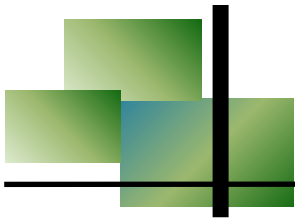




DEPARTMENT OF PATIENT SAFETY AND QUALITY

ANNUAL REPORT

2011



ANNUAL REPORT

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I. INTRODUCTION TO DEPARTMENT OF PATIENT SAFETY AND QUALITY ANNUAL REPORT

The 2011 Annual Report is organized according to the structure of the Department of Patient Safety and Quality. We hope this report provides a meaningful overview of the activities and accomplishments of our various sections in 2011.

As a result of quality improvement efforts across many disciplines, Denver Health was ranked #6 out of 110 academic health centers and was the highest performing Public Safety Net Hospital in the UHC data base on their aggregate quality and accountability score in 2011. Even more impressive, Denver Health has been ranked #1 out of 114 academic health centers with respect to observed to expected mortality for 9 of the previous 13 quarters. It is also notable that through great efforts to improve CMS Core measure performance in 2010 and 2011, the current estimates from both NAPH and UHC are that we will achieve a financial gain of approximately \$100,000 through the Medicare Value Based Purchasing program scheduled for implementation in 2013.

In 2011, the Department embraced the principles of effective meeting and strategic planning as outlined in the book "Death by Meeting". With a mix of tactical and strategic planning meetings, we believe we have achieved more than in any prior year.

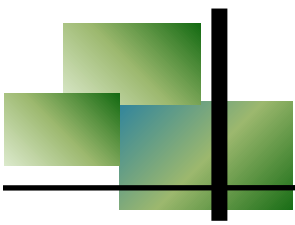
II. DEPARTMENT OF PATIENT SAFETY AND QUALITY 2011 ORGANIZATION, STAFF, AND BUDGET

A. ORGANIZATION

As of December 31, 2011, the Department of Patient Safety and Quality was comprised of nine units under the supervision of Philip Mehler, M.D, Chief Medical Officer. The units were:

1. Patient Safety and Quality Oversight: Thomas MacKenzie, MD, MSPH, Chief Quality Officer
2. Patient Safety, Quality and Regulatory Compliance: Kendra Moldenhauer, RN, Director
3. Ambulatory Quality Improvement: Ray Estacio, MD, Associate Director of CHS for Quality and Research, and Rachel Everhart, MS, Data Team Administrator
4. Division of Education: Chris Carey, MD, Director
5. Medical Biostatistics: Allison Sabel, MD, PhD, MPH, Director
6. Infection Prevention: Connie Price, MD, Director
7. Medical Staff Office: Sandra Taylor, CPCS, Manager
8. Health Services Research: Ed Havranek, MD, Director
9. Utilization Management: Teresa Kukolja, RN, Director

The Department of Patient Safety and Quality is responsible for clinical quality monitoring, performance improvement, utilization management, and regulatory preparedness.



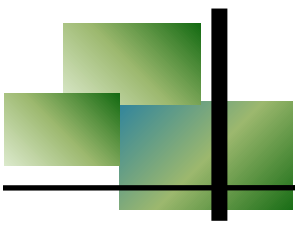
The Medical Staff Office (MSO) is responsible the credentialing and privileging of the Denver Health Medical Staff and Allied Health Professionals.

The Director of Education is responsible for bringing oversight and organization to the professional education occurring within Denver Health and Hospital Authority.

The Director of Regulatory Compliance and Care Process provides coordination of regulatory reviews, surveys, or inquiries to Denver Health. This includes activities related to Joint Commission, CMS, Office of Civil Rights, and the Colorado Department of Public Health and Environment. In addition, the Director also reviews care processes, systems, and tools to assist in improving the quality and efficiency of care provided and assures that these changes meet or exceed regulatory expectations. The Director of Regulatory Compliance also supports the many different quality initiatives of Denver Health and from the Department of Patient Safety and Quality.

The Director of Infection Control is responsible for provision of safe, high quality health care in the setting of minimizing the risk of acquiring and transmitting infections. This is accomplished through utilization of healthcare epidemiology, surveillance, and prevention strategies against healthcare associated infection, through the efforts of the infection control nurses.

Administration refers to the organizational support function for the MSO, Regulatory Compliance, Patient Representatives, and the Division of Education. All administrative functions (budget, space, equipment, etc.) are also subsumed in the Administration Section.



B. DEPARTMENT STAFF

As of December 31, 2011, the Department of Patient Safety and Quality positions and staff consisted of the following:

Chief Medical Officer, Denver Health – Philip Mehler, M.D.

Administrative Assistant, Adriana Padgett

Chief Quality Officer – Thomas MacKenzie, MD, MSPH

Administrative Assistant, Denise Delaney

Director of Patient Safety, Quality and Regulatory Compliance – Kendra Moldenhauer, RN

Continual Readiness administrative support: Jonathan Harry

Document Control Specialist: Kathleen Bybee

Senior Quality Improvement Nurse – Kelly Gettman, RN

Senior Quality Improvement Nurse – Julie Makatura, RN

Patient Safety Net Analyst – Stephanie Kennedy

Manager of Patient Safety and Quality –Peggy Alder, RN

Senior Quality Improvement Nurse – Pam Sue McLaughlin, RN

Director of Education – Chris Carey, MD

Education Secretary – Laura Rendon

Director of Medical Biostatistics – Allison Sabel, PhD MPH

Data Team Administrator – Vacant

Statistical Research Specialist - Carolyn Valdez

Director of Infection Control – Connie Price, MD

Manager of Infection Control – Amber Miller, MSN, RN, CIC

Infection Control Nurse – Cathy Vigil, BSN, RN, CIC

Infection Control Nurse – Amy Irwin, RN, DNP

CHS Infection Control Nurse – Kenneth Stiefvater, BSN, RN

Statistical Research Specialist – Brian Knepper, MSc, MPH

Antibiotic Stewardship Director – Tim Jenkins, MD

Antibiotic Stewardship Pharm D – Claire Swartwood, PharmD

Infectious Disease (ID) Fellow – Heather Young, MD

Manager of Medical Staff Office – Sandra Taylor, CPCS

MSO Credentialing Coordinator – Suzan Livengood

MSO Credentialing Coordinator – Sydney Befort

MSO Credentialing Coordinator – Aleka Trujillo

Director of Health Services Research – Ed Havranek, MD

Assistant Director, HSR – Susan Moore, MSPH

Research Projects Coordinator – Michael (Joshua) Durfee, MSPH

Research Projects Coordinator – Deborah Rinehart, PhD, MA

Hospital Physician Advisor – Norma Stiglich, MD

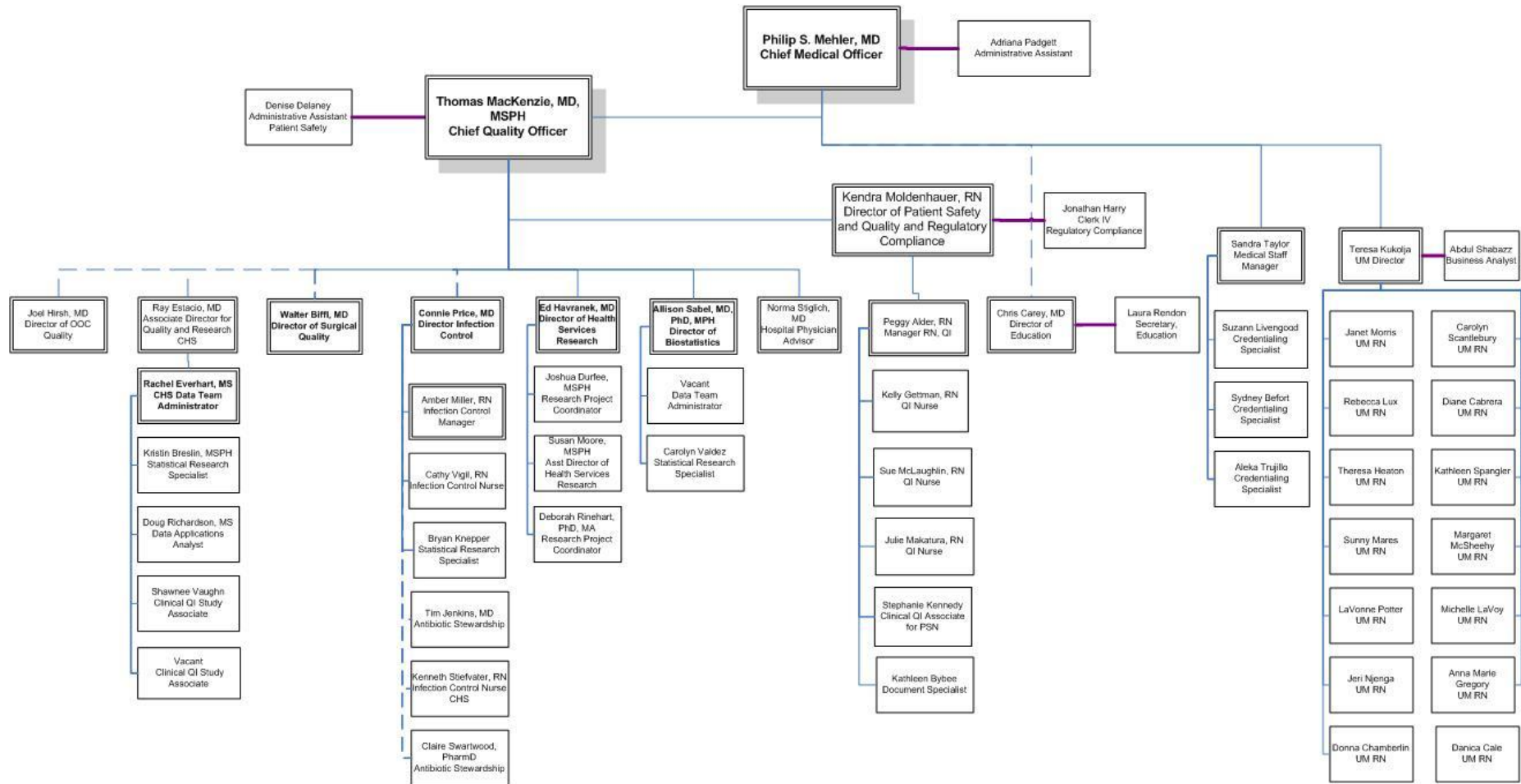
Director, Utilization Management – Teresa Kukolja, RN

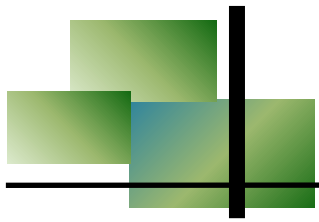
Director, Surgery Quality Improvement – Walter Biffl, MD

Attachment 1

Department of Patient Safety and Quality

January, 2012

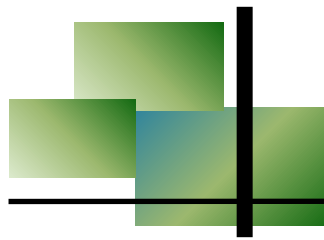




C. DEPARTMENT BUDGET

Please refer to Attachment 2 for the Department of Patient Safety and Quality's 2011 actual expenditures versus budget as of December 31, 2011.

The department ended the year under budget by \$97,326.00.



ATTACHMENT 2

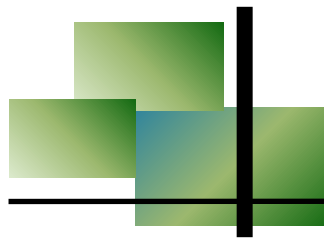
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Patient Safety and Quality

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| | December Actual | December Budget | December Variance | December Var Pct | YTD Actual | YTD Budget | YTD Variance | YTD Var Pct |
|---|--------------------|--------------------|----------------------|---------------------|---------------------|------------------|-----------------|----------------|
| * CHARGES: | | | | | | | | |
| REVENUE ADDITIONS/DEDUCTIONS | | | | | | | | |
| EXPENSE | | | | | | | | |
| PERSONNEL: | | | | | | | | |
| 5001/5002 ADMIN/MGRL SAL | 31,781.13 | 79,186 | 47,405 | 60 | 720,553.72 | 922,455 | 201,901 | 22 |
| 5011/5012 ADMIN/MGRL PHYS | 33,057.24 | 33,374 | 317 | 1 | 387,455.51 | 385,903 | (1,553) | 0 |
| 5021/5022 ADMIN/MGRL RN SAL | 0.00 | 6,015 | 6,015 | 100 | 0.00 | 70,822 | 70,822 | 100 |
| 5061/5062 CLNCL PROF/TECH S | 3,837.51 | 2,793 | (1,045) | (37) | 31,241.34 | 32,886 | 1,645 | 5 |
| 5071/5072 NONCLNCL PROF/TCH | 28,103.22 | 35,285 | 7,182 | 20 | 336,357.50 | 412,869 | 76,512 | 19 |
| 5081/5082 CLERICAL SALARIES | 15,196.40 | 14,316 | (880) | (6) | 176,364.77 | 168,083 | (8,282) | (5) |
| 5101/5102 RN SALARIES | 26,812.08 | 28,823 | 2,011 | 7 | 329,924.53 | 335,841 | 5,916 | 2 |
| 5121/5122 PHYSICIAN SAL | 26,961.11 | 7,720 | (19,241) | (249) | 143,564.32 | 90,530 | (53,034) | (59) |
| 5141/5142 RESIDENT/INTRN MD | 720.00 | 0 | (720) | 0 | 4,950.00 | 0 | (4,950) | 0 |
| 5161/5162 OTHER PERSONNEL | 0.00 | 1,193 | 1,193 | 100 | 0.00 | 14,042 | 14,042 | 100 |
| 5221/5222 OVERTIME | 112.91 | 0 | (113) | 0 | 5,277.14 | 0 | (5,277) | 0 |
| 5231/5232 SHIFT DIFFERENTL | 0.00 | 0 | 0 | 0 | 52.25 | 0 | (52) | 0 |
| 5251/5252 PROFESSIONAL DIFF | 915.07 | 0 | (915) | 0 | 8,142.47 | 0 | (8,142) | 0 |
| 5032 ON-CALL SALARIES | 0.00 | 704 | 704 | 100 | 0.00 | 8,288 | 8,288 | 100 |
| 5310 VACANCY SAVINGS | 0.00 | (14,429) | (14,429) | 100 | 0.00 | (168,189) | (168,189) | 100 |
| 5380/5390 MISC PAYROLL-DHA | 0.00 | (26,459) | (26,459) | 100 | 0.00 | (57,829) | (57,829) | 100 |
| TOTAL SALARIES | 167,496.67 | 168,521 | 1,024 | 1 | 2,143,883.55 | 2,215,701 | 71,817 | 3 |
| BENEFITS: | | | | | | | | |
| 5565 FRINGE BENEFITS | 47,569.05 | 54,848 | 7,279 | 13 | 608,862.91 | 639,450 | 30,587 | 5 |
| TOTAL BENEFITS | 47,569.05 | 54,848 | 7,279 | 13 | 608,862.91 | 639,450 | 30,587 | 5 |
| TOTAL SALARIED PERSONNEL | 215,065.72 | 223,369 | 8,303 | 4 | 2,752,746.46 | 2,855,151 | 102,405 | 4 |
| CONTRACT/AGENCY PERSONNEL NON-PERSONNEL: | | | | | | | | |
| PROFESSIONAL SERVICES: | | | | | | | | |
| 5750 OTHER PROFESSIONL SVCS | 2,538.75 | 3,333 | 794 | 24 | 53,618.52 | 40,000 | (13,619) | (34) |
| TOTAL PROFESSIONAL SERVICES | 2,538.75 | 3,333 | 794 | 24 | 53,618.52 | 40,000 | (13,619) | (34) |



ATTACHMENT 2 CONTINUED

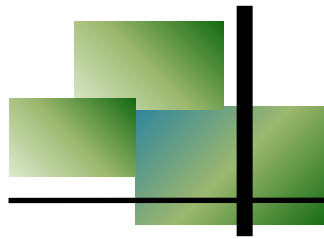
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| | December Actual | December Budget | December Variance | December Var Pct | YTD Actual | YTD Budget | YTD Variance | YTD Var Pct |
|---|--------------------|--------------------|----------------------|---------------------|------------------|---------------|-----------------|----------------|
| SUPPLIES: | | | | | | | | |
| 7000 SUPPLIES-OFFICE ADMIN | 153.03 | 1,042 | 889 | 85 | 8,973.08 | 12,500 | 3,527 | 28 |
| 7001 EDUCATIONAL MATERIALS | 0.00 | 125 | 125 | 100 | 324.18 | 1,500 | 1,176 | 78 |
| 7020 SUPPLIES - LABORATORY | 0.00 | 0 | 0 | 0 | 10.51 | 0 | (11) | 0 |
| 7050 SUPPLIES - FOOD | 3.25 | 0 | (3) | 0 | 83.50 | 0 | (84) | 0 |
| 7080 MNR FURN/EQUIP-NON-MED | 0.00 | 167 | 167 | 100 | 422.25 | 2,000 | 1,578 | 79 |
| 7090 SUPPLIES - OTHER | 0.00 | 17 | 17 | 100 | 858.82 | 200 | (659) | (330) |
| 7095 FREIGHT - INVENTORY | 5.95 | 0 | (6) | 0 | 63.39 | 0 | (63) | 0 |
| TOTAL SUPPLIES | 162.23 | 1,351 | 1,189 | 88 | 10,735.73 | 16,200 | 5,464 | 34 |
| REPAIR AND MAINTENANCE: | | | | | | | | |
| TECHNICAL & OTHR SUPPRT SVC: | | | | | | | | |
| 5770 LAB & DIAGNOSTIC SVCS | 0.00 | 0 | 0 | 0 | 750.00 | 0 | (750) | 0 |
| 5790 OTHER SUPPORT SERVICES | 131.50 | 83 | (49) | (59) | 2,366.50 | 1,000 | (1,367) | (137) |
| 6280 PRINTING/COPYNG/PROCNG | 0.00 | 58 | 58 | 100 | 0.00 | 700 | 700 | 100 |
| 7300 COPIER RENTAL | 461.32 | 833 | 372 | 45 | 7,641.53 | 10,000 | 2,358 | 24 |
| TOTAL TECH & OTHR SPPT SVCS | 592.82 | 974 | 381 | 39 | 10,758.03 | 11,700 | 942 | 8 |
| MANAGED CARE: | | | | | | | | |
| UTILITIES & COMMUNICATN SVC: | | | | | | | | |
| 7350 COMMUNICATION | 320.00 | 142 | (178) | (125) | 3,520.00 | 1,708 | (1,812) | (106) |
| 8020 POSTAGE/SHIPPING | 0.00 | 7 | 7 | 100 | 6.00 | 89 | 83 | 93 |
| TOTAL UTIL. & COMMUNICATION | 320.00 | 149 | (171) | (115) | 3,526.00 | 1,797 | (1,729) | (96) |
| INSURANCE & CLAIMS: | | | | | | | | |
| TRAVEL/CONFERENCES: | | | | | | | | |
| 6000 TICKET FARES | 0.00 | 250 | 250 | 100 | 3,650.88 | 3,000 | (651) | (22) |
| 6010 LODGING | 0.00 | 500 | 500 | 100 | 6,098.07 | 6,000 | (98) | (2) |
| 6020 MEALS | 0.00 | 125 | 125 | 100 | 1,493.25 | 1,500 | 7 | 0 |
| 6040 MILEAGE/PARKING | 0.00 | 58 | 58 | 100 | 394.53 | 700 | 305 | 44 |
| 6045 TRAVEL - OTHER | 0.00 | 125 | 125 | 100 | 620.45 | 1,500 | 880 | 59 |
| 6050 CONFERNCE/MEETNG COSTS | 0.00 | 500 | 500 | 100 | 4,673.00 | 6,000 | 1,327 | 22 |
| TOTAL TRAVEL/CONFERENCES | 0.00 | 1,558 | 1,558 | 100 | 16,930.18 | 18,700 | 1,770 | 9 |



ATTACHMENT 2 CONTINUED

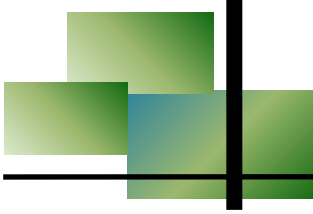
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| | December Actual | December Budget | December Variance | December Var Pct | YTD Actual | YTD Budget | YTD Variance | YTD Var Pct |
|------------------------------|--------------------|--------------------|----------------------|---------------------|----------------|---------------|-----------------|----------------|
| DUES/AWARDS/EDUCATION: | | | | | | | | |
| 8000 DUES/MEMBERSHIP FEES | 575.00 | 42 | (533) | (1,269) | 700.00 | 500 | (200) | (40) |
| 8010 SUBSCRIPTIONS & BOOKS | 0.00 | 208 | 208 | 100 | 1,232.54 | 2,500 | 1,267 | 51 |
| 8015 JOURNALS | 0.00 | 42 | 42 | 100 | 0.00 | 500 | 500 | 100 |
| TOTAL DUES/AWARDS/EDUCATION | 575.00 | 292 | (283) | (97) | 1,932.54 | 3,500 | 1,567 | 45 |
| EMPLOYEE RECRUITMENT: | | | | | | | | |
| 6060 ADVRTSMNT/INTRVIEW EXP | 0.00 | 0 | 0 | 0 | 499.00 | 0 | (499) | 0 |
| TOTAL EMPLOYEE RECRUITMENT | 0.00 | 0 | 0 | 0 | 499.00 | 0 | (499) | 0 |
| LEASE/DEBT PAYMENTS: | | | | | | | | |
| OTHER OPERATING EXPENSES: | | | | | | | | |
| 8030 PARTICPNT STIPNDS/INCN | 0.00 | 100 | 100 | 100 | 0.00 | 1,200 | 1,200 | 100 |
| 8320 OTHER EXPENSES | 0.00 | 0 | 0 | 0 | 174.50 | 0 | (175) | 0 |
| TOTAL OTHER OPERATING EXP | 0.00 | 100 | 100 | 100 | 174.50 | 1,200 | 1,026 | 85 |
| CHARGEBACK/REDUCTION OF EXP: | | | | | | | | |
| TOTAL NON-PERSONNEL EXPENSE | 4,188.80 | 7,757 | 3,568 | 46 | 98,174.50 | 93,097 | (5,078) | (5) |
| TOTAL OPERATING EXPENSE | 219,254.52 | 231,126 | 11,871 | 5 | 2,850,920.96 | 2,948,248 | 97,327 | 3 |
| NON-OPERATING EXPENSE: | | | | | | | | |
| DEPRECIATION/AMORTIZATION: | | | | | | | | |
| INTEREST EXPENSE: | | | | | | | | |
| CAPITAL: | | | | | | | | |
| NET INCOME | (219,254.52) | (231,126) | 11,871 | (5) | (2,850,920.96) | (2,948,247) | 97,326 | (3) |



III. 2011 DEPARTMENT OF PATIENT SAFETY AND QUALITY VISION AND MISSION STATEMENTS

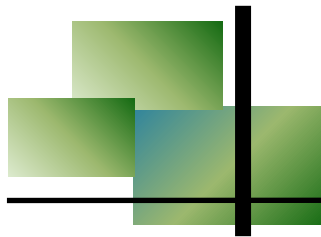
Vision: To be the leader in high-quality, high-value, harm-free health care.

Mission: To lead enterprise efforts to improve and sustain patient-centered, high quality, and safe health care.

