antifungal Costs/Quarter	\$77,568	\$89,090	14.9%	\$11,521.18
Systemic Antifungal Costs/Patient Day	\$45.35	\$50.26	10.8%	\$4.92
Other Antimicrobial Costs**				
Other Antimicrobial Costs	\$3,355	\$635		
Mean Other Antimicrobial Costs/Quarter	\$839	\$381	-54.6%	-\$457.52
Other Antimicrobial Costs/Patient Day	\$0.49	\$0.22	-56.1%	-\$0.28

Note:

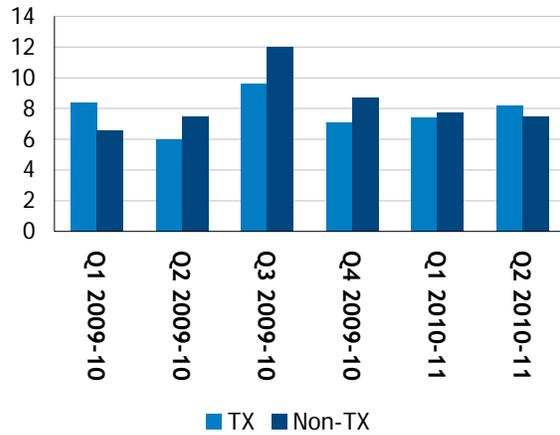
*Total Antimicrobial Costs is the sum of systemic antibacterial costs + systemic antifungal costs + other antimicrobial costs;

**Other Antimicrobial Costs are the costs of any antimicrobial that is neither a systemic antibacterial or systemic antifungal

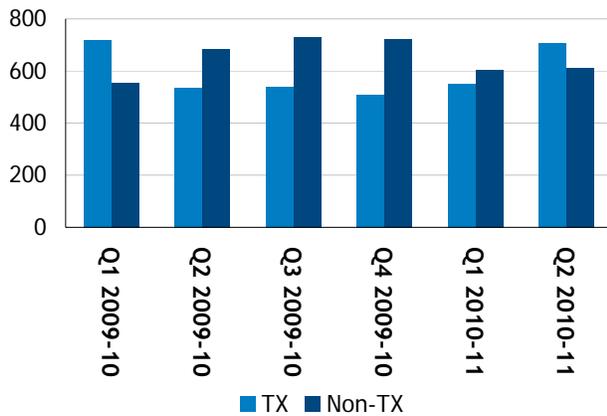
TGH ICU Mortality



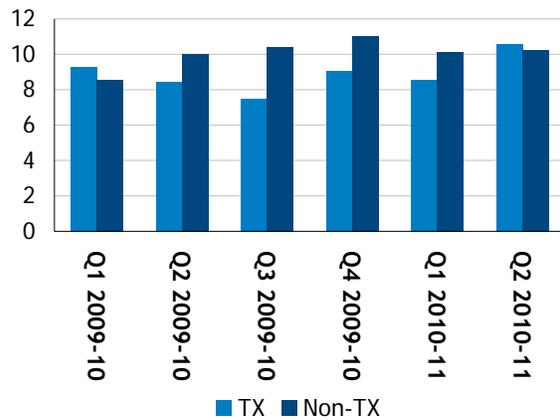
TGH ICU Mean Length of Stay (days)



TGH ICU Vent Days

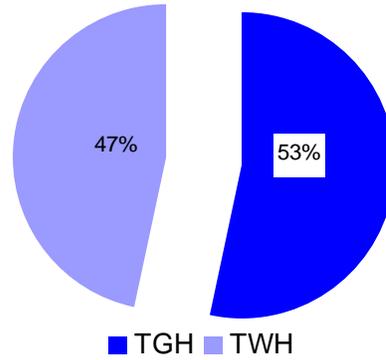
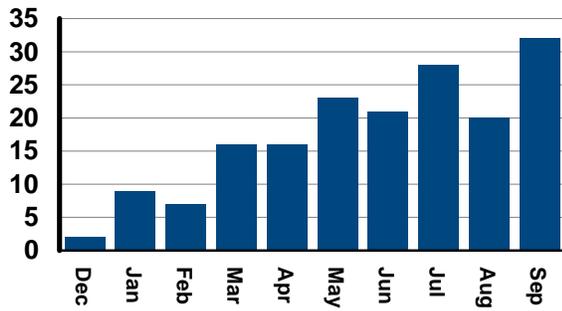


TGH ICU Bed Occupancy

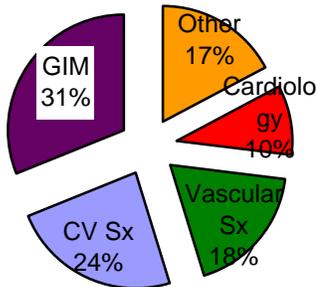


Outpatient Parenteral Antimicrobial Therapy (OPAT) Program

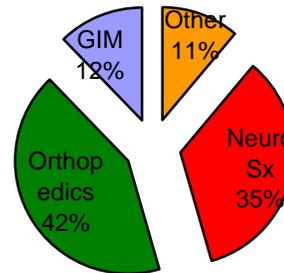
New Referrals to OPAT, by Month



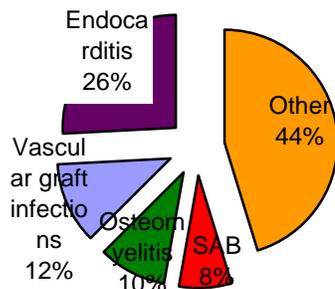
Referring Service, TGH



Referring Service, TWH



OPAT Diagnosis, TGH



OPAT Diagnosis, TWH