IV. PATIENT SAFETY, QUALITY AND REGULATORY COMPLIANCE 2011 ANNUAL REPORT

2011 DEPARTMENT OF PATIENT SAFETY AND QUALITY STRATEGIC INITIATIVES

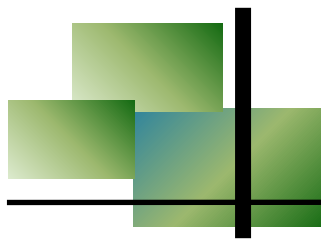
1. Develop a Global Safety Score Tool
 - a. Detect and evaluate triggers that allows for measurement of adverse event or harm.
 - b. Enhance identification, prevention, and mitigation of risk
 - c. Proactive identification of areas for performance improvement and support continuous improvement
 - d. Near real time review of triggering events that may result in improved patient outcomes
2. Prevent Hospital Acquired Conditions (HAC)
 - a. Engage the enterprise in coordinated effort to reduce harm
 - b. Continue high level focus on interventions to improve identification and rescue of deteriorating patients (clinical triggers program)
 - c. Enhance the use and dissemination of data from the PSN voluntary reporting system
 - d. Evaluate unexpected and often preventable adverse events: CMS-defined hospital acquired conditions (HACS) , AHRQ patient safety indicators (PSI), and High Acuity Care indicators
 - e. Review systems, clinical processes, communication and clinical documentation to identify opportunities for clinical process improvement
 - f. Facilitate performance improvement activities and process redesign.
 - g. Provide clinical outcomes data to inform performance improvement
 - h. Consult on relevant electronic health record (EHR) projects to ensure that new systems are designed to support patient safety and quality initiatives
 - i. Educate staff regarding patient safety and quality opportunities identified through HAC initiatives



3. Improve Abnormal Result Tracking Processes
 - a. Develop and implement a clinical care standard for outpatient test result follow-up
 - b. Develop a system for electronic notification of critical findings and follow-up for diagnostic radiology exams (inpatient and outpatient)
4. Engage Departments in Quality and Safety Initiatives
 - a. Continue to develop the Executive Patient Safety and Quality Committee
 - i. Report departmental quality initiatives as a standing agenda item
 - ii. Discuss and define the responsibilities of the Executive Patient Safety and Quality Committee (include in the DH Quality Management Plan)
 - b. Provide outcome measure performance data to individual providers and departments- to encourage involvement in performance improvement initiatives. Examples include, core measures data, ongoing professional practice evaluation (OPPE) data, medical record audits etc. departmental ongoing)
 - c. Identify and add CHS and ED physician representatives to the Quality Management Team.
 - d. Collaborate with Nursing via the Quality Integration Committee
 - e. Develop a Professional Quality, Safety, Research and Evidence Based Practice Council
5. Improve the process for clinical guideline development, approval, and dissemination
 - a. Hire a Document Control Specialist to lead the guideline development, approval and dissemination process
 - b. Develop standard templates for each category of clinical (and administrative) documents.
 - c. Engage departments in the process to review and update outdated policies
 - d. Educate responsible department representatives.
 - e. Provide all survey teams with current and accurate clinical documents during regulatory surveys
6. Raise the awareness on resident and allied health provider oversight by attending physician staff

PROJECTS TO SUPPORT STRATEGIC INITIATIVES AND IMPROVE PATIENT SAFETY

1. LifeLink Clinicals Optimization, LifeLink Clinicals 2012 Go Live, LifeLink CPOE and Meaningful Use
Goals: Improve the quality, content, efficiency, and safety of clinical documentation and patient care orders. Ensure that all new clinical documentation and patient care order designs meet regulatory requirements.
2. Clinical Practice Committee
Goal: Provide clear and consistent guidance, support, and oversight regarding development, approval and dissemination of clinical documents.
3. Administrative Policy and Procedure Improvement Project.
Goals: Redefine policy and procedure definitions, create standard work for the development, review, and submission of hospital policy and procedures, and eliminate outdated and



unnecessary documents. Hire a Document Control Specialist to manage policies and procedure.

- a. Hired a Document Control Specialist (1.0 FTE) to manage the policy and procedure process

4. Department engagement in quality and safety initiatives

Goal: Raise awareness and improve collaboration and coordination of clinical improvement activities

- a. Created the expectation that each major clinical department will present quality and safety initiatives to the Executive Patient Safety and Quality Committee.
- b. Implemented the Quality Integration Meeting to assimilate the work of the Departments of Patient Safety and Quality and Nursing
- c. Continued the "Mini Tracer" project and initiated Patient Safety Rounds to involve more leadership and frontline staff in patient safety

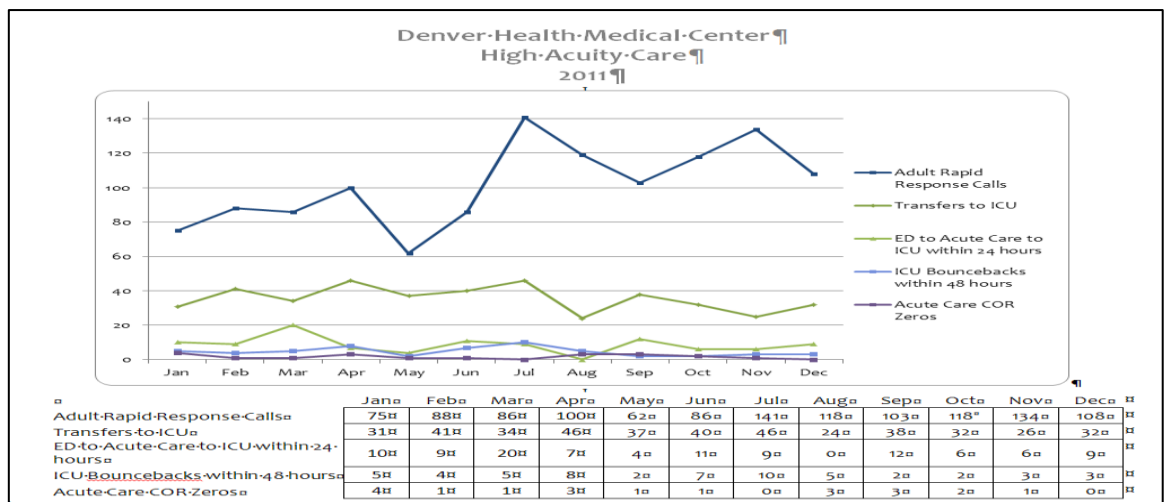
5. High Acuity Care

Goals: ↑ use of the Rapid Response process, ↓ Acute Care COR Zeros per 1000 non-ICU census days, ↓ ICU Bounceback within 48 hours and ↓ ED to Acute Care to ICU transfers within 24 hours

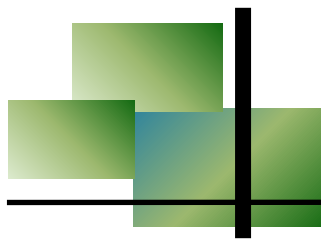
- a. Rapid Response Program (clinical triggers) Goal: Timely and appropriate response to episodes of clinical deterioration and increased use of the clinical triggers program. Accomplished
 - i. Developed Rapid Response Clinical Care Standard
 - ii. Developed, tested and implemented a LifeLink Rapid Response Clinical Workflow
 - iii. Increased use of the clinical triggers program from 47 calls/month in 2010 to 101/month in 2011
- b. Acute Care COR Zero Review. Goal: ↓ Acute Care COR Zeros per 1000 non-ICU census days Accomplished
 - i. Reviewed and analyzed all acute care COR Zeros and determined performance improvement opportunities related to patient management, response to clinical deterioration and communication.
 - ii. Identified system failures that contribute to delays in response
 - iii. Facilitated performance improvement projects
 - iv. Provided feedback to providers, nursing and ancillary services regarding opportunities for improvement.
 - v. Provided data and case review information to the COR Zero Committee to consider for process improvement
 - vi. Decreased Acute Care COR Zeros per 1000 non-ICU days from 0.48 to 0.27 in 2011
- c. ICU Bounceback Project Goal: ↓ 48 hour ICU Bouncebacks/100 ICU transfers Not Accomplished
 - i. Reviewed and analyzed all ICU Bouncebacks (within 48 hours) and determined performance improvement opportunities



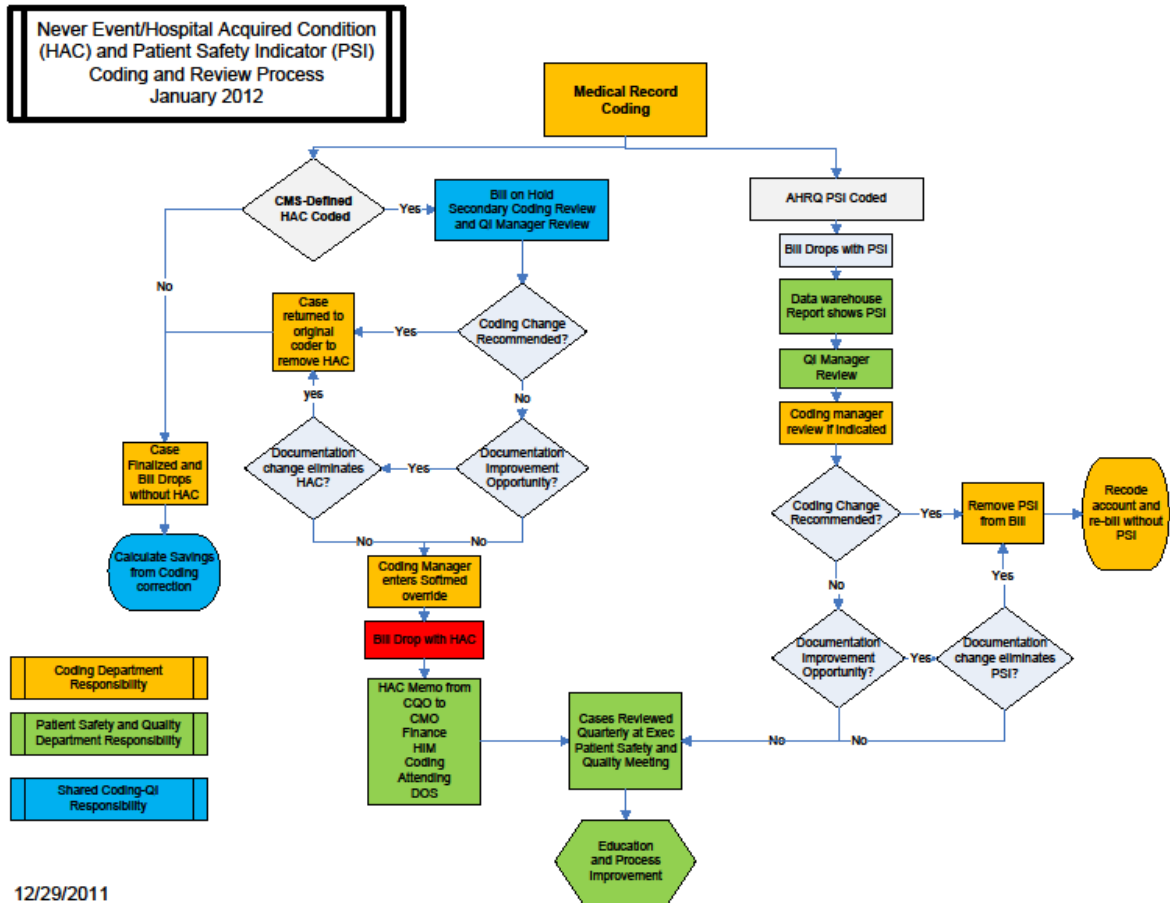
- ii. ICU Bouncebacks per 100 ICU transfers remained the same in 2011; however there are approximately 40% fewer bouncebacks than in 2009.
- d. ED to Acute Care to ICU within 24 hours. Goal: Decrease the number of patients who are admitted to Acute Care and quickly transfer to the ICU. Accomplished
 - i. Met with multidisciplinary teams to discuss clinical decision making and process issues around ED to Acute care Admissions
 - ii. Reviewed ICU Admission Criteria
 - iii. Evaluated respiratory therapy needs on Acute Care and identify opportunities to improve communication regarding respiratory needs
 - iv. Reinstated use of the ED to Acute Care report tool
 - v. Reevaluated the use of IV antihypertensives on Acute Care
 - vi. Decreased ED to Acute Care to ICU transfers within 24 hours. 2009 15/month, 2010 9.75/month, 2011 8.5/month



- 6. Hospital Acquired Conditions(HAC) and Patient Safety Indicators (PSI) Project Goal: Evaluate and improve coding of HACs and PSIs, correct coding as appropriate, and identify opportunities to improve patient safety. Accomplished
 - a. Developed report in the Data Warehouse of discharged patients coded with a HAC or PSI which can be accessed daily for timely review of coding accuracy and quality issue identification.
 - b. Participated in a collaborative process with coding staff and clinical documentation staff on a bi-monthly basis for the purpose of on-going education, discussion and understanding of documentation and coding clinic guidelines and changes.
 - c. Developed a process of reviewing HAC documentation before the record is finalized for the purpose of reviewing for documentation and coding accuracy and seeking clarification from the provider if needed before the record is released.
 - d. Presented monthly HAC and PSI data to Executive Patient Safety and Quality Committee.



- e. Provided timely feedback to providers and staff when trends and opportunities are identified.
- f. Defined work flow for communicating HACs to responsible physicians.



- 7. Procedural Sedation Improvement Project Goal: Improve the safety and quality of care during procedures that require sedation, improve the content and quality of documentation, and respond to adverse events related to sedation in a timely and effective manner.

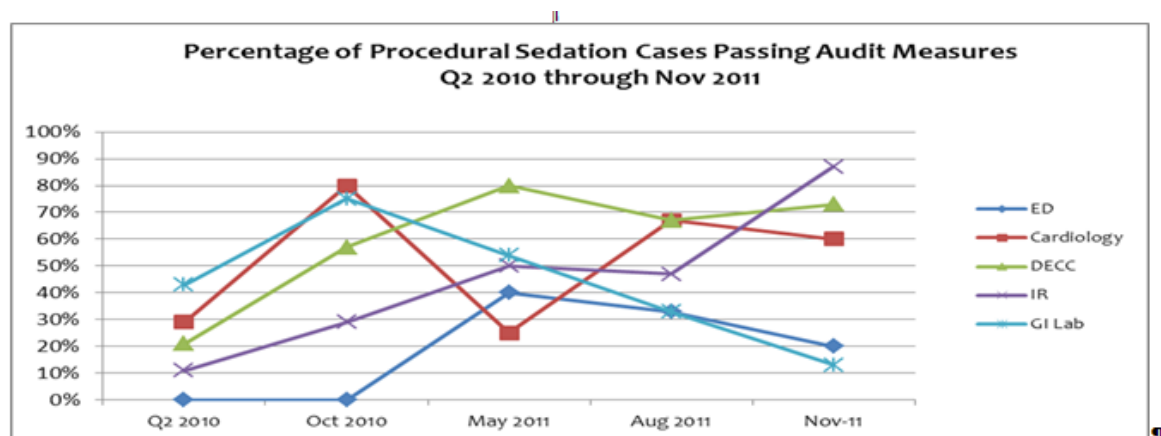
Accomplished

- a. Revised the Clinical Care Standard (Sedation and Analgesia for Non-Anesthesiologists) and the standardized Procedural Sedation Monitoring Forms
- b. Implemented a Procedural Sedation quality review form to be filled out after procedures to identify safety events related to procedural sedation
- c. Provided procedural sedation audit data to the leadership teams of the GI Lab, Cardiology, Denver Emergency Center for Children (DECC), Emergency Department



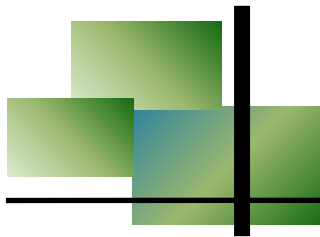
(ED), and Interventional Radiology (IR). Each team was responsible for developing an action plan for any elements of the procedural sedation bundle < 90%. Quarterly data was reported to the Medical Staff Executive Committee.

- d. Focused education for Cardiology and the DECC to help improve documentation
- e. Developed annual competencies for nurses who work in the GI Lab, ED, DECC, Cardiology, IR, Women's Care Clinic (WCC) and APC
- f. Formed the Procedural Sedation Committee in August. The committee is co-chaired by Dr. Duke (Anesthesia) and Julie Makatura RN (Dept. of Patient Safety and Quality)
- g. Expanded procedural sedation oversight to include the Dental Clinic and Bronchoscopy Lab
- h. Planned for 2012 nursing competencies to be expanded to inpatient areas and Respiratory Therapists



8. Extreme Falls Program (Critical Care) Goal: Decrease critical care falls per 1000 patient days and achieve zero falls resulting in injury. Accomplished
 - a. Maintained Extreme Falls Program
 - b. Decreased critical care falls/100 patient days from 3.86 in 2010 to 1.9 in 2011
 - c. Achieved no falls with injury in the 4th quarter of 2011

9. Pre-operative History and Physicals Availability –Goal: Improve provider access to patient history and physical information prior to surgery. Accomplished
 - a. Initial State: pre-operative paperwork was stored in a locked file cabinet in the OR until the day of surgery. The information was not available to care providers if needed.
 - b. Implemented consistent process for scanning preoperative paperwork into EDM the day after preoperative workup is complete. Data collected for 3 months—100% compliance.
 - c. Preoperative paperwork information is available to all providers in the time period prior to the actual surgery date.

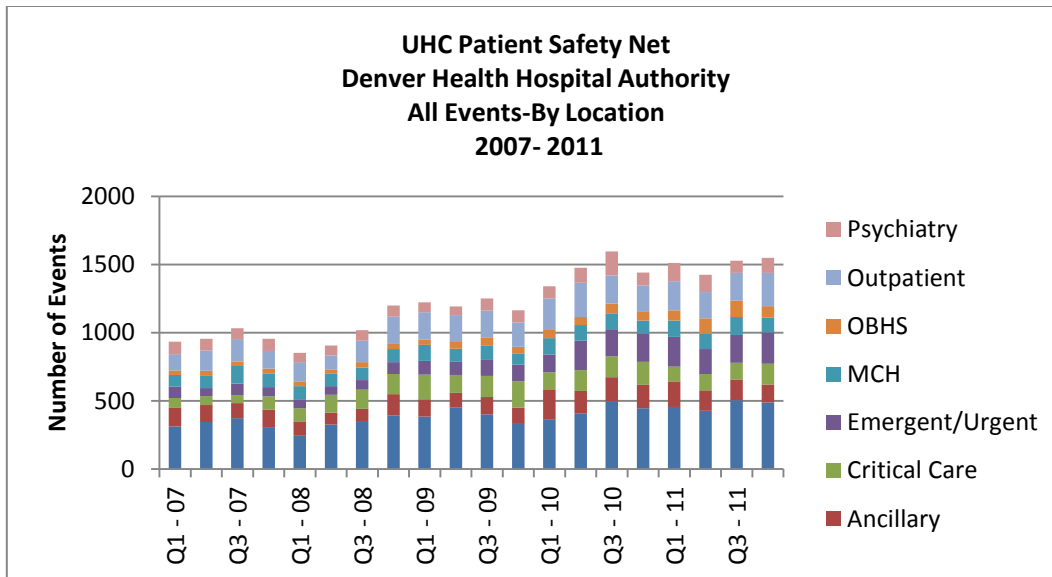


10. Conversion from Silicone to Latex indwelling urinary catheters as standard product when no latex allergies have been identified. Goal: Eliminate quality of care issues related to patients experiencing severe pain and bleeding during removal of silicone catheters. Accomplished.
 - a. Gathered expert and community standard data about the exclusive use of silicone catheters
 - b. Researched latex products with evidence for the lowest allergenic potential and consideration for cost savings
 - c. Converted to latex indwelling urinary catheters completed December, 2011.

11. Culture of Safety Survey utilizing AHRQ validated survey tool. Goal: 1) Obtain direct feedback from providers and staff across the organization about our environment related to safety. 2) Benchmark our organization against others across the country on key dimensions contributing to patient safety. 3) Develop action plans for improvement. Accomplished.
 - a. Hospital Survey
 - i. Increased respondents from 819 in 2009 to 1074 in 2011
 - ii. Increased percent of positive responses from 59% in 2009 to 62% in 2011 (slightly below AHRQ benchmark of 63%)
 - iii. Strongest positive responses in the dimension of “Teamwork Within Units” and “Supervisor Expectations & Actions Promoting Patient Safety”
 - iv. Lowest number of positive responses in the dimensions of “Non-punitive Response to Error” and “Handoffs & Transitions”
 - v. Departments developed an action plan for improvement for each dimension that was 5% or more below the AHRQ Benchmark for percent positive responses
 - b. CHS Survey—first year survey had 285 respondents
 - i. Strongest positive responses in the dimensions of “Teamwork within Clinic” and Supervisor Manager Expectations & Actions Promoting Patient Safety”
 - ii. Lowest number of positive responses in the dimensions of “Staffing” and Non-punitive Response to Error:

STRUCTURE AND TOOLS TO SUPPORT PATIENT SAFETY

1. Patient Safety Net
 - a. Real-time, web-based occurrence reporting tool
 - b. Classifies events into harm, no harm or near-miss events
 - c. Utilizes AHRQ taxonomy
 - d. Facilitates manager and quality/risk review of events
 - e. Increases awareness of patient safety events
 - f. Enables reporting of events, harm scores, locations, trends and outcomes
 - i. Quarterly reports to DH BOD
 - ii. Quarterly reports to PSN Task Force
 - iii. Adhoc reports for project requests, department leaders, Lean initiatives etc.



2. Electronic Quality Scorecard
 - a. Electronic tool to report and track progress of patient safety efforts
 - b. Measure and monitor core measures compliance, high acuity care, infection prevention efforts, patient flow, patient safety occurrences, and Ambulatory Care quality

3. Global Safety Score
 - a. Validation testing and pilot implementation in 4th quarter

4. Employee Engagement in Continual Readiness
 - a. Mini Tracers – 1168 completed in 2011
 - b. Patient Safety Rounds – 2732 completed in 2011

5. Continual Readiness SharePoint Site.
 - a. Continual Readiness Tools
 - b. Data
 - c. Regulatory resources

6. Collaboration with local and national quality organizations
 - a. CHA – Colorado Quality Report Card Steering Committee
 - b. CHA – Colorado Quality Professionals Meeting
 - c. NAPH – Quality Professional’s Group
 - d. University Healthsystem Consortium – Quality Council
 - e. NHLBI – JNC 8 Hypertension guideline panel and implementation work group
 - f. NQF – Patient Safety Advisory committee
 - g. State of Colorado – HQIP (Hospital Quality Incentive Payment) Advisory committee
 - h. High Value Health System Collaborative – one of 5 founding institutions (Dartmouth, Intermountain, Cleveland Clinic, Mayo, Denver Health) now with 16 partner institutions.



CORE MEASURES

Goal: Improve the quality of care and the Denver Health UHC ranking by improving the overall DH core measure bundle score. The scores represented in this section are for the period of July 2010 through June 2011 as the final data for the last two quarters of calendar year 2011 is not yet available.

1. CMS Appropriate Core Measure Overall bundle score – 89%
 - a. 856/960 cases passed the overall core measure bundle
2. Hospital Quality Alliance (HQA) Heart Failure bundle – 88%
 - a. 253/286 cases passed the heart failure bundle.
 - b. Improved abstraction/feedback process beginning Q2 2010 due to implementation of Siemens' Soarian Quality Measures (SQM) tool.
 - c. Unrelenting focus on education related to the discharge medication process is credited with the overall 6% improvement in HF bundle over the previous year.
3. Hospital Quality Alliance (HQA) Acute MI bundle –100%
 - a. 121/121 cases passed the acute MI bundle.
 - b. No failed cases since Q1 2010.
4. Hospital Quality Alliance (HQA) Pneumonia bundle – 83%
 - a. 161/194 cases passed the pneumonia bundle.
 - b. Performance challenges associated with our combined electronic and manual activities required for our immunization process, and ED antibiotic documentation.
5. Hospital Quality Alliance (HQA) SCIP bundle –89%
 - a. 322/360 cases passed the SCIP bundle.
6. Comprehensive online Core Measure Site serves as a source for core measure education, information about the current status of core measure compliance and performance improvement activity.
7. Continued partnership with Siemens to test and provide input for product upgrades and expansion.
 - a. Case availability for abstraction via SQM remains consistent at approximately 7days allowing time to provide feedback to teams and the opportunity to add clarifying addendums that change measure status from “Fail” to “Pass” or to “Exclusion” for some measures.
8. Multiple presentations to providers and staff to communicate current core measures performance as well as those to be added in 2012. Collected baseline information for global immunization and ED throughput measures to be added in 2012.

Compliance with regulatory standards is essential to maintain accreditation and to preserve our financial viability. Our goal is to meet state, federal, and national regulatory requirements by focusing on patient safety at all times.

Accomplishments in 2011

1. Successful completion of annual Periodic Performance Review - hospital
2. Achieved Joint Commission Accreditation
 - a. Laboratory and Pathology - hospital – May 2011



- b. Hospital – including specialty clinics, Outpatient Behavioral Health Services and East Grand Community and Emergency Center August 2011
 - c. Behavioral Health – Methadone August 2011
 - d. Community Health Services August 2011
 - e. Community Health Services Lab August 2011
3. Maintained Department of Behavioral Health 27-65 licensure
 4. Implemented Patient Safety Quick Reads to provide greater focus on challenging standards
 5. Developed materials, collaborated with the University Hospital to provide consistent Continual Readiness information, and messaging to residents at both institutions.
 6. Successful response to two on-site CDPHE substantial allegation surveys – no findings
 7. Successful response to one Joint Commission complaint – no findings.
 8. Completion of CHS, BHS and Hospital Periodic Performance Reviews (PPR)
 9. Formed a Continual Readiness Steering Committee to provide direction for ongoing continual readiness activities.

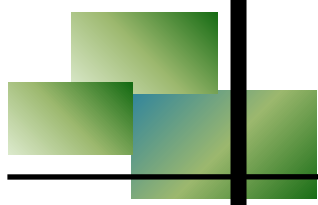
DEPARTMENT OF PATIENT SAFETY AND QUALITY STRATEGIC PLAN 2012

Vision: To be the leader in high-quality, high-value, harm-free health care.

Mission: To lead enterprise efforts to improve and sustain patient-centered, high quality, and safe health care.

Initiatives

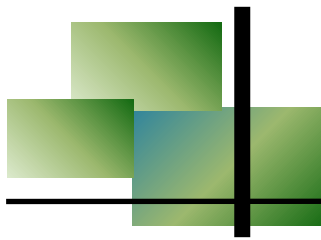
1. Clinical Outcomes Case Reviews
 - a. Formalizing the process for case reviews
 - b. Creating a database
 - c. House-wide conference
2. Safe and Effective Communication
 - a. Handoffs
 - b. Transitions in care
 - c. Abnormal results tracking
3. Adverse event prevention
 - a. HACs/PSIs/AEs
 - b. Global Safety Score
 - c. Acute care COR zeros
 - d. Unexpected ICU transfers
4. Guidelines / Ordersets / EHR Oversight



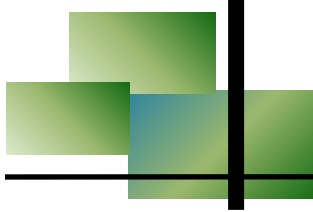
REGULATORY ACTIVITY

JANUARY 1, 2011 – DECEMBER 31, 2011

| DATE | SURVEYORS | DH STAFF COORDINATOR | ISSUES | ORG | DEFICIENCIES | COMMENTS |
|------------------------------|-----------|-------------------------------|--|-------------------------------|---|--|
| February 2011 One day | Two | Kendra Moldenhauer | Substantial Allegation Survey following the death of an adolescent within 12 hours of discharge from the DECC | CDPHE | None | Care was appropriate |
| May 2011 Four days | One | Linda Kaufman and Andi German | Accreditation Survey – Lab and Point of Care Testing | The Joint Commission | Three Indirect Impact Requirements for Improvement | RFI's - ESC completed Full accreditation |
| May 2011 Three days | Four | Kendra Moldenhauer, | Complaint Investigation Report to CDPHE by another healthcare organization regarding concerns for an unsafe discharge from DH. | CDPHE/CMS | Conditions of Participation Not Met: Nursing, Services and Quality Assessment and Performance Improvement Program. d | The survey team identified problems with the following: <ul style="list-style-type: none"> • Discharge planning • Patient rights • Patient safety issues • Nursing assessments • Communication between providers – involvement of consultants • Performance Improvement Process Findings during this survey resulted in a full CMS survey (8/2011) |
| June 2011 One day | Two | Jen Brown | Division of Behavioral Health 27-65 Relicensure Survey | Division of Behavioral Health | None | The Division of Behavioral Health recommended that we evaluate our mechanism for notifying patients about how to contact the patient representatives. This is an advocacy issue. |



| DATE | SURVEYORS | DH STAFF COORDINATOR | ISSUES | ORG | DEFICIENCIES | COMMENTS |
|--------------------------|-----------|----------------------------------|--|----------------------|---|---|
| August 2011 Four days | Four | Kendra Moldenhauer | Accreditation Survey – Hospital and Specialty Clinics | The Joint Commission | Two Direct and three indirect Requirements for Improvement | RFI’s – ESC completed Full accreditation Per JC surveyors – “World Class Organization” |
| August 2011 Two days | One | John Lundin Martinez | Accreditation Survey - Methadone Program | The Joint Commission | One Direct and two Indirect Requirements for Improvement | RFI – ESC completed Full accreditation |
| August 2011 | Two | Vickie Lesnansky | Accreditation Survey - CHS | The Joint Commission | Two Indirect and two Direct Impact Requirements for Improvement | RFI – ESC and MOS not completed |
| August 2011 | Two | Linda Kaufman and Andi German | Accreditation Survey – Lab CHS | The Joint Commission | Six Indirect Requirements for Improvement | RFI – ESC completed Full accreditation |
| August 2011 | Five | Kendra Moldenhauer | Full CMS Conditions of Participation Survey –includes LSC survey below | CPDHE/CMS | No CoP violations Five standard violations | Plan of Correction developed, submitted to CMS and CDPHE and implemented. No response from CDPHE or CMS regarding approval of Plan of Correction |
| August/Sept 2011 | Two | Jon Clark | Full CMS Life Safety Code Survey | CDPHE/CMS | One CoP violation. Multiple “k” tags | Waiver request – accepted Plan of Correction developed, submitted to CMS and CDPHE and implemented. No response from CDPHE or CMS regarding approval of Plan of Correction |
| December 2011 | Two | Kendra Moldenhauer | Complaint Investigation – Grievance Process | CDPHE | None | Unable to substantiate the allegations |



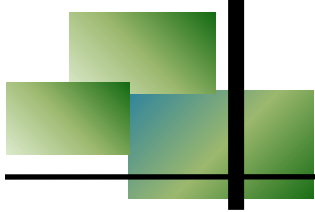
V. MEDICAL STAFF OFFICE 2011 ANNUAL REPORT

The Medical Staff Office (MSO) is an operating section within the Denver Health Department of Patient Safety and Quality. The MSO supports the Medical Staff, Allied Health Professionals, and Administration for credentialing, privileging, Joint Commission, CMS and NCQA preparedness, and standards interpretation.

The MSO consists of four (4) FTE's. The Manager, and three (3) FTE's Credentialing Coordinators who maintain the credentialing and privileging for the Denver Health Medical Staff and the Allied Health Professional Staff.

A. Comparative Data Credentialing and Privileging Appointments and Reappointments 2009 to 2011 Denver Health Medical Staff and Allied Health Staff

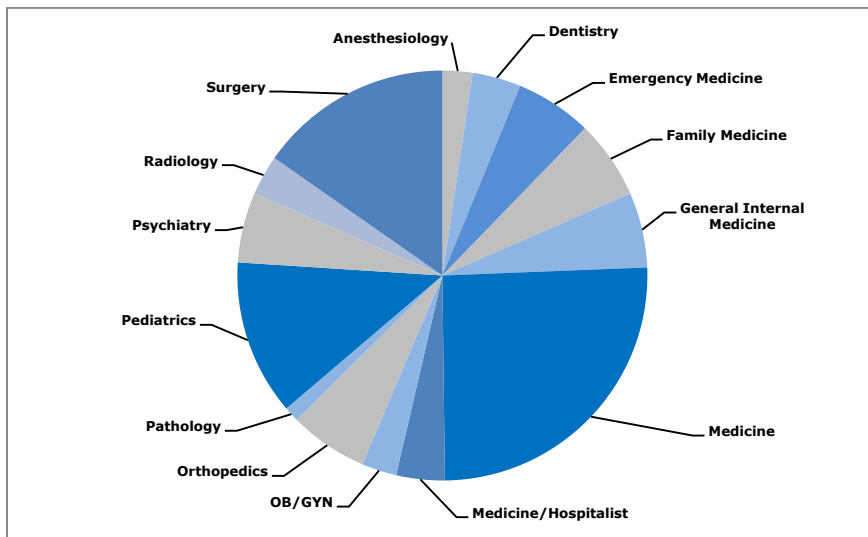
| Comparative Activity | 2009 | 2010 | 2011 |
|---|------|------|------|
| Active Medical Staff Files Maintained | 720 | 756 | 759 |
| Medical Staff Initial Applications Processed | 91 | 109 | 107 |
| Medical Staff Reappointment Applications Processed | 325 | 291 | 301 |
| Active Allied Health Professional Files Maintained | 235 | 244 | 263 |
| Allied Health Initial Applications Processed | 31 | 33 | 42 |
| Allied Health Reappointments Applications Processed | 89 | 120 | 87 |

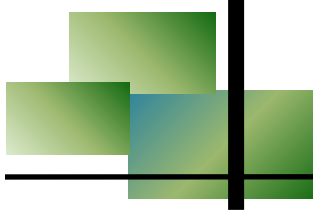


Number of Physicians by Department

| Department | Number of Physicians | Percent of Total Medical Staff |
|---------------------------|----------------------|--------------------------------|
| Anesthesiology | 18 | 3% |
| Dentistry | 29 | 4% |
| Emergency Medicine | 46 | 6% |
| Family Medicine | 47 | 6% |
| General Internal Medicine | 45 | 6% |
| Medicine | 193 | 25% |
| Medicine/Hospitalist | 29 | 4% |
| OB/GYN | 21 | 3% |
| Orthopedics | 47 | 6% |
| Pathology | 9 | 1% |
| Pediatrics | 93 | 12% |
| Psychiatry | 42 | 6% |
| Radiology | 24 | 3% |
| Surgery | 116 | 15% |

TOTAL: 759

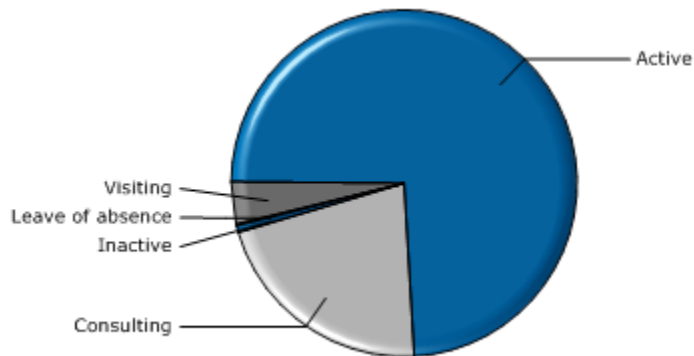




Number of Physicians by Staff Category

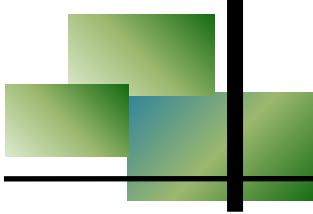
| Status | Number | Percent |
|------------------|--------|---------|
| Active | 561 | 74% |
| Consulting | 162 | 21% |
| Inactive | 5 | 1% |
| Leave of absence | 1 | 0% |
| Visiting | 30 | 4% |

TOTAL: 759

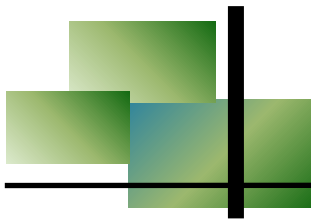


Staff Category by Department

| Department And Status | | Number | % Total Medical Staff |
|----------------------------------|------------|--------|-----------------------|
| Anesthesiology | | | |
| | Active | 18 | 3% |
| Dentistry | | | |
| | Active | 19 | 3% |
| | Consulting | 3 | 0% |
| | Inactive | 2 | 0% |
| | Visiting | 5 | 1% |
| Emergency Medicine | | | |
| | Active | 45 | 6% |
| | Consulting | 1 | 0% |
| Family Medicine | | | |
| | Active | 44 | 6% |
| | Consulting | 1 | 0% |
| | Inactive | 2 | 0% |
| General Internal Medicine | | | |
| | Active | 45 | 6% |
| Medicine | | | |
| | Active | 96 | 13% |



| | | | |
|-----------------------------|------------------|----|------|
| | Consulting | 83 | 11% |
| | Visiting | 14 | 2% |
| Medicine/Hospitalist | | | |
| | Active | 29 | 4% |
| OB/GYN | | | |
| | Active | 18 | 2.5% |
| | Consulting | 3 | .5% |
| Orthopedics | | | |
| | Active | 31 | 4% |
| | Consulting | 13 | 2% |
| | Visiting | 3 | 0% |
| Pathology | | | |
| | Active | 9 | 1% |
| Pediatrics | | | |
| | Active | 69 | 9% |
| | Consulting | 22 | 3% |
| | Visiting | 2 | 0% |
| Psychiatry | | | |
| | Active | 36 | 5% |
| | Consulting | 5 | 1% |
| | Leave of absence | 1 | 0% |
| Radiology | | | |
| | Active | 21 | 3% |
| | Consulting | 2 | 0% |
| | Visiting | 1 | 0% |
| Surgery | | | |
| | Active | 81 | 11% |
| | Consulting | 29 | 4% |
| | Inactive | 1 | 0% |
| | Visiting | 5 | 1% |
| Total: 759 | | | |



Board Certified by Specialty

| Board Specialty | Certified | Not Certified | Percent Certified |
|---------------------------------|------------|---------------|-------------------|
| Allergy and Immunology | 1 | 0 | 100% |
| Anatomic and Clinical Pathology | 4 | 0 | 100% |
| Anesthesiology | 17 | 1 | 96% |
| Cardiovascular Disease | 8 | 0 | 100% |
| Child & Adolescent Psychiatry | 1 | 0 | 100% |
| Clinical Pathology | 1 | 0 | 100% |
| Dermatology | 14 | 0 | 100% |
| Diagnostic Radiology | 10 | 0 | 100% |
| Emergency Medicine | 45 | 5 | 90% |
| Endocrinology | 2 | 0 | 100% |
| Endodontics | 0 | 1 | 0% |
| Family Medicine | 47 | 1 | 98% |
| Gastroenterology | 22 | 0 | 100% |
| General Dentistry | 0 | 13 | 0% |
| General Medicine | 1 | 0 | 100% |
| General Surgery | 2 | 0 | 100% |
| Geriatrics | 1 | 0 | 100% |
| Hand Surgery | 0 | 1 | 0% |
| Internal Medicine | 176 | 1 | 99% |
| Medicine | 5 | 1 | 98% |
| Neonatal/Perinatal | 3 | 0 | 100% |
| Neonatology | 2 | 0 | 100% |
| Nephrology | 3 | 0 | 100% |
| Neurology | 12 | 0 | 100% |
| Neurosurgery | 11 | 3 | 85% |
| OB/GYN | 20 | 1 | 96% |
| Ophthalmology | 33 | 9 | 80% |
| Oral/Maxillofacial Surgery | 12 | 2 | 86% |
| Orthodontics | 1 | 0 | 100% |
| Orthopedic Surgery | 15 | 9 | 64% |
| Otolaryngology | 15 | 0 | 100% |
| Pathology | 4 | 0 | 100% |
| Pediatric Cardiology | 3 | 0 | 100% |
| Pediatric Emergency Medicine | 1 | 0 | 100% |
| Pediatric Neurology | 1 | 0 | 100% |
| Pediatrics | 76 | 6 | 93% |
| Pediatrics/Neonatal/Perinatal | 1 | 0 | 100% |
| Physical Medicine & Rehab | 18 | 0 | 100% |
| Plastic Surgery | 2 | 1 | 66% |
| Podiatric Orthopedics | 0 | 1 | 0% |
| Podiatric Surgery | 1 | 0 | 100% |
| Prev Med Occ Med | 1 | 0 | 100% |
| Preventive Medicine | 1 | 0 | 100% |
| Psychiatry | 31 | 9 | 80% |
| Pub Health/Preventive Med | 4 | 0 | 100% |
| Pulmonary | 1 | 0 | 100% |
| Pulmonary Disease | 3 | 0 | 100% |
| Pulmonary/Critical Care | 1 | 0 | 100% |
| Radiology | 12 | 1 | 94% |
| Rheumatology | 4 | 0 | 100% |
| Spine Surgery | 0 | 1 | 0% |
| Surgery | 22 | 0 | 100% |
| Thoracic Surgery | 2 | 0 | 100% |
| Toxicology | 1 | 0 | 100% |
| Trauma Surgery | 0 | 1 | 0% |
| Urology | 11 | 5 | 69% |
| Total | 686 | 73 | 91% |

Total Number of Physicians: 759

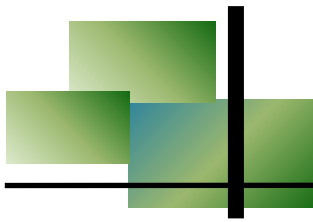


B. MSO ACCOMPLISHMENTS 2011

- The Medical Staff did not receive any recommendations for improvement during the Joint Commission survey. The surveyor interview was hosted by Dr. Philip Mehler, CMO and Sandra Taylor, Manager Medical Staff Services. Many members of the Medical Staff were present for a question and answer session after the interview. The Medical Staff should be congratulated for their hard work on the Ongoing and Focused Professional Evaluation process.
- The Medical Staff Office (MSO) was able to purchase new credentialing software funded by the Medical Staff dues. The new system is a Web based product. It will allow the providers to complete the State Credentialing Application electronically, provides easy access to view provider's privileges, and will eventually eliminate the paper files. It has features that will allow the MSO to perform primary source verifications online and improve the time it takes to complete appointments and reappointments. The EHS department provided great support and a well-trained project manager.
- The (MSO) has delegated credentialing contracts with: CO Access, Anthem BCBS of Colorado, Denver Health Medical Plan, Inc. for DHHA, CIGNA, Aetna, United Healthcare, Coventry Insurance, and MultiPlan. Each contract performed an audit in 2011 and complete compliance was achieved and full delegation was awarded.
- The Medical Staff By-Laws were revised in March 2011. The Credentialing and Privileging Policies and Procedures were incorporated into the By-Laws to meet Joint Commission standards.
- The MSO worked with the Allied Health Credentialing Committee to revise the Allied Health privileging forms.
- The MSO continued working with each individual department to create forms, enhance policies, and structure a tracking system for Ongoing and Focused Evaluations for the Medical Staff.
- The MSO staff attended 2 state professional educational conferences. One member of the MSO attended the National Association of Medical Staff Services national education conference in September 2011.
- The MSO provided support to the Department of Patient Safety and Quality to help monitor and track training on Pain Management and Assessment, Restraint for the Non-Violent Patient, and Fluoroscopy Radiation Safety.

C. MSO INITIATIVES FOR 2012

1. Implement and facilitate the Medical Staff and Allied Health Professionals use of the new electronic process for completion of their credentialing applications.
2. Maintain quality staff and continue to provide educational developmental opportunities.
3. Provide high quality customer service to all credentialing applicants.
4. Provide data to other departments throughout Denver Health as requested.
5. Identify any areas for quality improvement.
6. Strive for a totally electronic credentialing process eliminating waste and paper.



VI. DIVISION OF HOUSTAFF AND STUDENT EDUCATION 2011 ANNUAL REPORT

SPONSORED PROGRAMS

Emergency Medicine

The Emergency Medicine Residency Program successfully filled all first year positions in the match. The program continues to be one of the most desirable programs for medical students and we attracted highly competitive applicants from across the United States. The program received continued full accreditation for 4 years from the Residency Review Committee in our annual evaluation in 2011.

In 2012, we received notice that we will get a Site Visit in 2012 to address concerns raised by the anonymous survey of residents performed by ACGME. We have taken steps to address the issues raised.

The Emergency Medicine Residency Program applied for and was granted an expansion in residency complement by the RRC. We offered the additional programs in the 2011 match and filled the positions.

Medical Toxicology

The Medical Toxicology program underwent an Internal Review. Issues raised at the last Site Visit have been addressed. We anticipate another Site Visit in the next year. The program applied for and was granted an expansion of one fellow to accommodate a candidate from the US Air Force. This fellow began in July 2011.

Oral and Maxillofacial Surgery

The program is fully accredited by the Commission on Dental Accreditation. The program has one resident per year.

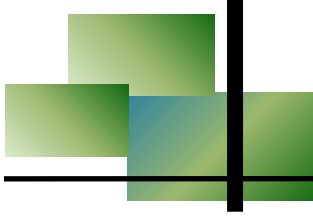
General Dentistry

The program is fully accredited by the Commission on Dental Accreditation.

OTHER RESIDENCY ISSUES

Nearly 1000 residents rotated at Denver Health in 2011. The Graduate Medical Education Committee met approximately every other month and discussed residency issues.

This year we faced significant challenges related to new Common Program Requirements from the ACGME. This new requirements further restricted the hours that first year residents could work and increased the supervision requirements for faculty. It has been estimated by the ACGME that the new requirements will cost teaching hospitals between \$380 million to over \$1 billion per year. In response to the anticipated increased costs, we implemented a Lean Planning Event in Sept 2010 to plan for the new requirements. This event had representatives from University Hospital, Children's Hospital, various residencies, and the Graduate Medical Education Office. We implemented the changes as outlined in the report. Some of the changes have been successful – the addition of the Resident Liaison, the change in the handoff procedures, and the changes in intern rotations to meet the new work hour restrictions. We also expanded the hours that the residents could get meals, and eliminated the “meal tickets”. Instead, the residents now get credit on a “meal credit card” that they can use for the amount of food that they need.



MEDICAL STUDENTS

Approximately one third of medical students from the University of Colorado rotated at Denver Health for core rotations.

This year we made significant changes in the evaluation of faculty teaching by medical students. We worked with the University of Colorado School of Medicine to improve the reporting and documentation of faculty teaching by medical students. As a result, we implemented a pilot program in Obstetrics and Gynecology that ties student evaluations of faculty to faculty evaluation of students, and worked to improve documentation across all residencies. Many faculty members received medical student teaching evaluations for the first time in their careers. This effort resulted in a presentation at the Association of Professors of Obstetrics and Gynecology.

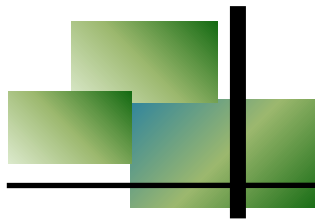
The School of Medicine has asked us to explore starting a Denver Health Track for medical students. We have explored various models, and scheduled a site visit at the Sanford School of Medicine to see their model.

OTHER STUDENTS

Approximately 1,500 individual students of various types came to Denver Health for educational experiences in 2010. These include Army Medics, Audiology, Chaplin, CRNA, Dental, Dieticians, Foundations in Doctoring, HIM, Medical Assistant, Midwives, Occupational Therapy, Ophthalmology, Otolaryngology/ENT, Paralegal, Pathology/Blood Bank, Pharmacy, Physical Therapy, Physician Assistant, Psychology, Radiology Techs, Research/Observation, Respiratory Therapy, Shadowing, Social Work, Speech/Language Pathology, Surgery Techs, Toxicology, and Ultrasound/Sonographers. We do not have a good grasp of the costs of these students to Denver Health. It is likely that these students provide some labor to Denver Health.

BADGING

We recognized that it was a significant expense to provide badges to all of the students listed above. We had an RIE around the badging and access issues for students. As a result of that RIE, we determined that we could make reusable badges that were specific to a type of student and require students to wear the picture ID badges provided by their home institution. Implementation of this policy saved Denver Health an estimated \$60,000 per year.



VII. MEDICAL BIOSTATISTICS 2011 ANNUAL REPORT

This annual report summarizes the 2011 activities and accomplishments of the division of Medical Biostatistics, including the degree to which 2011 goals as outlined in the 2010 annual report were met, and is presented in sections as follows:

- A. Overview of Biostatistics and Clinical Data Warehousing at Denver Health
- B. Goals and Achievements in 2011
- C. Research Support in 2011
- D. 2012 Goals

A. OVERVIEW OF BIOSTATISTICS AND CLINICAL DATA WAREHOUSING (BCDW)

Biostatistics is the science of statistics applied to the analysis of biological or medical data. Medical Biostatistics is a division within the Denver Health Department of Patient Safety and Quality.

This department is currently comprised of 2.6 FTEs as follows:

Allison Sabel, MD, PhD, MPH, CMQ serves as the Director of Biostatistics and Clinical Data Warehousing since November 2005. She is board-certified in Public Health and General Preventive Medicine with her Masters of Public Health in Epidemiology. Her doctorate is in Biostatistics and she is Certified in Medical Quality. In August 2011, Dr. Sabel decreased to 0.8 FTE and began telecommuting 70% of the time. This retention strategy allowed Denver Health to retain Dr. Sabel as part of its high quality workforce.

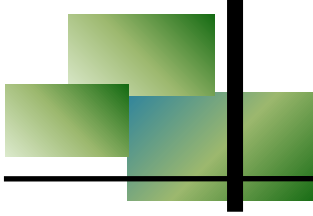
Carolyn Valdez serves as the Statistical Research Specialist. In August 2011, Carolyn decreased from 0.9 FTE to 0.8 FTE and began telecommuting 70% of the time. This retention strategy allowed Carolyn to move with her family and complete the final stages of her Masters of Science in Biostatistics.

Data Team Administrator position is vacant as of November 2011. Unfortunately, this position was very difficult to fill in 2010 because non-health care information technology positions were abundant and offered better compensation. The plan for 2012 is to convert this position into two positions that would be more beneficial to our department. There is a need for an Application Administrator and a Biostatistician to assist with enterprise-wide clinical data requests and research projects.

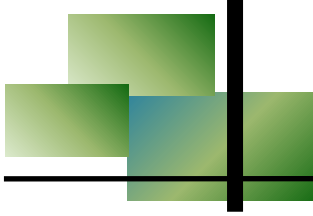
B. GOALS AND ACHIEVEMENTS IN 2011

In its 2010 annual review and report, Medical Biostatistics identified seven goals to achieve in 2011. This section describes these goals and how they were achieved.

Goal #1. Coordinate the planning, analyzing, reviewing, interpreting, and summarizing of statistical data for Denver Health, with a specific emphasis on the needs of the Department of Patient Safety and Quality while expanding the scope of the department's QI efforts.



- Department of Patient Safety and Quality Priorities 2011
 - A. Abnormal Results Tracking
 - Created automated reports that tracked our Anticoagulation patients and expanded metrics to the inpatient setting
 - Medication reconciliation data was summarized each month and disseminated internally
 - Global Safety Score was developed and validation efforts undertaken
 - B. Guideline Development, Approval, and Dissemination
 - Provided the preparatory information needed for Lean events on order set usage and guideline development
 - C. Department/Service-line Engagement in Quality and Patient Safety
 - Developed metrics for provider-based evaluations.
 - Provided monthly reports to nurse stations and CHS clinics on adult immunization status for their patients
 - Collaborated with every clinical department at Denver Health with data requests and biostatistical analysis
 - D. Hospital Acquired Condition and Adverse Event Prevention
 - Determined how often abnormal vital signs were occurring on acute care patients which will provide further insight into the criteria for our Rapid Response Program.
 - Upgraded the Agency for Healthcare Research and Quality Patient Safety Indicators (PSI) software which allowed Denver Health to identify patients with PSIs in a timely manner, thereby providing the opportunity to improve physician documentation and address the PSI if applicable. Shifted all stored procedures from weekly to daily runs so that reports could update nightly.
 - Created automated reports in Web Publishing for CMS Never Events and AHRQ PSIs so that cases could be reviewed within a week of discharge.
 - E. Resident Physician and AHP Oversight
 - Generated reports for case reviews to determine appropriate oversight
 - F. Global Safety Score Development
 - Led the development of the automated global safety score during the fall of 2010 with validation during 2011 and implementation planned for winter of 2012.
- Regulatory Compliance
 - Summarized data for the Joint Commission standard related to providing the same standard of care, treatment, and services throughout the hospital
 - Created monthly reports for any Joint Commission standards that relied upon electronic data
- Patient Safety Net
 - Organized and led the enterprise-wide migration to the new version of PSN
 - Required a massive re-architecture of our current system
- DPSQ Production Board, Tactical Meeting, and Quality Scorecard
 - Developed metrics for a department production board that is reviewed on a weekly basis
 - Created a template for the weekly Tactical Meeting that automatically updates the production metrics
 - Update manual metrics on the Quality Scorecard on a monthly basis
- Lean Involvement
 - Participated in metric development for Clinical Value Stream
 - Provided metrics for VTE, Joint Commission Preparedness, Inpatient Diabetes



Goal #2. Provide the clinical, technical, and statistical expertise needed for the successful development, validation, implementation, and data extraction of Denver Health's data warehouse.

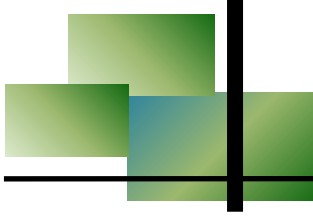
- Collaborated with every clinical department at Denver Health with data requests and biostatistical analysis.
- Provided clinical guidance for the new extraction, translate, and load processes for data from: Lifelink Nursing Documentation, Lifelink Vital Signs, and Lifelink Workflow Engine
- Created log file and usage reports for Lifelink Workflow developers and end users
- Provided statistical support on multiple projects for Alcohol Task Force
- Analyzed Rapid Response and its usefulness at Denver Health
- Provided data and review of applications for award nominations or external reporting, such as: Report to the City, HEDIS, GAO Survey

Goal #3. Support the Performance Improvement nurses on data concerns in regards to the core measures and provide support for existing and future reports from Soarian Quality Measures data.

- Provided clinical guidance and data support four SQM upgrades and assisted with technical issues
- Improved the reporting capabilities of core measures data by creating customized reports from the data warehouse.
- Organized the enterprise-wide efforts to evaluate the impact of 3M's resequencing of ICD-9 codes and our strategy to fix the situation
- Identified patients eligible for future core measures so the department could determine compliance and implement process improvements prior to public reporting
- Created a report listing admitted patients whom were not up to date on immunizations and developed a process to email this report to nursing administration

Goal #4. Provide mentorship to medical trainees and statistical research specialists, especially those who focus on quality and safety.

- Allison Sabel provided mentorship to the following individuals in study methodology, survey design, data collection, data cleaning, and statistical techniques:
 - Carolyn Valdez, Statistical Research Specialist in Department of Patient Safety and Quality, Division of Biostatistics and Clinical Data Warehousing
 - Rachel Everhart, Data Team Administrator in Department of Patient Safety and Quality, Division of Ambulatory Quality Improvement
 - Stacy Nitura, Data Team Administrator in Department of Patient Safety and Quality, Division of Biostatistics and Clinical Data Warehousing
 - Josh Durfee, Statistical Research Specialist in Department of Patient Safety and Quality, Division of Health Services Research
 - Kate Fagan, Statistical Researcher in Department of Patient Safety and Quality, Division of Ambulatory Quality Improvement
 - Dina Marroquin, Application Analyst for eHS Decision Support Solutions
 - Michelle Ramos, Administrative Assistant
 - Dr. Shulamit Schwartz, ophthalmology research fellow
 - Dr. Craig Hogan, orthopedic resident
 - Dr. Jens Hahnhaussen, orthopedic research fellow
 - Hari Prabhakar, medical student



- Carolyn Valdez provided mentorship in data extraction, data cleaning, and statistical techniques to:
 - Kristin Breslin, Statistical Research Specialist in Department of Patient Safety and Quality, Division of Ambulatory Quality Improvement

Goal #5. Demonstrate the successes of Denver Health's quality improvement projects and the data warehouse through lectures on the national level and through peer-reviewed publications.

- BCDW was significantly involved in one project which received national recognition in 2011
 - The National Association of Public Hospitals and Health Systems Safety Net Improving Patient Safety Award was bestowed for our use of Lean to improve VTE prophylaxis and reduce thrombosis.
- 2 manuscripts related to patient safety, quality improvement, or clinical data warehousing were published or accepted for publication in peer-reviewed journals in 2011.
 - Biffi WL, Beno M, Goodman P, Bahia A, **Sabel A**, Snow K, Steele AQ, Swartwood C, Thienelt C, MacKenzie T, and Mehler PS. "Leaning" the Process of Venous Thromboembolism Prophylaxis. *The Joint Commission Journal on Quality and Patient Safety*. 2011 Mar; 37(3):99-109.
 - Jenkins TC, Knepper BC, **Sabel AL**, Sarcone EE, Long JA, Haukoos JS, Morgan SJ, Biffi WL, Steele AW, Price CS, Mehler PS, Burman WJ. Decreased Antibiotic Utilization After Implementation of a Guideline for Inpatient Cellulitis and Cutaneous Abscess. *Arch Int Med* 2011 Feb 28 [Epub ahead of print]
- 4 peer-reviewed abstracts were presented or accepted in 2011.
 - Jenkins T, Knepper B, **Sabel A**, Sarcone E, Long J, Haukoos J, Morgan S, Biffi W, Steele A, Price C, Mehler P, Burman W. Decreased antibiotic utilization after implementation of a guideline for inpatient cellulitis and cutaneous abscess. In: Program and abstracts of the 21st Annual Scientific Meeting of the Society for Healthcare Epidemiology of America (Dallas). Arlington, VA: Society for Healthcare Epidemiology of America, 2011.
 - Buchanan JA, MacKenzie TD, **Sabel A**, Lavonas EJ. Use of a Health Information Data Warehouse to Conduct Active Surveillance and Targeted Provider Education for Agranulocytosis Caused by Contaminated with Levamisole. North American Congress of Clinical Toxicology Annual Meeting. Washington, D.C., September 21-26. *Clinical Toxicology* (2011), 49, 515-627.
 - Bapoje SR, Mehler PS, Albert RK, **Sabel AL**, Bellomo R, Chandrasekaran S, Chu ES. Effectiveness of Rapid Response Call Criteria: A Systematic Review and Meta-Analysis. Society of Hospital Medicine's Annual Meeting. Dallas, TX, May 10-13, 2011.
 - Sagar UN, Krantz MJ, **Sabel AL**, Long CS, Barbey JT, White KV, Gaudiani JL, Mehler PS. Is QT-Prolongation a Characteristic Feature of Severe Anorexia Nervosa. International Academy of Cardiology 16th World Congress on Heart Disease. Vancouver, BC, Canada. July 23-26, 2011.
- 4 invited national, regional, or local lectureships were presented by Allison Sabel on the successes of Denver Health's quality improvement projects or the data warehouse.
 - Colorado Clinical and Translational Sciences Institute Informatics Seminar, "Denver Health's Data Warehouse and its Use in Quality Improvement and Clinical Research", Aurora, CO, January 20, 2011
 - Healthcare Information and Management Systems Society (HIMSS) Webinar, "Business Intelligence: Leveraging Meaningful Use Data", April 20, 2011
 - University of Kentucky Healthcare Executive Leadership Program, "Using Data in Healthcare Decision Making", Louisville, KY, June 24, 2011

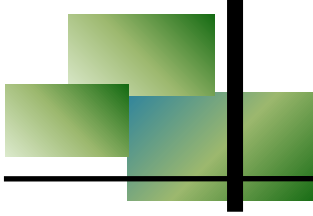
- MIT Information Quality Industry Symposium, “Data Aggregator’s Dilemma: How to Overcome Inaccurate Data and Maintain Data Quality”, Boston, MA, July 14, 2011

Goal #6. Provide biostatistical support on grant applications, research projects, and publication of scientific manuscripts.

- Grants and National Collaboratives
 - High Value Healthcare Collaborative
 - Medical Global Payment Demonstration Project
 - Reducing Inappropriate Prescribing of Antibiotics by Primary Care Clinicians
- Scientific manuscripts receiving biostatistical support
 - Gaudiani JL, **Sabel AL**, Mascolo M, and Mehler PS. Severe Anorexia Nervosa: Outcomes from a Medical Stabilization Unit. *International Journal of Eating Disorders*. First published online 10DEC 2010 DOI: 10.1002/eat.20889.
 - Flierl MA, Gaudiani JL, **Sabel AL**, Long CS, Stahel PF, and Mehler PS. Complement C3 Serum Levels in Anorexia Nervosa: A Potential Biomarker for the Severity of Disease? *Annals of General Psychiatry*. 2011; 10:16 (4 May 2011).
 - Krantz MJ, **Sabel AL**, Sagar U, Long CS, Barbey JT, White KV, Gaudiani JL, Mehler PS. Factors Influencing QT Prolongation in Patients Hospitalized with Severe Anorexia Nervosa. *General Hospital Psychiatry*. Doi:10.1016/j.genhosppsy.2011.08.003 [Epub ahead of print].
 - Ozer K, Kilic A, **Sabel A**, Ipaktchi K. The Role of Bone Allografts in the Treatment of Angular Malunions of the Distal Radius. *J Hand Surg*. 2011; 36A:1804-1809.
- Research Projects
 - Redesign of Anticoagulation Clinic Services to Improve Access to Care: A Lean Approach – submitted to *Journal of Health Care for the Poor and Underserved*
 - Higher BMIs Associated with an Increase in Medical Encounters for Musculoskeletal Injuries
 - Emergency Department Restraint Analysis

Goal #7. Promote continuing education for staff related to progress towards completion of degrees or certifications.

- Developed the skill set to create automated reports using SAS EG, thereby replacing the need to create SAS datasets, export into Excel, and manually create graphs on a monthly basis
- Developed the skill set to create automated reports in SSRS, deploy them to development, and conduct validation
- Attended monthly webinars provided by University HealthSystem Consortium (UHC) about national changes in healthcare, enhancements to their database, and guidance for use of their database
- Advisory member on all major UHC clinical committees:
 - Clinical Informatics Advisory Group Executive Committee
 - Quality and Accountability Steering Committee
 - Risk Adjustment Task Force
 - Performance Improvement and Comparative Data Operations Committee
 - Patient Safety Net Steering Committee
- Attended continual education at MIT Data Quality Symposium, UHC Annual Conference, Colorado Hospital Association Clinical Performance Measurement Conference



C. RESEARCH SUPPORT IN 2011

Reducing Inappropriate Prescribing of Antibiotics by Primary Care Clinicians

AHRQ ACTION 290-2007-100-08 RFTO #16

8/2009 – 8/2012

Total Funding: \$625,000

BCDW Funding: 8% of Allison Sabel's salary

D. 2012 GOALS

1. Coordinate the planning, analyzing, reviewing, interpreting, and summarizing of statistical data for Denver Health, with a specific emphasis on the needs of the Department of Patient Safety and Quality while expanding the scope of the department's QI efforts.
2. Provide the clinical, technical, and statistical expertise needed for the successful development, validation, implementation, and data extraction from Denver Health's data warehouse.
3. Support the Performance Improvement nurses on data concerns in regards to the core measures and provide support for existing and future reports from Soarian Quality Measures data.
4. Provide mentorship to medical trainees and statistical research specialists, especially those who focus on quality and safety.
5. Demonstrate the successes of Denver Health's quality improvement projects and the data warehouse through lectures on the national level and through peer-reviewed publications.
6. Provide biostatistical support on grant applications, research projects, and publication of scientific manuscripts.
7. Promote continuing education for staff related to progress towards completion of degrees or certifications.

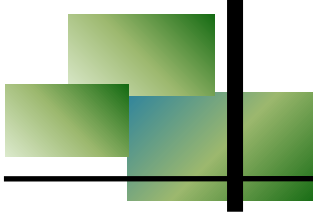
VIII. INFECTION PREVENTION AND ANTIBIOTIC STEWARDSHIP PROGRAM 2011 ANNUAL REPORT

This report serves to address the requirements for our:

- 2011 Annual Report of Denver Health's Infection Prevention (IP) and Antibiotic Stewardship (AS) program
- 2011 Infection Control and Prevention Analysis/ 2012 Plan to comply with Joint Commission standards

This report will be presented as follows:

- A. Program Description
- B. Infection Prevention and Control Report



C. Antibiotic Stewardship Report

Sections B and C are further divided into analysis of 2011 goals; risk assessment for 2012; and 2012 goals.

The report addresses Denver Health strategic imperatives #1 (Maintain financial viability and success) and #6 (Maintain high quality patient care).

A. PROGRAM DESCRIPTION

Mission of the program is to support Denver Health in providing the highest quality and safest health care by:

1. Reducing the risk of acquiring and transmitting infections in both the inpatient and outpatient settings
2. Ensuring the optimal antibiotic choice, dose, and duration of therapy for each patient to maximize the opportunity for a favorable outcome and minimize unnecessary antibiotic use
3. Decreasing infection-related costs
4. Engaging in research aimed at furthering knowledge of preventing healthcare associated infections and the optimal use of antibiotics.
5. Providing leadership in community and national infection prevention and stewardship initiatives

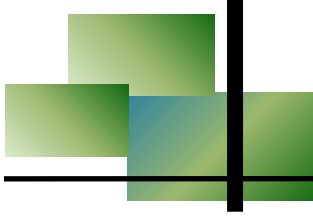
Denver Health and Hospital Authority is located in a metropolitan area of Denver, Colorado. A major teaching facility, it is comprised of a 477 licensed bed hospital, multiple specialty clinics, community health centers, and school based clinics as well as the health department for the city and county of Denver. Denver Health serves to meet the special health care needs of the population with services ranging from level one trauma care to those needed by multiple correctional care facilities in the state of Colorado. It also addresses the needs of special populations especially those of the poor, underinsured, mentally ill, the homeless and victims of violence. A twenty-one bed correctional care facility is part of the hospital itself. Other facilities include the Rocky Mountain Poison and Drug Center, Denver Cares detoxification facility, a center for Occupational Health and Safety and the Denver Paramedics. Mental Health services are provided from children ages 8 through adults in both inpatient and outpatient settings. Physicians are salaried employees who retain academic appointments on the University of Colorado School of Medicine faculty. Training is provided in 28 medical specialties and 23 allied health fields.

Other pertinent facts for the IP and AS program at Denver Health:

- No transplant services
- No cardiac surgery
- Most of our immunocompromised patients are related to HIV infection.
- Denver Health receives few long-term care patients relative to most other metro area hospitals.
- Expanding pediatric services

The Infection Prevention and Antibiotic Stewardship Program now is comprised of the following core program members coming together from 4 departments at DH:

Connie Savor Price, MD (Department of Medicine/Chief of Infectious Diseases) serves as the Infection Prevention program medical director/healthcare epidemiologist since July 2002, with a 0.5 FTE effort to devote to the program. She has specialty fellowship training and research interest in healthcare epidemiology. She is actively involved with and serves as a board member of the Society of Healthcare Epidemiology of America (SHEA). In addition, she is board certified in internal medicine (ABIM), infectious diseases (ABIM) and medical microbiology (ABP). She serves as the Physician Representative on Colorado's Healthcare Associated Infections Advisory



Committee for public reporting; provided faculty leadership for the Statewide collaborative to reduce surgical site infections and *Clostridium difficile* infections; acted as an advisor to the CDPHE emerging infections network on healthcare associated infections. She has served as a PI on a number of federally funded grants and contracts on the study of healthcare associated infection prevention, surveillance, and emerging infectious diseases.

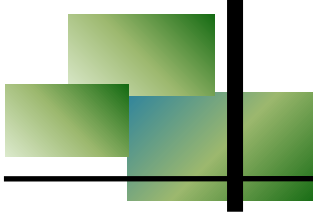
Timothy Jenkins, MD (Department of Medicine/Infectious Diseases) serves as the Antibiotic Stewardship program medical director since its inception in July 2008, with a 0.5 FTE effort devoted to the program. His research interests include strategies to improve antibiotic prescribing for common infections treated in the hospital and ambulatory care settings, antibiotic utilization for skin and soft tissue infections, and the epidemiology, evaluation, and treatment of Staphylococcus aureus bloodstream infections. He recently received a fundable score on a 5-year K23 career development award to study antibiotic stewardship in the treatment of skin and soft tissue infections. Dr. Jenkins is board certified by the ABIM in Internal Medicine and Infectious Diseases and is a member of the Infectious Diseases Society of America (IDSA) and the Society of Healthcare Epidemiology of America (SHEA).

Amber Miller, RN, MSN, CIC (Department of Patient Safety and Quality) is the Program Manager of Infection Prevention at Denver Health. Before her start date in April 2011, Ms Miller had been in the combined role(s) of Patient Safety and Infection Prevention Manager for Exempla since 2003, where she had been responsible for the development, coordination, implementation, and evaluation of all activities and outcomes in the Patient Safety Program and Infection Prevention Program over the previous 8 years. She has led several infection prevention collaboratives such as Transformation of the ICU, Surviving Sepsis, and more recently led the pilot project for the Joint Commission's Center for Transforming Healthcare Hand Hygiene Collaborative utilizing Lean Six Sigma. The latter has gained her national recognition for use of LEAN in Infection Prevention. Ms. Miller is a registered nurse in the state of Colorado and certified in infection control by the Certification Board of Infection Control. She is active in the national and local chapter of the Association for Professionals in Infection Control (APIC) and served on the Colorado Healthcare Associated Infections Advisory Committee. She also served as lead faculty for the American Reinvestment and Recovery Act (ARRA) funded Infection Prevention training course for Colorado.

Claire Swartwood, PharmD (Department of Pharmacy) serves as the Antibiotic Stewardship program's infectious diseases-trained clinical pharmacy specialist, with a 0.8 FTE effort devoted to the program. She has worked as a pharmacist at Denver Health since 2004, initially as the Medication Use Coordinator, and more recently, the Emergency Department Pharmacist. She transitioned to her infectious diseases pharmacist position and joined the Antibiotic Stewardship Program in December 2009. She is board certified by the Board of Pharmaceutical Specialties in pharmacotherapy and is a member of Infectious Diseases Society of America (IDSA), American Society of Microbiology (ASM), Society of Critical Care Medicine (SCCM), and several other pharmacy-related organizations focusing on their sub-groups of infectious disease and critical care.

Cathy Vigil, RN, BSN, CIC (Department of Patient Safety and Quality) has served as an infection control practitioner at DH since June 2005 in a full-time role after years of experience as a community health nurse. She completed her BSN in 2007 and received her certification in infection prevention (CIC) in 2008. She is an active member of the Association for Professionals in Infection Control and Epidemiology (APIC).

Kenneth Stiefvater RN, BSN (Department of Community Health Services) has served as an infection control practitioner at DH since mid- 2005 at a half-time effort. He serves as a liaison to our program for issues in



infection prevention relevant to CHS and our Denver Public School clinics, with formal reporting through the CHS Director of Nursing Services (Vickie Lesnansky, RN)

Amy Irwin, RN, DNP (Department of Medicine) completed her clinical doctorate in nursing in 2006, and has worked full-time at DH since December 2007 as a research nurse coordinator for infectious diseases. She has provided study coordination for a number of healthcare associated infection research grants and originated the Healthcare Infection Prevention Performance Improvement (HIPPI) Champion program at Denver Health in 2008. She participated in the 2010 SHEA-CDC Healthcare Epidemiology and Infection Control training course as a Pugliese Scholarship recipient, and the Johns Hopkins Fellows Course in Hospital Epidemiology and Infection Control. She is currently a Co-investigator on the Intermountain CMMI Hospital Engagement network.

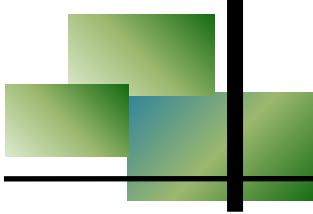
Heather Young, MD (Department of Medicine) is a second year Infectious Diseases fellow at the University of Colorado. After coming to us from the University of Massachusetts Medicine/Pediatrics combined program, she successfully completed all of her Infectious Diseases clinical requirements during her 1st year of fellowship training. Her 2nd and 3rd years of fellowship are devoted to research in healthcare associated infections, specifically on the topic of surgical site infections (SSI), in close collaboration with our Department of Surgery and the Colorado Hospital Association. She has been instrumental in designing efforts to reduce SSI in hysterectomy patients at Denver Health.

Bryan Knepper MSc, MPH (Department of Patient Safety and Quality) has served as our Statistical Research Specialist as of June 2010 in a full-time role after years of experience in a similar role at CDPHE. He is charged with maintaining Infection Prevention data, designing more efficient methods for surveillance that will allow us to expand our data capture and feedback, administering NHSN for public reporting, and generating reports for increasing legal and regulatory demands for infection prevention data.

Research Support 2011

Grants and Contracts

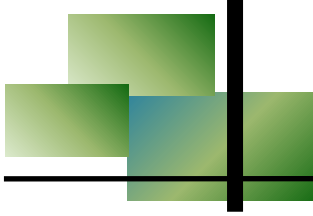
| Title | Sponsor | Local PI | Estimated Total Funding |
|---|--|-----------------|-------------------------|
| Center for Medicare and Medicaid Innovation (CMMI) Hospital Engagement Network (HEN) | CMMI (Intermountain) | Price | \$300,000 |
| Respiratory Protection Effectiveness Clinical Trial (ResPECT) study | CDC/DHQP, NIOSH, and VHA (Hopkins) | Price | \$460,000 |
| Effect of the Use of Universal Glove and Gowning on Healthcare Associated Infection Rates and Antibiotic Resistant Bacteria | AHRQ HHS 2902006000151 | Price/ EE Moore | \$50,000 |
| Reducing Healthcare Associated Infections through a Statewide Collaborative | CDC Patient Safety Program RFP #LQ HFD1002 | Price | \$22,500 |
| Improving the Measurement of Surgical Site Infection (SSI) Risk Stratification and Outcome Detection | AHRQ ACTION I | Price/Biffi | \$500,000 |
| Reducing Inappropriate Prescribing of Antibiotics by Primary Care Clinicians | AHRQ Primary Care Based Research Network (U of CO) | Price | \$500,000 |



| | | | |
|---|-------------------------------|---------------|---------------------|
| Rapid bacterial identification and antibiotic resistance testing in critically ill adults at risk for ventilator acquired pneumonia | Denver CTSA | Price/Douglas | \$100,000 |
| Healthcare Associated Infections in Colorado | CDPHE | Price | \$20,000 |
| The Role of Antibiotics in Open Fractures Revisited: Characteristics of Staphylococcus aureus and Susceptibility Profile | Orthopedic Trauma Association | Price | \$80,000 |
| LARRK Foundation Fellowship in Infectious Diseases | LARRK Foundation | Young | \$50,000 |
| Moving the Field Forward: Evaluation of Antibiotic Prescribing Practices, the Clinical Course, and Biomarkers in Patients Hospitalized with Skin and Soft Tissue Infections | NIH/NIAID (K23 Award) | Jenkins | \$654,879 (pending) |

Pharmaceutical/Biotech

| Title | Sponsor | Local PI | Total Funding |
|--|--------------------------|-----------------|----------------------|
| DAP-4IE-06-03 A phase 4 multicenter, randomized, double blind study to describe the efficacy and safety of cubicin® (daptomycin for injection) with and without initial gentamicin combination therapy in the treatment of Staphylococcus aureus infective endocarditis | Cubist Pharma | Price | TBD |
| Development of Rapid Microbiology Techniques Using Leftover Human Specimens. | Accler8 Corp | Price/Douglas | TBD |
| BCX1812-301: A Phase 3, multicenter, randomized, double-blind, controlled study to evaluate the efficacy and safety of peramivir administered intravenously in addition to standard of care compared to standard of care alone in adults and adolescents who are hospitalized due to serious influenza | BioCryst Pharmaceuticals | Price | TBD |



Publications 2011

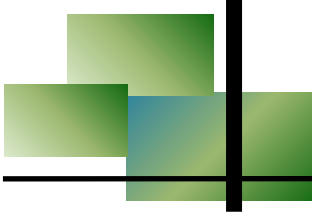
Peer-Reviewed Manuscripts 2011

1. Burden M, Cervantes L, Weed D, Keniston A, Price CS, Albert R. Newly Cleaned Physician Uniforms and Infrequently Washed White Coats Have Similar Rates of Bacterial Contamination After an Eight-Hour Workday: A Randomized Controlled Trial. *J Hosp Med*. 2011 Feb 10.
2. Saveli C, Belknap R, Morgan S, Price CS. The Role of Prophylactic Antibiotics in Open Fractures in an Era of Community Acquired Methicillin Resistant Staphylococcus aureus (MRSA). *Orthopedics*. 2011 Aug;34(8):611-6
3. Millett PJ, Yen YM, Price CS, Horan MP, van der Meijden OA, Elser F. Propionobacter acnes Infection as an Occult Cause of Postoperative Shoulder Pain: A Case Series. *Clin Orthop Relat Res*. 2011 Jan 15.
4. Jenkins TC, Knepper BC, Sabel AL, Sarcone EE, Long JA, Haukoos JS, Morgan SJ, Biffi WL, Steele AW, Price CS, Mehler PS, Burman WJ. Decreased Antibiotic Utilization After Implementation of a Guideline for Inpatient Cellulitis and Cutaneous Abscess. *Arch Intern Med*. 2011 Feb 28.
5. Albert RK, Connett J, Bailey WC, Casaburi R, Cooper JAD, Criner GJ, Curtis JL, Dransfield MT, Han MK, Lazarus SC, Make B, Marchetti N, Martinez FJ, Madinger NE, McEvoy C, Niewoehner DE, Porsasz J, Price CS, Reilly J, Scanlon PD, Scirba FC, Scharf SM, Washko GR, Woodruff PG, Anthonisen NR for the COPD Clinical Research Network. Azithromycin for Prevention of COPD Exacerbations. *N Engl J Med*. 2011 Aug 25;365(8):689-98
6. Young H, Swartwood CJ, Jenkins TC, Belknap R. Successful treatment of gentamicin-resistant Enterococcus faecalis bacteremia with synergistic intravenous streptomycin in a hemodialysis patient: case report and literature review. *Journal Infect Chemother* 2011; 17:698-9
7. Young H, Tomsick S, Storfa A, Jenkins T. Arm Pain and Fistulous Tract in a 45-year-old Liberian Woman. *Clin Orthop Relat Res* 2011; 469:1800-3
8. Beieler AM, Jenkins TC, Price CS, Saveli CC, Bruntz M, Belknap RW. Successful limb-sparing treatment strategy for diabetic foot osteomyelitis. *J Am Podiatric Med Assoc* (in press)
9. Jenkins TC, Sakai J, Knepper BC, Swartwood CJ, Haukoos JS, Long JA, Price CS, Burman WJ. Risk factors for drug-resistant Streptococcus pneumoniae and antibiotic prescribing practices in outpatient community-acquired pneumonia. *Acad Emerg Med* (in press)
10. Young H, Berumen C, Knepper B, Miller A, Silverman M, Gilmartin H, Wodrich E, Alexander S, Price CS. Statewide collaboration to evaluate the effects of blood loss and transfusion on surgical site infection after hysterectomy. *Infect Control Hosp Epidemiol*. 2012 Jan;33(1):90-3. Epub 2011 Nov 22.
11. Young H, Bliss R, Carey JC, Price CS. Beyond core measures: identifying modifiable risk factors for prevention of surgical site infection after elective total abdominal hysterectomy. *Surg Infect (Larchmt)*. 2011 Dec;12(6):491-6. Epub 2011 Dec 5.
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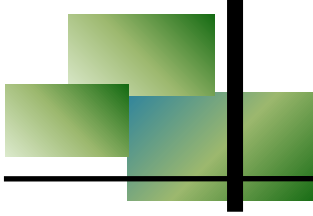
B. THE INFECTION PREVENTION (IP) PROGRAM AT DENVER HEALTH

ANALYSIS OF 2011 IP GOALS

The following summarizes the status of goals and strategies that were initiated as part of the 2011 program at Denver Health:

2011 Goal #1. Improve hand hygiene compliance.

From a baseline of <40% compliance when surveillance started in 2005, to 85% overall compliance in 2009 and 86% in 2010, we maintained our progress with an **overall compliance rate of 90% in 2011.**



These measurements were **taken from 2566 observations** of hand hygiene opportunities made throughout 2011 in our acute care areas (n=1806) including general medicine wards, ICUs, ED, urgent care, and psychiatry settings and CHS (n=760).

Numerous other strategies were employed to sustain our improvements in 2011:

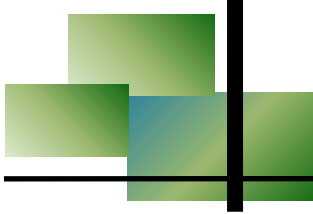
- Ongoing observation in all clinical areas continued with reports prepared quarterly, presented at infection prevention committee, and sent to all stakeholders. We continued to promote data transparency to drive improvement by posting on the PULSE, nursing dashboards, and in clinical areas.
- We continued focus education using new employee orientation, new physician education, nursing orientation and annual required competency training.
- A new Hand Hygiene Campaign has commenced with selecting a new hand hygiene product for DH. Employees were involved with selecting the product by trialing samples of candidate waterless products. The product selected has been chosen based on staff input, cost, and environmental considerations around disposal.
- Using LEAN tools involving ample visual cues, signs posted in inpatient rooms as well as in exam rooms for CHS and specialty clinics encourages visitors and patients to remind caregivers to perform hand hygiene prior to giving care. These signs are available in Spanish and English.
- In CHS, patient interviews after the appointment asked the patient how their provider did with hand hygiene.
- The reporting icon on the Pulse empowered staff to report hand hygiene violations. Due to low use, the icon was discontinued in August 2011.
- A CDC video in both English & Spanish is available on the patient education channel.
- Focused efforts in lower compliance areas, especially the Emergency Department, involved increased observations, identifying ED staff champions, and making waterless hand sanitizers more widely available.
- Pocket hand gel on Behavioral Health and Rehabilitation units

Continued barriers to our goal of 100% compliance relate to competing provider priorities, better compliance with “before” opportunities in the inpatient settings, and some inefficiencies in processes (eg excess in-and-out of patient rooms).

2011 Goal #2. Decrease the rate of device related infections

Central venous catheters, endotracheal tubes, and urinary catheters pose increased risk for healthcare associated infections. The following interventions were continued or implemented to decrease risk for infection from these devices in 2011:

- The Healthcare Infection Prevention Performance Improvement (HIPPI) champion program transitioned leadership from our Infection Prevention research program into our quality program. The front line providers who serve as HIPPI champions monitor process measures shown to prevent device related infections in the SICU, MICU, & PCU.
- We have begun to expand the HIPPI program to acute care inpatient areas to assist in auditing and monitoring of CLABSI-prevention best-practices.
- Audit processes for CLABSI & VAP during each quarter by IP and/or HIPPI champions. Take action as needed based on the audits.



- We have worked with Patient Safety and Quality to encourage use of checklist for central line insertion in real time (and not filled out after procedure is completed).
- We have developed a checklist for use in pediatrics
- Continued online training with posttest for all medical staff (including housestaff) who perform central line insertions, intubations, and ventilator care.
- We have developed a Central Line workflow in LifeLink to target provider evaluation of daily necessity for central line, which has “gone live” on test wards
- We have continued implementation in acute care, the CAUTI workflow in LifeLink to target removal of unnecessary urinary catheters on general medicine wards. This intervention has also served as education on appropriate indications for urinary catheters and ensured that urinary catheters are inserted only when necessary for patient care.
- We have semi-automated our CLABSI surveillance, using electronic algorithms developed by Bryan Knepper, to flag candidate patients for line infections, which has allowed for whole house surveillance of CLABSI in 2011 and compliance with CDPHE, CMS, and Joint Commission mandatory reporting.

Benchmarking was performed against >1500 hospitals contributing data to the CDC’s National Healthcare Surveillance Network (NHSN). Denver Health rates were monitored and benchmarked against national mean rates for comparable units, e.g. MICU was benchmarked against other similar medical major teaching ICUs and SICU was benchmarked against other trauma ICUs. Each rate is given an NHSN “percentile” according to where we rank vs our similar peer units: top 10%; 10-25%; 25-50%; 50-75%; 75-90%; and 90%.

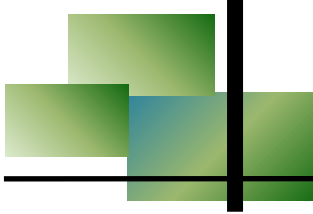
The Standardized Infection Ration (SIR) is a metric generated within the National Healthcare Safety Network (NHSN). It uses important risk factors in historical data to calculate the expected number of infections given a patient population’s risk factors for a specific infection event, and subsequently compares this number statistically with the actual number of infections observed.

Central-line associated bloodstream infections (CLABSI): Rates in the MICU, SICU, PICU, NICU and Progressive Care Unit (PCU) were monitored and benchmarked against national mean rates for comparable units. Continued “bundle” interventions resulted in sustained to improved rates. Quarter 3, 2010, marked the initiation of CLABSI surveillance in Acute Care. In adult and pediatric ICUs, **all 2010 rates again were below national pooled mean rates; adult ICUs and PICU accomplished lower than national pooled mean rates again for the 4th consecutive year.** The Progressive Care Unit had a lower frequency of central line utilization; thus the 2 CLABSI diagnosed in PCU patients in 2010 resulted in rates for that unit that were above pooled mean national rates, but improved vs their own rates from the previous 2 years.

Denver Health CLABSI rates over the last 4 years, and the corresponding National Healthcare Surveillance Network (NHSN) percentile, were as follows:

CLABSI per 1000 central line days

| | 2007 | 2008 | 2009 | 2010 | 2011 | NHSN percentile for 2011 |
|-------------|------|------|------|------|------|--------------------------|
| MICU | 1.4 | 1.7 | 1.8 | 1.0 | 0.0 | 10% |
| SICU | 2.9 | 2.2 | 1.7 | 0.8 | 1.74 | 25-50% |
| PCU | --- | 3.7 | 3.9 | 2.7 | 0.9 | 50-75% |
| PICU | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10% |



| | | | | | | |
|------------|-----|-----|-----|-----|-----|--------|
| NICU | 0.0 | 5.7 | 0.0 | 0.0 | 2.5 | 50-75% |
| Acute Care | -- | -- | -- | 1.1 | 0.9 | 50-75% |

MICU and PICU benchmarked in the top 10% and SICU benchmarked in the top 25%-50% of comparable units reporting to NHSN.

Interventions again championed by the Infection Prevention, Patient Safety and Quality, HIPPI champions, unit directors, and most importantly- front line staff- included a “CLABSI bundle” with the following key elements:

- Hand hygiene
- Maximal barrier precautions
- Chlorhexidine/Etoh antiseptis of catheter insertion site except very LBW infants
- Non-femoral vein catheter insertion in adults
- Daily review of line necessity; prompt removal of unnecessary lines
- Chlorhexidine patch at line site
- Checklist
- Line cart
- Annual training for inserters

Rates were also publicly reported to the State of CO per new reporting law. **For the second year in a row, the ICUs CLABSI Standardized Infection Ratio (ratio of observed to expected infections) was statistically significantly below the expected rate of CLABSI** based on individual patient risk factors determined by the CDC’s National Healthcare Surveillance Network (NHSN). **In 2011, DH experienced 64% fewer CLABSI infections than expected based on patient risk factors (p<0.05).**

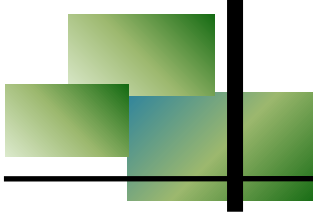
Avoiding unnecessary central lines was also a goal for 2010. Evaluation of our central line use **revealed lower utilization of central lines in our MICU and PICU (top 10-25%) and SICU (top 25-50%) compared to comparable units reporting nationally through NHSN**, which may in part explain low rates of CLABSI in these units as well. Findings are described in table below.

Central Line Utilization Ratio*

| | 2008 | 2009 | 2010 | 2011 | 2011 NHSN percentile |
|----------|------|------|------|------|----------------------|
| MICU | 0.54 | 0.47 | 0.47 | 0.42 | 10-25% |
| SICU | 0.62 | 0.57 | 0.51 | 0.50 | 25-50% |
| PCU | 0.28 | 0.26 | 0.20 | 0.22 | 50-75% |
| PICU | 0.40 | 0.20 | 0.18 | 0.19 | 10-25% |
| MED/SURG | 0.15 | 0.14 | 0.12 | 0.13 | 50-75% |

* line days/ patient days

Further opportunity for improvement to reduce unnecessary central lines is greatest in PCU and medicine/surgery general inpatient wards. In 2011, an intervention utilizing our Lifelink electronic documentation system sent daily alerts that would require documenting an appropriate indication for all central venous catheters. Those lines without an indication would be removed by a physician or qualified staff.



Ventilator-associated Pneumonia: Rates in the MICU, SICU, and PCU were monitored and benchmarked against national mean rates for comparable units. Note that benchmarking against national rates for VAP is problematic given lack of easily standardized definitions for VAP and (likely) under-reporting practices. Currently used surveillance definitions are being revised by the CDC in attempt to better standardize reporting and accuracy of benchmarking

As a more important indicator of quality, **benchmarking against our own historical data showed improved VAP rates for the 6th consecutive year in our MICU, achieving our lowest VAP rates to date.** After achieving historically low rates in 2010, the SICU and PCU experienced increases in rates.

Denver Health VAP rates over the last 4 years, and the corresponding National Healthcare Surveillance Network (NHSN) percentile, are shown below:

VAP per 1000 ventilator days

| | 2007 | 2008 | 2009 | 2010 | 2011 | NHSN percentile for 2011 |
|-------------|------|------|------|------|------|--------------------------|
| MICU | 2.0 | 2.5 | 2.1 | 1.34 | 1.3 | 50-75% |
| SICU | 9.9 | 7.4 | 3.4 | 3.02 | 6.5 | 50-75% |
| PCU | --- | --- | 2.1 | 0.0 | 3.7 | 75-90% |

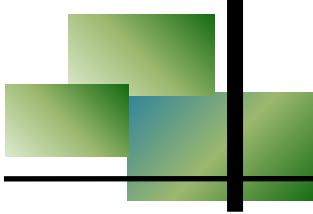
Interventions again championed by the Infection Prevention, Patient Safety and Quality, HIPPI champions, unit directors, and most importantly- front line staff- included a “VAP bundle” with the following key elements:

- Minimize duration of ventilation
- Daily assessment of readiness to wean
- Daily interruption of sedation
- Elevate head of bed
- Regular oral care
- Continuous aspiration of subglottic secretions

Catheter-Related Urinary Tract Infections (CAUTI). Surveillance for CAUTI in the adult ICUs continued in 2011. Although this is a low morbidity/mortality infection, it is a priority for infection prevention because a) CAUTI tends to be caused by more antibiotic resistant pathogens and their control is impacted by efforts toward reducing CAUTI and b) non-reimbursement by CMS for CAUTI.

Rates of CAUTI have decreased in the SICU from 2009 to 2011. **The SICU was substantially lower than the national mean for CAUTI rates (top 25-50th percentile) in 2011.** After a significant decline in 2009, rates of CAUTI in the MICU have increased. Surveillance was initiated in other high risk units for CAUTI- PCU and rehab- during 2011.

Denver Health CAUTI rates over the last 3 years, and the corresponding National Healthcare Surveillance Network (NHSN) percentile, is shown below.



CAUTI per 1000 catheter days

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2011 NHSN percentile |
|---------------|------|------|------|------|------|----------------------|
| MICU | -- | 3.5 | 1.7 | 2.7 | 4.3 | 75-90% |
| SICU | -- | 3.9 | 3.2 | 2.8 | 1.7 | 25-50% |
| PCU** | -- | -- | -- | -- | 4.6 | 90% |
| Rehab* | -- | -- | -- | -- | 2.8 | 50-75% |

* Only 2 quarters of data available

**Only 3 quarters of data available

In 2010, Infection Prevention, with the front line staff from the Medicine and Nursing services, spearheaded a CAUTI Workflow initiative in conjunction with eHealth Services. The purpose of this workflow was to continue initiatives set forth in 2009 from the “Get the Catheters Out” campaign and define opportunities to decrease the risk of CAUTI through addressing unnecessary catheter use. Evaluation of our urinary catheter use practices revealed opportunity for improvement for decreasing catheter use, particularly in surgical intensive and progressive care units, as described in table below.

Urinary Catheter Utilization Ratio*

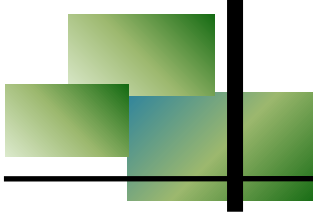
| | 2008 | 2009 | 2010 | 2011 | 2010 NHSN percentile | 2011 NHSN percentile |
|-----------------|------|------|------|------|----------------------|----------------------|
| MICU | 0.74 | 0.77 | 0.64 | 0.69 | 10%-25% | 25-50% |
| SICU | 0.94 | 1.0 | 0.96 | 1.01 | 75%-90% | 90% |
| PCU | 0.71 | 0.67 | 0.58 | 0.64 | 90% | 90% |
| PICU | 0.36 | 0.21 | 0.20 | 0.25 | 25%-50% | 50-75% |
| MED/SURG | 0.18 | 0.15 | 0.14 | 0.13 | 10% -25% | 25-50% |

* catheter days/ patient days

After initial pilot data revealed decreased urinary catheter utilization on intervention wards, the nursing driven protocols to remove unnecessary catheters was programmed into Lifelink throughout the inpatient setting during 2011.

2011 Goal #3. Decrease surgical site infection (SSI) rates.

Denver Health SSI rates over the last 4 years, and the comparison to NHSN pooled mean rates along with the Standardized Infection Ratio (observed/expected infection rate based on individual patient risk) is shown in the table below:



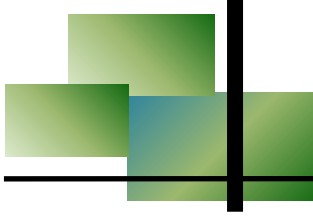
SSI per 100 Operations

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2011 NHSN comparison | 2011 SIR |
|-------------------------------|------|------|------|------|------|--|----------|
| Knee Arthroplasty | 2.9 | 0.0 | 1.3 | 2.1 | 2.9 | 75 th -90 th %ile of risk index 2,3 procedures | 2.74 |
| Hip Arthroplasty | 4.0 | 4.1 | 1.3 | 1.2 | 0.0 | 10 th %ile of risk index 2,3 procedures | 0.00 |
| Abdominal Hysterectomies | 10.0 | 10.3 | 8.8 | 3.8 | 0.0 | 10 th %ile of risk index 2,3 procedures | -- |
| Vaginal Hysterectomies | -- | -- | 0.0 | 1.8 | 1.9 | 75 th -90 th %ile of risk index 1,2,3 procedures | -- |
| Craniotomies | 5.6 | 6.5 | 3.2 | 3.1 | 3.7 | Below pooled mean for risk index 2,3 procedures | 1.22 |
| Thoraco/Lumbar Spinal Fusions | -- | 7.6 | 4.5 | 5.3 | 3.0 | 25 th -50 th %ile of risk index 2,3 procedures | 0.74 |
| Bariatric Surgeries | 13.6 | 13.9 | 13.3 | 4.5 | 0.0 | 10 th %ile of risk index 2,3 procedures | -- |
| Herniorraphies | | 2.3 | 2.2 | 1.0 | 0.2 | Below pooled mean for risk index 2,3 procedures | 0.29 |
| Colon Surgeries | -- | -- | -- | -- | 5.9 | 50 th -75 th %ile of risk index 2,3 procedures | 1.14 |
| Breast Surgeries | -- | -- | -- | -- | 1.04 | Below pooled mean for risk index 2,3 procedures | -- |
| Prostate Surgeries | -- | -- | -- | -- | 4.01 | Above pooled mean for risk index 2,3 procedures | -- |

Because of our vertically integrated system, we have the advantage of doing thorough post-discharge infection surveillance that most hospitals are unable to do. The ability to do thorough surveillance may make rates appear higher than other hospitals reporting to NHSN.

Despite the better SSI capture, our institution fared at or better than pooled mean rates for medium to high-risk patient populations in 7 of 11 procedures under surveillance. A better measure of progress may be comparison to our own historical rates. **With all monitored procedures taken together, our overall SSI rate improved in 2011 for 5 of our 8 measures, with dramatic improvements in hysterectomy, bariatric, and hernia surgeries.** Rates were stable for vaginal hysterectomies, knee arthroplasties, and craniotomies. These will remain priorities in 2011.

Among all surgeries under surveillance our Standardized Infection Ratio (observed/expected rate) is 1.0 and thus, according to NHSN, as expected given our patient risk factors.



General interventions to decrease rates of infection included

- avoidance of hypothermia
- appropriate perioperative antibiotics
- avoidance of shaving
- cutaneous antisepsis
- wound care education
- outpatient followup
- environmental services best practices
- medical optimization

Perioperative antibiotic compliance continued to be monitored by CMS chart abstractors and reported quarterly to the infection prevention committee. Infection Prevention supplemented this monitoring on all SSI cases.

In addition, Infection Prevention developed and, through Patient Safety and Quality, implemented online educational materials for all surgery and OR staff in the prevention of Surgical Site Infection in 2011. We also described our expected practices in a formal clinical care guideline for the prevention of SSI in 2011.

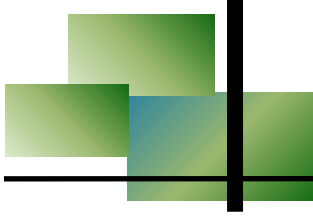
We also validated a more efficient surveillance system for SSI that allowed us to decrease manual chart review time and broaden our surveillance activities in this regard. An algorithm was constructed to electronically identify surgical cases likely to be associated with infection. It incorporates microbiological data, infection treatment data and follow-up visit data to screen cases. The algorithm was validated using all craniotomy, spinal fusion, hip and knee arthroplasty, and abdominal and vaginal hysterectomy procedures performed at Denver Health from 2007 and 2010 (n=2180). All 63 infections that had been identified through manual chart review were also selected by the algorithm (100% sensitivity). In addition, 376 false positive charts were selected. **Overall, workload was reduced by 1741 charts, the rough equivalent of about 18 8-hour days each year.** The algorithm was implemented on a prospective basis in April 2011 and has been updated to include breast procedures.

Beginning in 2011, a formal surgical site infection report was provided to individual surgeons to submit for their Ongoing Physician Performance Evaluations (OPPE) biannually. This served to fulfill a JC requirement as well as provide important feedback to surgeons about their infection data.

Through the hiring of Amber Miller, our Infection Prevention Manager, we developed a more formal relationship with the OR with a more continuous presence of IP personnel to monitor compliance with infection prevention measures. Several issues identified during summer 2011 in SPD have been rectified. Routine rounds in Sterile Processing were implemented by Ms Miller and Infection Prevention now provides more regular consultation to assure the processes in place are both evidence-based and meet current regulatory requirements. Standing quarterly reports to the Infection Prevention Committee from SPD representatives on these process measures has been implemented in 2011.

Other procedure-specific interventions:

Prosthetic knee and hip replacements. These rates are publicly reported to the State of Colorado. Knee arthroplasties were stable to increased in 2011 while hip arthroplasties rates decreased. Use of chlorhexidine for cutaneous antisepsis, *Staphylococcus aureus* nasal decolonization, and pre-operative patient optimization was again emphasized in 2011. Review of cases determined need for better pre-operative patient optimization involves working with the surgeons and primary care providers to make sure patients have their, e.g., diabetes,



among other chronic conditions, well controlled prior to elective surgery. Patient education materials and preoperative “packets” were created to increase compliance with these protocols. Automating this process was a focus of a “mini-RIE” in 2011. Denver Health also joined the CHA led IHI JOINTS collaborative to help drive improvement.

Abdominal hysterectomies. These rates are publicly reported to the State of Colorado. In 2011 a multifaceted approach including reporting SSI rates to the gynecology department, improving SCIP measure compliance, and changing sterile preparation product, and encouraging more selective transfusion practices resulted in a dramatic decrease in the rate of SSI after TAH at our institution. The improvement in SSI rates at our institution was made in the absence of “cream-skimming,” or choosing patients of lower operative risk. In conclusion, this investigation and intervention were successful in decreasing SSI rates after TAH.

Vaginal hysterectomies. This is a low risk procedure of which rates are publicly reported to the State of Colorado. In 2010, we had one (1) SSI case related to this procedure. In 2011, we had no further cases until December 2011. The low volume of procedures makes each infection sentinel and detailed evaluation of practices for vaginal hysterectomy has commenced in 2012.

Craniotomies. Aggressive interventions to prevent craniotomy infections continued in 2011, including enhanced wound cleaning on post-operative patients; earlier patient follow-up after discharge; increased patient education re: wound care; and evaluation of OR environment and engineering controls. After dramatic reduction in 2009, the gains made have continued and SSI rates have remained stable for past 3 years.

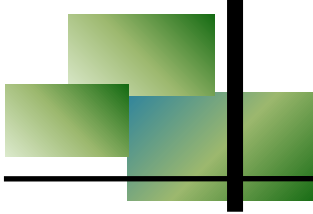
Bariatric Surgeries. There are no national benchmarks for bariatric surgery. Interventions based on findings from our case control study in previous years continued in 2011, including weight based dosing of ampicillin-sulbactam for perioperative prophylaxis. Other procedure based interventions were made in surgery dept (e.g., type of approach). A decrease in SSI rates continued in 2011, which is below pooled mean for gastric surgeries overall. It is notable, however, that comparatively fewer surgeries were done in 2011 vs 2010.

Spinal fusions (lumbosacral). Neurosurgical procedures were a focus of intervention in 2011 (see craniotomy above). A rate decrease was observed in 2011. For the first time in 4 years, spinal fusion SSI rates were below pooled mean rates. These rates were 25% less than expected rates in patients with similar risk factors.

Herniorrhaphies. Because of state reporting requirements, surveillance for herniorrhaphy surgical site infection (SSI) continued in 2011. SSI rates are below NHSN mean and decreased again- and dramatically- in 2011 in comparison to 2010. Rates were 70% lower than expected based on similar risk factors in other patient populations!

Colon. Beginning in 2014, CMS announced that hospitals would be reimbursed for rates of SSI after colon surgery reported to NHSN. In preparation, DH Infection Prevention has begun to enter data in order to anticipate and mitigate the consequences of this initiative in our unusually high risk trauma population. Our first year of surveillance indicates that our rates do not significantly differ from expected rates in a risk adjusted population.

Breast. , DH Infection Prevention has begun surveillance for breast surgeries due to new surgical staff and anticipated expansion of these surgery types. Our first year of surveillance indicates that our rates do not significantly differ from expected rates in a risk adjusted population.



Prostate. DH Infection Prevention has begun surveillance for prostate surgeries at the request of our Patient Safety Department. Our first year of surveillance indicates that our rates may be higher than anticipated and thus has become a focus for intervention in 2012.

2011 Goal #4. Decrease healthcare transmission of multi-drug resistant organisms (MDRO)/ ensure containment of organisms of significance

Our goal is to minimize hospital-associated spread of MDROs and other organisms identified as significant at DH. These were tracked daily (Monday -Friday) and reported monthly at IP Committee. Denver Health rates over the last 5 years are shown in the table below:

Rates of MDROs and other organisms of significance per 1000 patient days

| | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|------|------|-------|--------|------|
| Aspergillus | 0.11 | 0.14 | 0.05 | 0.08 | 0.16 |
| <i>Acinetobacter baumannii</i> | 0.43 | 0.47 | 0.23 | 0.13 | 0.13 |
| Carbapenem Resistant <i>Pseudomonas aeruginosa</i> | -- | 0.2 | 0.15 | 0.10 | 0.04 |
| Klebsiella producing carbapenemases (KPCs) | -- | --- | 0.02 | 0.01 | 0.03 |
| <i>Extended spectrum beta lactamases</i> (ESBLs) | -- | -- | 0.33 | 0.41 | 0.40 |
| Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) | -- | 1.07 | 0.80 | 0.10** | 0.15 |
| Vancomycin-resistant enterococci (VRE) | 0.36 | 0.29 | 0.50 | 0.44 | 0.19 |
| <i>Clostridium difficile</i> | 0.91 | 0.81 | 1.00* | 0.82 | 1.04 |
| Influenza | | 0.13 | 1.40 | 0.13 | 0.55 |

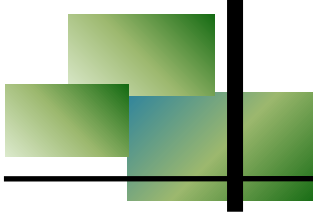
*New, more sensitive C diff testing methods implemented in 2009

** Surveillance definitions revised to include only healthcare associated MRSA

As of 2011, daily monitoring of the labs of significance are now generated 100% electronically to minimize paper waste, improve efficiency for tracking, and minimize data entry burden for staff. We review these data daily, weekly, and monthly to identify clusters that may indicate an outbreak situation.

We also continued efforts to increase compliance and understanding of transmission-based precautions through the following methods:

- Education of patient transporters, inpatient nursing staff and departments that care for patients especially in the area of contact precautions
- Education at nursing and at new physician orientation
- Consultation with other clinical departments to provide in-services to their employees and to aid them in establishing educational programs as part of the department education for new employees
- Quarterly audits and feedback of compliance with isolation precautions will be conducted by the Infection Prevention program.
- Education of patients regarding their MDROs using patient information sheets
- Education of visitors regarding standard and transmission-based precautions, especially when visiting patients in isolation.



Infection prevention also worked with the inpatient dialysis unit on 7A to develop improved processes for contact isolation. Infection prevention collaborated with Fresenius, engineering, construction, and environmental services to develop a modified contact isolation process for continuation of dialysis machine care separate from direct patient contact, in which current contact isolation processes will be applied and maintained. A “green zone” was implemented to clarify areas requiring donning of gown and gloves.

Aspergillus. Although not an MDRO, this organism is of interest due to frequent construction activities at DH. All isolates reported from clinical lab are recorded to alert infection control of potential breaches in construction early, as increase in isolation rates could be indicative of such a breach. **This monitor provides evidence of excellent containment in our construction activities.**

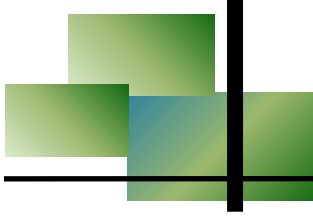
Acinetobacter. **In the past 2 years, the resistant version of *Acinetobacter baumannii*, prevalent in past years and at many trauma centers, was essentially eliminated from our institution.** This is credited to antibiotic stewardship and heightened infection control efforts in our SICU and OR (limited pulsatile lavage on colonized patients, empiric isolation, decreased fluoroquinolone usage).

Methicillin-resistant *Staphylococcus aureus* (MRSA)- ASC continued in both the MICU and SICU on admission and weekly as in the past several years. Charts continue to be identified with an “XX” to allow identification of colonized patients on readmission or in the clinic setting. **Routine monitoring showed that the healthcare associated transmission is low relative to colonization/infection burden.** It is notable that most of the MRSA seen at DH comes into our institution from the community and outpatient rates now exceed what we see in the inpatient setting.

Vancomycin-resistant enterococci (VRE). Rates continue to decrease over the past 3 years. The medical record continues to identify these patients with a “VV” to allow for appropriate precautions. **This, along with antibiotic stewardship and enhanced surveillance and prompt identification of potential clusters of cases (in near real-time) are credited for the lowest rate of VRE at our institution to date.**

Clostridium difficile. Nationally, rates of *C. difficile* have tripled in US hospitals since 2000, and in 2007, DH began to see an increase associated with an increase in severity. Our rates remain lower however, than those reported in the literature from other acute care hospitals and compared to other facilities in Colorado (based on surveillance data from CDPHE). **Despite concerning and increasing trends elsewhere, *C. difficile* rates have remained stable.** This is especially remarkable in light of new testing procedures introduced in 2009 that is more sensitive in detecting *C. difficile*. Enhanced precautions-- including isolation of a patient admitted with diarrhea unless an alternative cause is found; use of bleach and glo-germ monitoring to terminally clean all *C. difficile* inpatient rooms and equipment; hand hygiene with soap and water for *C. difficile* positive patients; and aggressive antimicrobial stewardship -- have led to a stabilization in the overall number of cases seen at DH.

Carbapenem Resistant *Pseudomonas aeruginosa*; Klebsiella producing carbapenemases (KPCs); and Extended spectrum beta lactamases (ESBLs). **Rates of multi-drug resistant gram-negative organisms such as extended-spectrum beta-lactamase (ESBL)-producing *E.coli* and *Klebsiella pneumoniae* carbapenemase (KPC)-producing organisms have remained stable despite increasing trends nationally. Rates of imipenem-resistant *P. aeruginosa* infections have progressively declined at Denver Health over time and remain low.** Aggressive surveillance, isolation, and antibiotic stewardship have kept these organisms from becoming endemic at Denver health



Influenza. 2011 influenza data encompasses the end of the 2010-2011 influenza season and the beginning of the 2011-2012 influenza season. **No incidence of hospital transmission of influenza was identified in 2011.** During 2011, 48 patients were hospitalized with influenza, mostly on adult Medicine wards. This is higher than the previous calendar year due to a severe 2010-2011 season due to emergence of H3N2.

2011 Goal #5. Decrease risk of healthcare associated infections related to construction and ensure that design of new or remodeled facilities optimizes infection prevention

The infection prevention personnel continued to attend meetings starting with predesign and preconstruction, including a weekly meeting where all ongoing projects are discussed. Routine walk-throughs were be done in all construction areas. Infection Control Risk Assessments (ICRAs) were done prior to the start of any construction and the contractors were in-serviced about the infection prevention concerns related to hospital construction. The project superintendent or their designees were held responsible for seeing that all workers were in-serviced in appropriate infection prevention techniques prior to the start of their work at DH.

Special attention was given to the largest project of 2011-- Pavillion M.. The new facility includes 4 ambulatory surgery operating suites, 2 gastroenterology suites, adolescent psychiatry (inpatient and outpatient), and an outpatient dialysis unit that is leased to a commercial dialysis company..

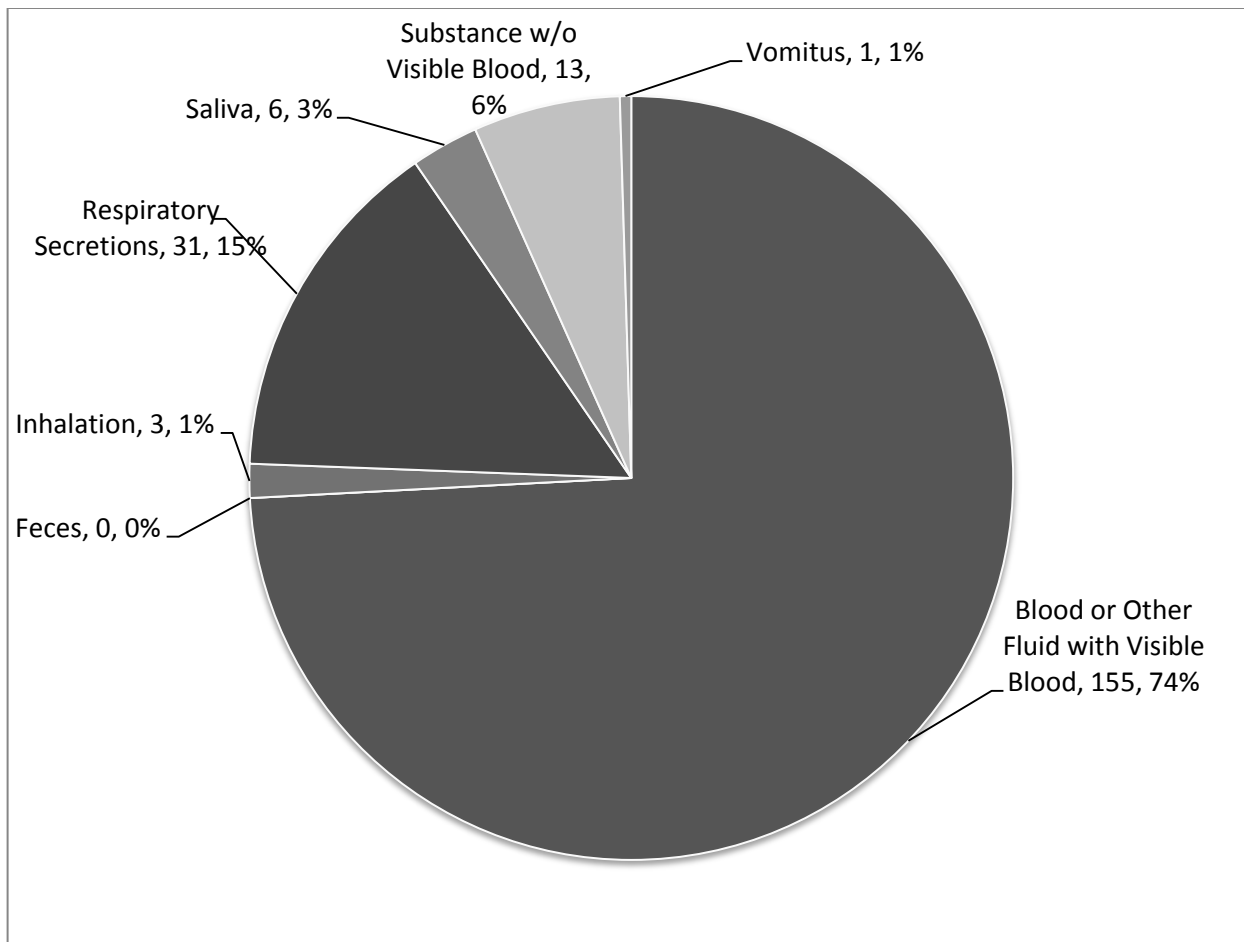
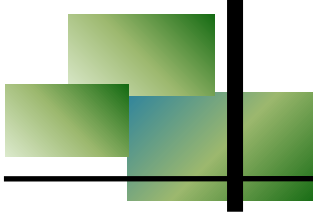
Rounds were made by the infection prevention nurses routinely. Frequency was based on the risk as determined by the Infection Control Risk Analysis (ICRA). Both planned and surprise visits were conducted. **Routine rounds, both announced and unannounced, showed good adherence to Infection Prevention requirements.**

Using the redesigned ICRA form and the methods of procedures document (MOP), breeches in infection control standards were mitigated in construction projects during 2011. Contractors were in-serviced to emphasize requirements by DH of complying with infection prevention policies, including continuous monitoring of negative airflow in construction areas; ensuring intact barriers; and frequently changing tacky mats.

Air monitoring studies of aspergillus spore counts were conducted by an outside contractor as directed by Engineering. When there is concern for construction containment, these reports are requested by the Infection Prevention. Rates of aspergillus isolated in clinical cultures also were reviewed each month by IPC. No breaches were noted from these surveillance data.

2011 Goal #6. Collaboration with Center for Occupational Safety & Health (COSH) to decrease occupational infection related hazards.

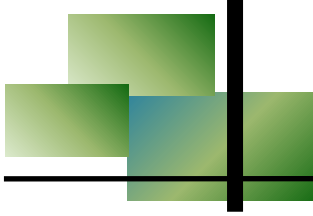
A summary of occupational exposures by exposure type is described in figure below. Please see the COSH Annual Report (Department of Medicine) for more details.



Infection Prevention worked closely with COSH in 2011 to decrease occupational infection related hazards through the following processes:

- Review bloodborne pathogen data periodically at IPC, taking action as indicated
- Review previous years' employee influenza vaccination data and devised a strategy to increase percentage of employees receiving the vaccine (See Goal #7)
- Provided education at new employee orientation
- Revised annual competency training on subject of reporting of bloodborne pathogen exposures
- Collaboration with COSH following potential exposure of employees to an infectious illness to consult on prophylaxis or therapy decisions
- Made policies and procedures for non-bloodborne exposures more easily accessible through desktop icon (in collaboration with COSH and OUCH line)
- Educated staff on appropriate processes for exposures
- Served on the products committee for the evaluation of new devices that could enhance exposure prevention to employees
- Promoted universal respiratory etiquette as part of standard precautions, which directs the employee to treat all patients presenting with a febrile respiratory illness of unknown etiology as potentially infectious.

Infection Prevention supported COSH efforts to decrease exposure incidents by providing a venue for reporting of exposure data at Infection Prevention Committee meetings. During these discussion , input from experts and front line staff was gathered on how to formalize interventions and better prevent these exposures.



2011 Goal #7. Increase employee Influenza vaccination rates.

Our past rates of 67% compliance with voluntary employee flu vaccine campaigns has fallen short of 's 90% goal. In order to meet our goal of >90% vaccination compliance of all direct care providers, Infection Prevention, in collaboration with COSH, MIMM, and Patient Safety Executive Committee, pursued a mandatory employee influenza vaccination strategy.

Rationale for implementing such a policy reflects our appreciation that influenza is a serious illness that results in significant patient mortality each year. Influenza is highly contagious and can spread rapidly through a health care facility, where our patients are at high risk. In addition, up to 25% of HCWs contract influenza each season. We also appreciate that influenza seasons correlate with staffing shortages, as evidenced an increase in sick calls at DH correlating with influenza peak activity during the past 5 flu seasons. Healthcare workers might work while ill and/or might have minimal symptoms but be able to transmit virus to patients or co-workers. It is also clear that the vaccine is most effective in younger, healthier people, such as our employee population. Finally, there are data showing:

- Decreased mortality in patients (LTCF)
- Decreased influenza among vaccinated HCWs
- Decreased nosocomial influenza among hospitalized patients
- ~ 50% fewer sick days in workers who receive influenza vaccine

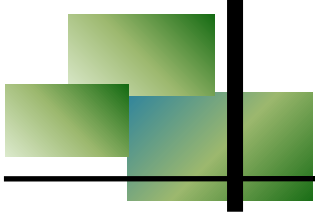
The initial strategy proposed was a “vax or mask” strategy that would require direct care providers (physicians, nurses, technicians, allied health, dentists) to receive influenza vaccination by Dec 1 of each year or wear a mask for all patient care activities for the duration of the influenza season. This strategy was endorsed by combined votes from the Infection Prevention, Medical Immunization, and Patient Safety Committees.

The proposal received Executive Staff support with the stipulation that the other academic facilities employ a consistent strategy, given the large presence of trainees rotating through our institution.

Meetings with Children and University Hospital resulted in an agreement to pursue a modified policy. The academic community endorsed a universal vaccination strategy for all employees at each center, with mask use reserved only for employees who had a medical or religious exemption. This strategy, although different than what was initially proposed by DH, was a similar strategy to that was later outlined in a resolution by the Colorado Hospital Association, as well as a proposed regulation by CDPHE.

In July 2011, Denver Health implemented HR Employee Principles and Practices #6-110 DHA Required all employees (and contractors with direct patient care contact) receive an influenza vaccine by Dec 1, 2012. Medical and religious exemptions are considered as part of this policy. Staff who could not receive vaccination were required to wear a mask for the duration of the influenza season when within 3 feet of patients. Staff without documentation of vaccination or valid exemption were considered non-compliant with DH policy and eligible for termination/ suspension of privileges

After the final executive approval of the policy, the Employee Flu Task Force had to work quickly to get an electronic tracking system up by the beginning of vaccination clinics in October. Working directly with eHealth Services, a paperless tracking system was developed with the goal of real-time reporting. A manager's portal was also created to give supervisors access to verify employee compliance and monitor mask requirements (if an



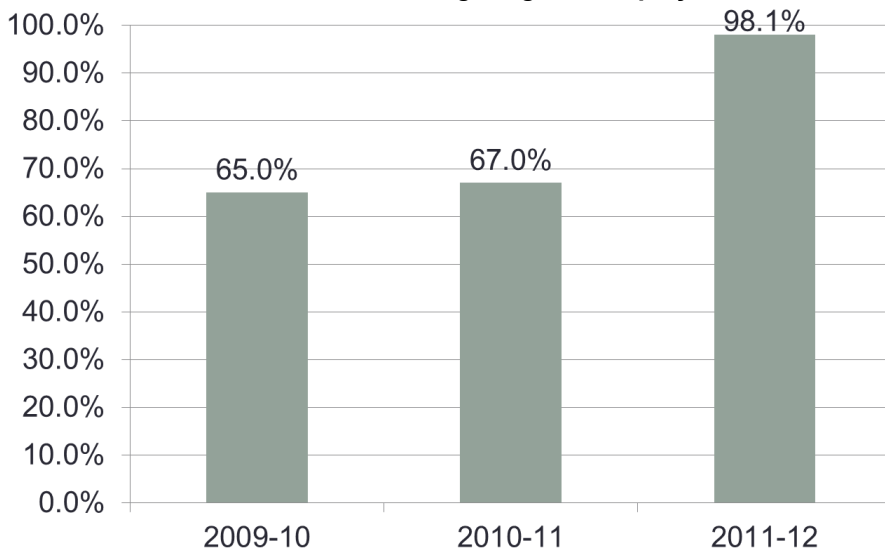
exemption was approved). The flu database also included the capability to send emails to employees to document and confirm receipt of the flu vaccination (which could be used at other institutions) and convenient online registration for vaccinators to work at mass vaccination clinics. This system was developed from the ground-up using our internal computer network. An alternative tracking process was piloted by Denver Public Health for DPH, EVS, Laundry and Food Services staff. Regularly scheduled meetings with partnering academic institutions were held to track compliance of rotating housestaff and to assure consistency and alignment with the University and Children’s Hospital.

In order to make the vaccine as accessible as possible, we implemented mass vaccination clinics, dispatched roaming carts on hospital floors and elected flu champions for offsite clinics to increase accessibility and oversight. Over 100 hours of employee vaccination were staffed on a largely volunteer basis and without request for extra resources. Employees throughout Denver Health participated in the mass vaccination clinics. Physicians, medical assistants, nurses assisted with vaccinating; pharmacy pre-filling syringes; administrative staff helped employees pre-register and performing data entry

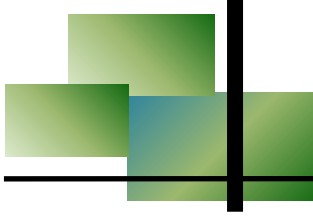
Exemption review process was implemented for appropriateness of medical and religious exemptions, with close involvement of Executive Staff. Audits of exempted employee compliance with mask use were done by unit managers and infection control.

Ultimately, Denver Health vaccinated 98% of all employees/contractors against seasonal influenza. There was a 2% exemption rate for those medical contraindications or religious waivers.

DH Influenza Vaccination Rate Among Targeted Employees 2009-2012



The initiative was successfully implemented well in advance of the CMS FY 2012 IPPS final rule reporting of healthcare personnel influenza vaccination rates as a condition for reimbursement. Our efforts, in collaboration with The University and The Children’s hospitals, may have molded or prompted the proposed CDPHE Board of Health Rule Regarding Influenza Vaccines for Healthcare Workers as well as the CHA resolution asking all CO hospitals to implement mandatory influenza vaccination of healthcare workers.



2011 Goal #8. Hiring and orientation of an infection control and prevention manager in 2011.

In April 2011, Amber Miller, RN, MSN, CIC, was recruited to become our new Manager of Infection Prevention at Denver Health. See her biography under program description in Section A of this report. In her first year, she has proven to be a capable leader who has provided leadership on the many accomplishments listed in this report.

2011 Goal #9. Improve behavioral health services knowledge of and compliance with infection prevention measures

Behavioral health services was provided with intensive in-service education both formally and on a consultative basis during 2011. They also were encouraged to utilize expertise of Infectious Diseases and Hospital Medicine consultative services to help distinguish between potentially infectious and non-infectious etiologies of diarrheal illness frequently encountered in this setting. Focused education on transmission-based precautions, particularly use of contact isolation, was emphasized in this patient care area. Unique issues for group therapy were specifically addressed and reinforced.

Hand hygiene compliance continued to be a focus in this setting. Behavioral Health staff performed monitoring of hand hygiene compliance and submitted reports to Infection Prevention each quarter. Infection Prevention periodically audited reports to ensure accuracy and consistency of surveillance. Reported compliance with hand hygiene ranged from 90% to 100% each quarter.

RISK ASSESSMENT FOR INFECTION PREVENTION IN 2012

Input toward a formal risk assessment for acute care areas was solicited in January and February 2012 from members of the Infection Prevention Committee, Acute and Critical Care Unit managers, surgeons, and nurse educators.

The risk assessment was completed by Amber Miller, RN with this input. The risk assessment includes all standard practices listed in the Joint Commission Compendium that was published in October of 2008, including: Prevention of Central-line Bloodstream Infections (CLAB), Prevention of Ventilator Associated Pneumonia (VAP), Prevention of Catheter –Related Urinary Tract Infections (CAUTI), Prevention of Surgical Site Infection (SSI), Prevention of *Clostridium difficile* Transmission (CDI) and Prevention of *Methicillin-Resistant Staph Aureus* (MRSA) *Transmission*. It also includes regulatory requirements, external collaborative goals, and the Joint Commission National Patient Safety Goals

A specific CHS and Behavioral Health risk assessment and plan will be maintained with their Departments.

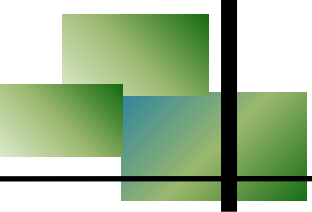
GOALS FOR THE 2012 INFECTION PREVENTION PROGRAM

Based on the review of both the assessment of the 2011 Infection Prevention Plan and the Risk Assessments outlined above, the following goals have been chosen for the 2012 Infection Prevention Plan:

1. Improve hand hygiene compliance.

Having achieved the organizational goal of 90% compliance for 2011, the hand hygiene goal for 2012 will be to again meet or exceed that goal. Our efforts will include the following strategies:

1. Continued focus education using new employee orientation, new physician education, nursing orientation and annual required competency training.
2. Increased use of Lean tools to maintain compliance

- 
3. Explore automated monitoring technologies
 4. Study novel approaches using human factors engineering
 5. Select new hand hygiene products (waterless and soap and water formulations, approved moisturizing lotions) with staff input.
 6. Focus on areas with results under 90% and perform a walk through of all areas with goal non-compliance to identify the following:
 - i. Opportunities for better location of hand hygiene products
 - ii. Barriers identified by the manager, educator, and IP for increasing staff compliance
 - iii. The manager, educator, and IP will design a methodology for the area that the manager and educator will implement with consultation from the IP as requested.

2. Decrease the rate of device related infections

Central venous catheters, endotracheal tubes, and urinary catheters pose increased risk for healthcare associated infections. The following interventions will be continued or implemented to decrease risk for infection from these devices in 2012:

- a) Continue the Healthcare Infection Prevention Performance Improvement (HIPPI) champion program to help accomplish change at a peer level in all acute care inpatient areas, and to assist in auditing and monitoring of CLABSI-prevention best-practices.
- b) Continue online training with post test for all medical staff (including housestaff) who perform central line insertions, intubations, and ventilator care.
- c) Refine the Central Line and CAUTI workflow in LifeLink to target provider evaluation of daily necessity for central line.
- d) Participate successfully as an active learner in the CMMI HEN initiative for prevention of CAUTI.
- e) Systematize nursing competencies for insertion and care of urinary catheters
- f) Regain successes from previous years in the prevention of VAP and CLABSI in our SICU

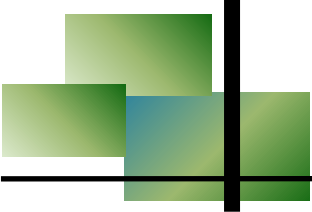
3. Decrease surgical site infection (SSI) rates.

The following surgeries will be targeted for SSI surveillance in 2011:

- a) Prosthetic knee and hip replacements
- b) Abdominal and vaginal hysterectomies
- c) Craniotomies
- d) Thoraco/lumbar fusions
- e) Bariatric surgeries
- f) Herniorraphies
- g) Colon resection (new)
- h) Breast surgeries
- i) Prostate surgeries

Arthroplasty, vaginal and abdominal hysterectomies, and breast surgeries will be publicly reported through CDPHE. Colon procedures will be reported to CMS using NHSN as a condition for reimbursement in 2014

We will continue to provide surgical site infection reports to individual surgeons to submit for their Ongoing Physician Performance Evaluations (OPPE). This will fulfill a JC requirement as well as provide important feedback to surgeons about their infection data.



Ensure implementation of the annual SSI web-based training module that was developed in 2010.

Continued interventions to decrease rates of infection will include continued pre-operative optimization of elective surgery patients; avoidance of hypothermia; perioperative glucose control; appropriate perioperative antibiotics; avoidance of shaving; cutaneous antisepsis; wound care education, outpatient follow-up, environmental services best practices, decreased OR traffic (especially between clean and contaminated cases), among other interventions (limiting transfusions).

Special focus will be on improving rates of SSI in orthopedic joint, prostate and vaginal hysterectomy procedures. Interventions for joints under consideration include those implemented to improve arthroplasty SSI rates, including preoperative CHG baths and nasal decolonization with mupirocin as well as perioperative care processes. We also aim to implement a weekly care conference with orthopedics, infectious diseases, and hospital medicine, to discuss complex orthopedic patients (including arthroplasty patients). For prostate surgeries, we will address opportunities for more decreased use of urinary catheters in the post-operative period. For vaginal hysterectomies, we will address surgeon specific practices.

Perioperative antibiotic processes will be restructured to ensure compliance with best practices around perioperative antibiotic administration. Restructuring will include a) revising guidelines for antibiotics b) redefine responsibilities around compliance c) systematize antibiotic administration needs as part of time outs

Routine rounds in Sterile Processing will be increased to monthly. Infection Prevention will provide consultation to assure the processes in place are both evidence-based and meet current regulatory requirements. Standing quarterly reports to the Infection Prevention Committee from SPD representatives.

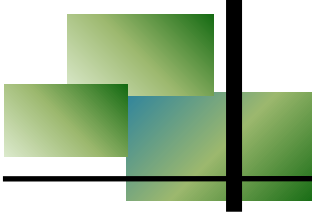
4. Decrease healthcare transmission of multi-drug resistant organisms (MDRO)/ ensure containment of organisms of significance

Daily surveillance of the following MDROs/organisms of significance will continue in 2012:

- a. Aspergillus
- b. Multi-drug Resistant *Acinetobacter baumannii* and
- c. Multi-drug Resistant *Pseudomonas aeruginosa*
- d. Klebsiella producing carbapenemases (KPCs)
- e. Extended spectrum beta lactamases (ESBLs)
- f. Methicillin-resistant *Staphylococcus aureus* (MRSA)
- g. Continued active surveillance culturing both on admission and weekly in the MICU & SICU; as needed in other areas including NICU
- h. Vancomycin-resistant enterococci (VRE)
- i. *Clostridium difficile*

We will continue to review microbiology reports daily to identify clusters of infection for appropriate isolation and any clusters that may indicate an outbreak situation so that we may act as early as possible and prevent further spread.

Emphasis on decreasing healthcare associated cases of *C. difficile* will include a) enhanced education around transmission based precautions b) environmental cleaning protocols and c) antibiotic stewardship.



We will also focus efforts on increasing better compliance with transmission based precautions, specifically on contact precautions. We will roll out a second phase of the “green zone” pilot to test this concept on other inpatient wards and, if successful, implement hospital-wide.

5. Decrease risk of healthcare associated infections related to construction and ensure that design of new or remodeled facilities optimizes infection prevention

The infection prevention personnel will continue to attend meetings starting with predesign and preconstruction. One of them will attend a weekly meeting where all ongoing projects are discussed. Routine walk-throughs will be done in all construction areas. Infection Control Risk Assessments (ICRAs) will be done prior to the start of any construction and the contractors are in-serviced about the infection prevention concerns related to hospital construction. The project superintendent or their designees will be responsible for seeing that all workers are ins-serviced in appropriate infection prevention techniques prior to the start of their work at DH.

Special attention will be given to the largest project of 2012—remodel of the SICU and perioperative areas.

6. Collaboration with Center for Occupational Safety & Health (COSH) to decrease occupational infection related hazards.

Infection Prevention will continue to work closely with COSH in 2012 to decrease occupational infection related hazards through the following processes:

- a) Review employee exposure data at Infection Prevention meetings at least semi-annually
- b) Education at new employee orientation and annual competency training about reporting of exposures
- c) Collaboration following potential exposure of employees to an infectious illness

In addition, Infection Prevention and COSH will work together again in 2012 on the universal employee influenza vaccination initiative.

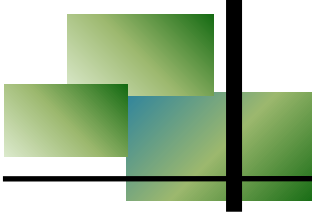
7. Environmental services

Infection Prevention will work closely with the new environmental services program in 2012 to focus on environmental cleaning protocols. Some of the initiatives shall include:

- Creating more standard work
- Evaluate new cleaning products
- Use of fluorescent markers to audit compliance with cleaning protocols
- Evaluate automatic technologies (eg H2O2 vapor) to improve efficiency and quality of cleaning in selected environments
- Standardize protocols for addressing introduction of mites (e.g. lice, bedbugs) from patients into patient care areas

8. Hiring and orientation of a new infection control professional in 2012.

We will recruit another qualified infection preventionist to accommodate increase in demand for infection control services due to expansion in hospital beds, a new ambulatory surgery pavilion, outpatient dialysis



services (through Fresenius), increasing regulatory requirements, and need for expanded presence in existing services

C. ANTIBIOTIC STEWARDSHIP (AS) PROGRAM AT DENVER HEALTH

ANALYSIS OF 2011 AS GOALS

Goal 1. Perform a comprehensive review of antimicrobial resistance at Denver Health; review and update antibiotic utilization strategies accordingly

Goal 1a. Develop the 2010 Denver Health hospital-wide antibiogram and specialized antibiograms, identify important trends in antimicrobial resistance, and disseminate results to clinicians and pharmacists.

The 2010 Denver Health hospital-wide antibiogram was completed and distributed to providers and pharmacists via electronic mail and posted on the Antibiotic Stewardship subsite of the Pulse in March 2011. The 2011 antibiogram has already been completed and was distributed in January 2012. Important trends in antimicrobial resistance compared with prior years are presented above in Table 1.

In March 2011, specialized antibiograms were developed for the medical ICU (MICU), surgical ICU (SICU), and the pediatric patient population and distributed to relevant stakeholders for review and discussion of antibiotic utilization strategies.

Goal 1b. Discuss overall antibiotic utilization strategies in the Antibiotic Subcommittee with input from appropriate stakeholders (e.g., critical care physicians, pediatricians, hospitalists) and disseminate results to clinicians and pharmacists.

Antibiotic utilization strategies for the hospital were discussed in the Antibiotic Subcommittee of P&T based on antimicrobial resistance data. Specialized antibiograms were also reviewed with input from stakeholders. Based on antimicrobial resistance data from the SICU suggesting increasing gram-negative resistance to piperacillin-tazobactam, the most commonly used empiric broad-spectrum antibiotic, it was decided in collaboration with the SICU attending physicians that a change to cefepime as the first-line broad-spectrum agent was indicated. The Antibiotic Stewardship Program will continue to monitor trends in antimicrobial resistance and evaluate the need for changes in empiric antibiotic selection based on these data.

Goal 1c. Re-evaluate the role of carbapenems given the new breakpoint recommendations of enterobacteriaceae and potential for earlier detection of ESBL-producing organisms.

We attended a webinar hosted by the Microbiology Laboratory in early 2011 that included a discussion of new breakpoint recommendations for enterobacteriaceae to promote earlier detection of extended-spectrum beta-lactamase (ESBL)-producing gram-negative organisms, an emerging threat in antimicrobial resistance. The new resistance breakpoints will not be implemented nationally until 2012; therefore, this issue will be readdressed accordingly when the change occurs. The Antibiotic Stewardship Program continues to monitor the rate of ESBL-producing organisms at Denver Health (see also Infection Prevention report above) (Figure 6).

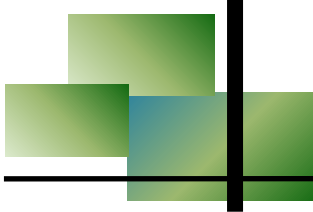
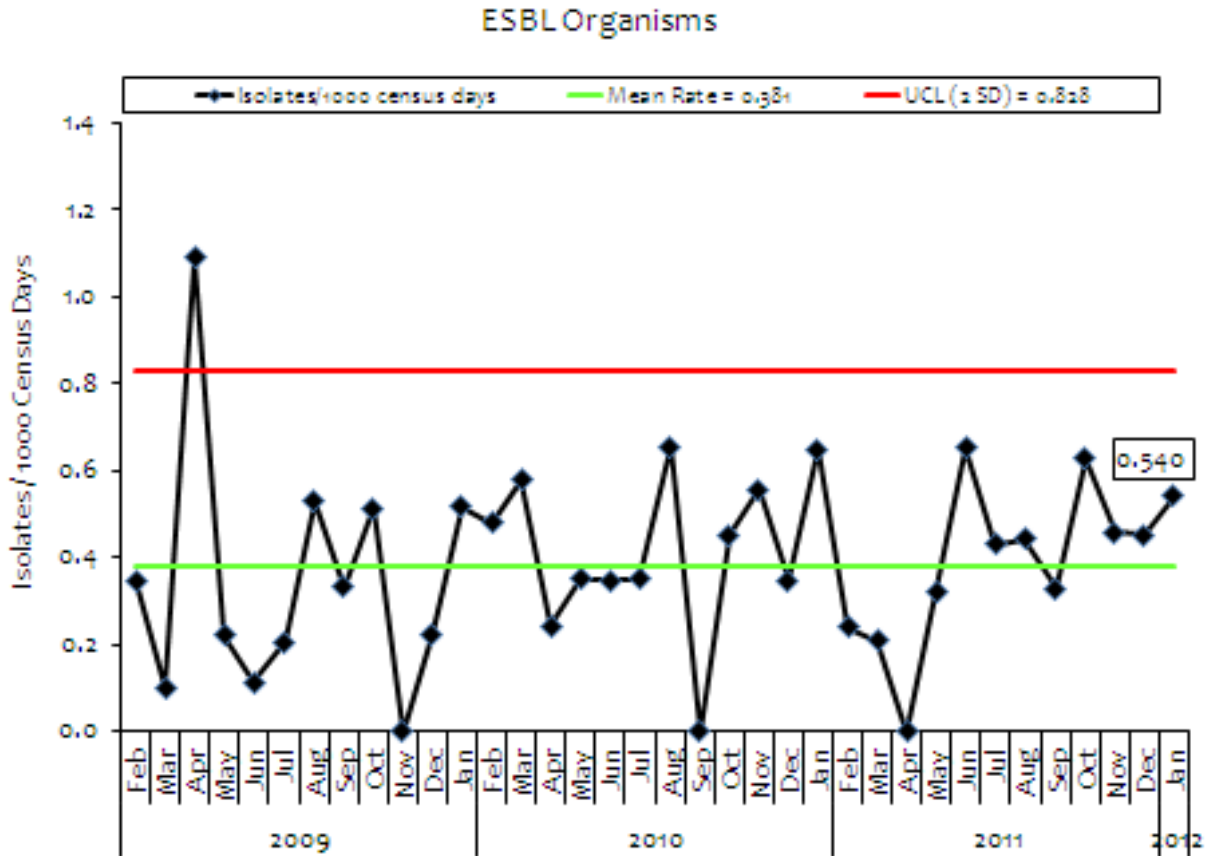


Figure 6. Rate of ESBL-producing organisms over time at Denver Health



Goal 2. Continue quarterly antimicrobial utilization surveillance; develop and maintain strategies to optimize antibiotic use accordingly

Goal 2a. Perform quarterly hospital-wide and ICU-specific surveillance for overall antibiotic use and commonly-used agents/classes.

We performed quarterly antibiotic utilization surveillance during 2011 (see Figure 1 above) and used the data to gauge progress of the stewardship program. In addition, we performed hospital-wide and nursing unit-specific surveillance for drug categories such as anti-pseudomonals (see Figure 2 above) and specific agents in order to guide interventions. As examples, we observed a sharp decrease in carbapenem use after inception of the Antibiotic Stewardship Program with relatively consistent low use since that time (Figure 7). In contrast, we have observed increasing ceftriaxone use as a result of shifting away from anti-pseudomonal agents (Figure 8).

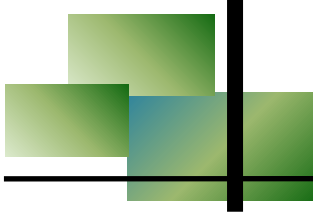


Figure 7. Total carbapenem, imipenem, and ertapenem use at Denver Health, 2007 – 2011.

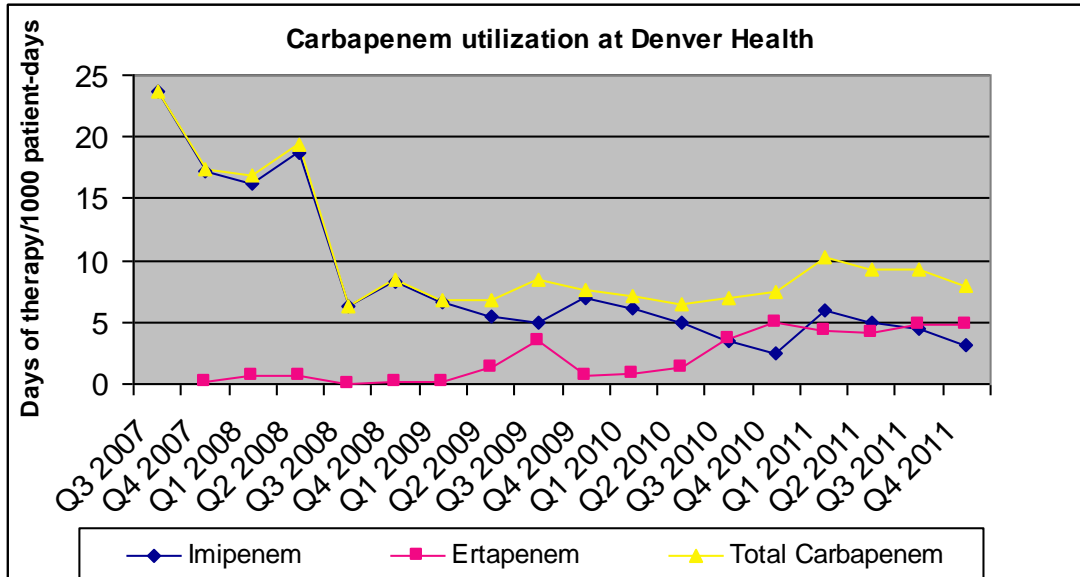
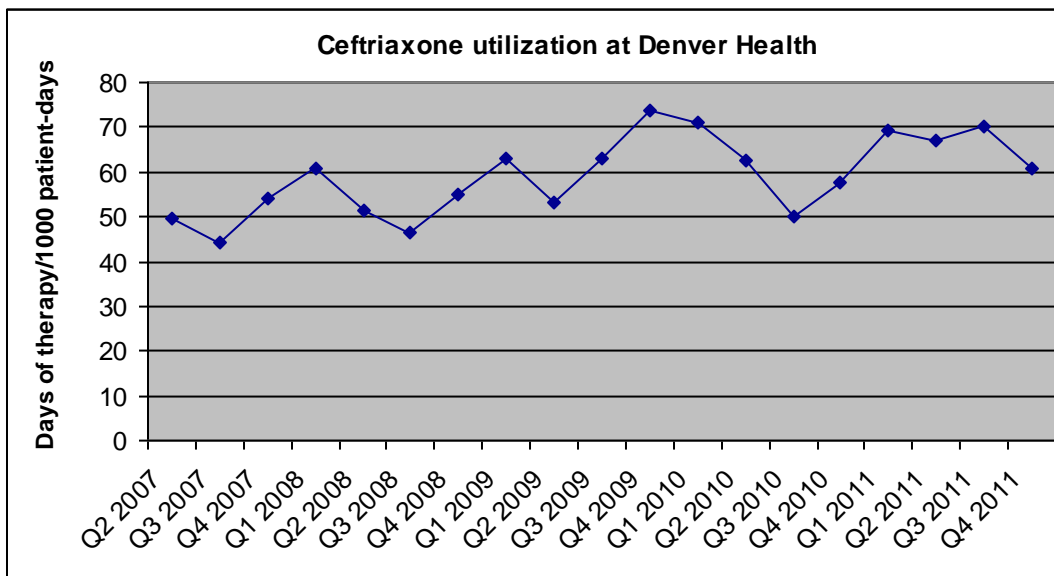


Figure 8. Ceftriaxone use at Denver Health, 2007 – 2011.



In addition to hospital-wide antibiotic surveillance, we continued to collaborate with physicians and pharmacists staffing the MICU and SICU to optimize antibiotic use for these critically ill patient populations. Data for the MICU are presented in Figure 9. Although overall antibiotic utilization has remained stable, we have observed an increasing trend in the use of anti-pseudomonal agents since the 3rd quarter of 2010 (Figure 9). This has been identified as a target for 2012 where we will work to determine the underlying cause of the increase and identify potential interventions to reduce use of these broad-spectrum antibiotics. Overall and anti-pseudomonal antibiotic use in the SICU remained stable during 2011 (data not shown).

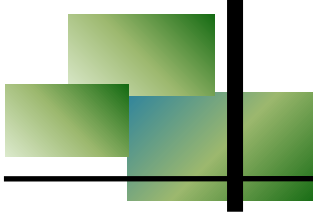
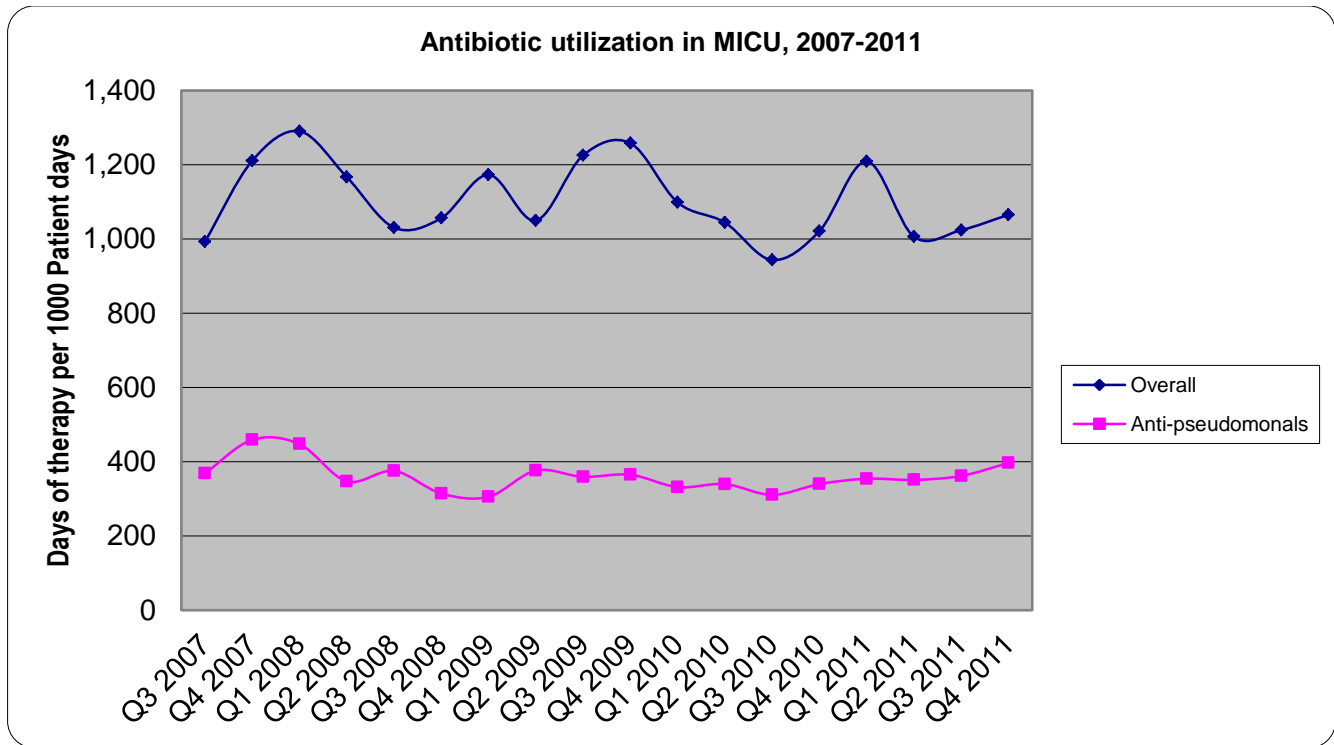


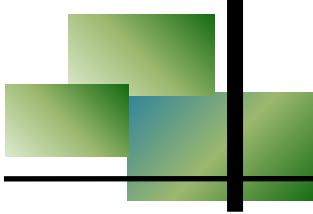
Figure 9. MICU total and anti-pseudomonal antibiotic use, 2007 – 2011.



Goal 2b. Develop and maintain strategies to prevent unnecessary use of anti-pseudomonal agents.

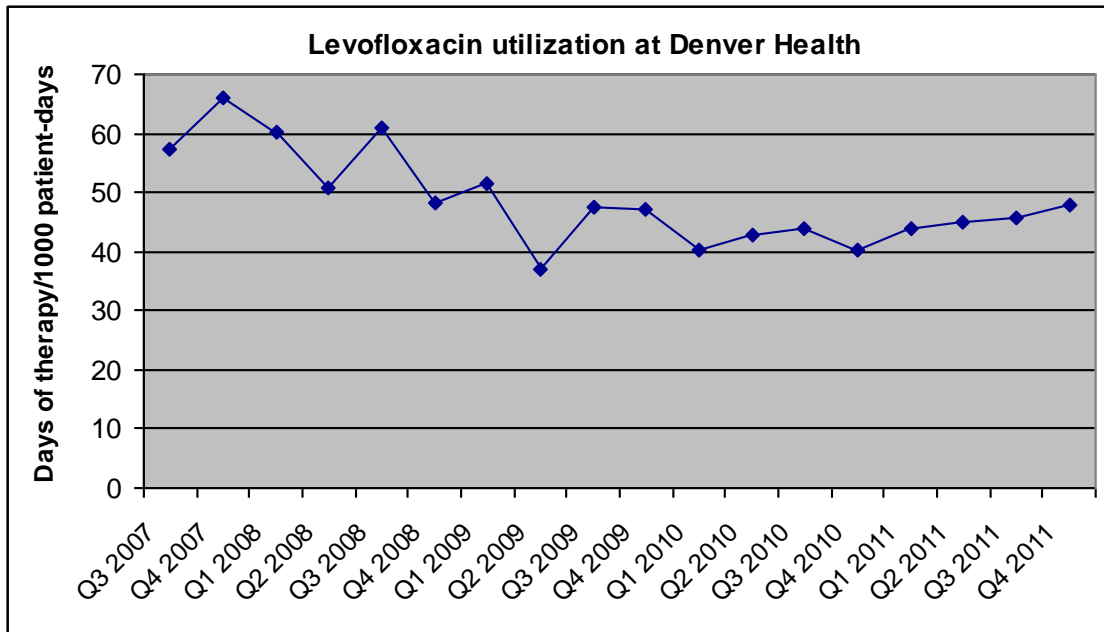
Anti-pseudomonal agents are critical antibiotics as they are frequently the last line of defense against resistant gram-negative pathogens. Despite increasing bacterial resistance in the United States and worldwide, new antibiotic development has dramatically slowed over the last 30 years. Therefore, conservation of existing antibiotics through judicious use is of the utmost importance. The Antibiotic Stewardship Program has therefore focused on reducing unnecessary use of anti-pseudomonal agents. Patients receiving these antibiotics are reviewed by Claire Swartwood, ID PharmD, on a daily basis. When appropriate, suggestions are made to providers to use alternative agents. These efforts have been targeted to carbapenems, piperacillin-tazobactam, levofloxacin, and aminoglycosides.

In addition to daily case-reviews with feedback to providers, Clinical Care Guidelines developed by the Antibiotic Stewardship Program promote alternatives to anti-pseudomonal agents when possible. As an example, the guideline for complicated intra-abdominal infection encourages use of ceftriaxone plus metronidazole over piperacillin-tazobactam for a subset of these infections. We collaborated with the General Surgeons in 2011 to increase awareness of this guideline among attendings and housestaff to reduce unnecessary piperacillin-tazobactam use. In addition, the Clinical Care Guideline for the management of skin and soft tissue infections discourages unnecessary use of gram-negative agents for these infections that are overwhelmingly caused by gram-positive organisms (staphylococci and streptococci). Implementation of the guideline through a multi-faceted intervention resulted in a 45% relative reduction in prescribing of gram-negative antibiotics without adversely affecting outcomes in the first year of the intervention.



Total anti-pseudomonal antibiotic use over time is shown in Figure 2 above. In 2011, we observed a modest increase in the use of levofloxacin (Figure 10), a specific anti-pseudomonal agent, after an initial reduction corresponding with the start of the Antibiotic Stewardship Program in July 2008. Because heavy levofloxacin use has also promoted the development of quinolone-resistant *E. coli* in the Denver Health system, we have targeted this drug for reduced use in 2012 and will perform daily case reviews to identify alternative agents when possible.

Figure 10. Inpatient levofloxacin use, 2007 – 2011.



Goal 2c. Develop and maintain strategies to prevent unnecessary use of vancomycin.

As a strategy to prevent unnecessary vancomycin use, improve dosing, and promote more appropriate use of serum levels, floor pharmacists have been engaged in the daily monitoring of this drug since 2010. Floor pharmacists perform prospective monitoring of patients receiving vancomycin 7 days per week with feedback to treating providers when appropriate.

As an additional effort to reduce vancomycin use in 2011, the Clinical Practice Guideline for inpatient skin and soft tissue infections was revised to recommend cefazolin for cases of cellulitis. Vancomycin was the recommended agent in the previous version of the guideline. This updated guidance was based on recent literature that suggests cellulitis is most commonly caused by beta-hemolytic streptococci despite the dramatic increase in MRSA infections from the community since 2002.

Figure 11 shows that vancomycin use at Denver Health has remained relatively consistent over time. This is in contrast to national data that has shown increasing vancomycin use.

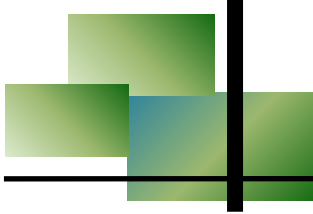
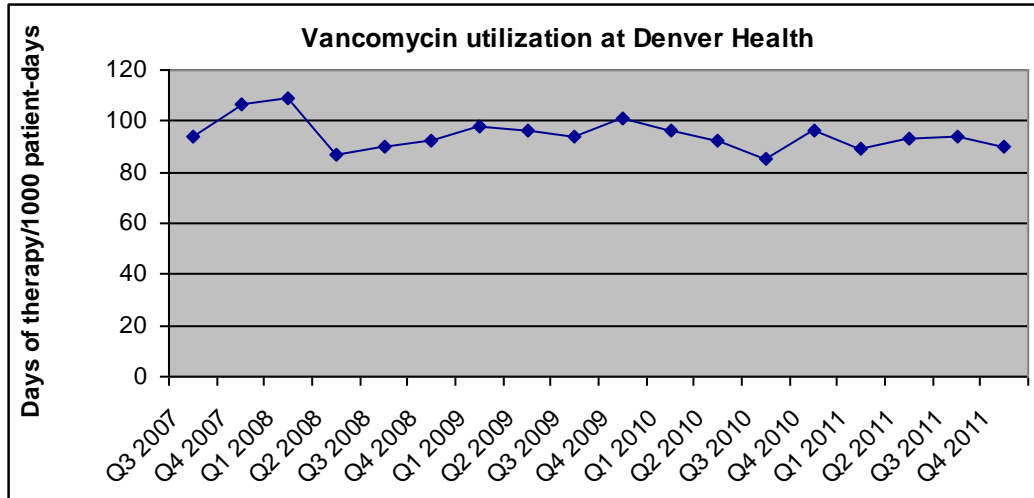


Figure 11. Vancomycin use, 2007 – 2011.



Goal 3. Expand the ability to perform prospective case reviews with provider feedback and prescribing recommendations

Goal 3a. Develop a patient-specific daily report including medications, allergies, vital signs, laboratory values, and microbiology data to improve the efficiency of prospective case reviews and provider feedback.

Prospective case review with feedback and prescribing recommendations to providers has been proven to be an effective stewardship intervention; however, this intervention requires that patient-level data be gathered including current medications, allergies, vitals signs, laboratory values, and microbiology data. This process is time-consuming and currently requires use of multiple health information systems at Denver Health. The development of a report where this information is automatically pulled into a single document for each patient on a daily basis would lead to time-savings and increased efficiency of this process. In 2011, we created a report template and are working with eHealth and data warehouse team members to operationalize this.

Goal 3b. Increase involvement of the floor pharmacists in daily antibiotic stewardship activities through education and competency training with electronic documentation of interventions.

Additional pharmacists were trained in 2011 to perform antibiotic stewardship-related duties. These pharmacists cover for the stewardship pharmacist shift and perform stewardship interventions while on other pharmacy shifts including Internal Medicine, ICU, Oncology, and Pediatrics. This has led to an increase in the number of prospective case reviews and prescribing recommendations to providers in 2011 compared with 2010 (Table 2).

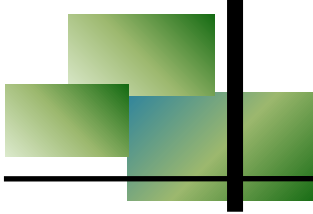


Table 2. Summary of prospective case reviews and prescribing recommendations to providers performed by Pharmacy, 2010 – 2011

| | Total number of cases reviewed | Prescribing recommendation made n (%) |
|-------------|---------------------------------------|--|
| 2010 | | |
| Qtr1* | 372* | 260 (70) |
| Qtr2 | 563 | 313 (56) |
| Qtr3 | 621 | 293 (47) |
| Qtr4 | 881 | 388 (44) |
| 2011 | | |
| Qtr1 | 1146 | 555 (48) |
| Qtr2 | 1695 | 906 (53) |
| Qtr3 | 2177 | 898 (41) |
| Qtr4 | 2062 | 871 (42) |

*2010 Qtr 1 data not complete due to an update to the Siemens pharmacy system in 3/2010

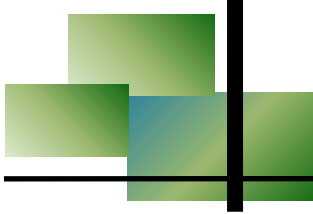
Goal 3c. Expand the use of automated, daily microbiology reports to facilitate timely bug-drug optimization.

In 2011, we continued to utilize automated, daily reports to identify patients where prospective case review with prescribing recommendations could improve antibiotic use. For example, we had previously developed a report of patients with positive blood cultures that automatically updates each hour to provide relatively real-time data of patients with positive cultures, the infecting pathogen, and antibiotic susceptibilities. Through review of this report, we have been able to quickly identify patients where antibiotic prescribing recommendations can help to ensure appropriate therapy and use of the narrowest-spectrum agent possible. In addition, we continued to utilize the daily report of inpatients with HIV infection in order to ensure the accuracy and completeness of antiretroviral therapy and opportunistic infection prophylaxis. In 2011, we observed an increase in the number of case reviews of HIV-infected inpatients as well as an increase in the number of medication regimen corrections as a result of these reviews (Table 3).

Table 3. Pharmacist case reviews of HIV-infected patients, 2010 – 2011

| | Patients on HIV medications reviewed | Medication change made n (%) |
|-------------|---|-------------------------------------|
| 2010 | | |
| Qtr1* | 14 | 6 (43) |
| Qtr2 | 23 | 6 (26) |
| Qtr3 | 46 | 7 (15) |
| Qtr4 | 55 | 16 (29) |
| 2011 | | |
| Qtr1 | 60 | 18 (30) |
| Qtr2 | 94 | 23 (24) |
| Qtr3 | 86 | 21 (24) |
| Qtr4 | 87 | 16 (18) |

*2010 Qtr 1 data not all inclusive due to an update to the Siemens pharmacy system in 3/2010



Goal 4. Expand Antimicrobial Stewardship Program services for hospital providers

Goal 4a. Maintain the Antibiotic Stewardship pager as a resource for providers to promote appropriate antibiotic prescribing.

The “Antibiotic Stewardship Pager” is carried Mondays – Fridays, 8am – 5pm, by a member of the Antibiotic Stewardship Program, and the pager number is listed on the “on-call” section of the Pulse. The purpose of the pager is two-fold: 1) to provide a service to providers who have questions regarding antibiotic prescribing that do not warrant a formal ID consultation, and 2) to provide a single contact number through which the prescribing of restricted antibiotics can be discussed and approved. Outside of the pager hours, requests for restricted antibiotics are directed to the Infectious Diseases attending on call. We maintained the Antibiotic Stewardship Pager as a resource for providers during 2011 and will continue to do so during 2012.

Goal 4b. Further develop and finalize an “Antibiotic Prescribing Table” to provide recommendations for empiric therapy, step-down oral options, and recommended duration of therapy for common infections in the hospital.

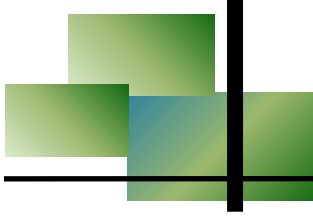
Table 4 summarizes antibiotic selection and duration of therapy recommendations for common inpatient infections at Denver Health and is intended to be used as a quick reference to improve antibiotic prescribing. Although this was not finalized as planned in 2011, we will expand this resource, obtain formal institutional approval, and make this available to providers in 2012.

Table 4. Suggested antibiotic regimens and duration of therapy for clinically responding patients

| Indication | Inpatient empiric therapy | Step-down oral therapy | Duration* |
|---|-----------------------------|--------------------------------------|-----------|
| Community-acquired pneumonia | Ceftriaxone + azithromycin | Azithromycin | 5 days |
| Cellulitis (no purulence/exudate) | Cefazolin | Cephalexin | 7 days |
| Cutaneous abscess | Vancomycin | Doxycycline, TMP-SMX, or clindamycin | 5 days |
| UTI from community (no upper tract involvement) | Ceftriaxone | Varies by organism susceptibilities | 7 days |
| Simple aspiration pneumonia (no abscess or empyema) | Ceftriaxone | Amoxicillin/clavulanate | 7 days |
| Hospital-acquired pneumonia | Cefepime + Vancomycin | Varies | 7 days |
| Biliary tract infection | Ceftriaxone + metronidazole | Amoxicillin/clavulanate | Varies |

Goal 4c. Develop Clinical Care Guidelines and Resources for important infections and antibiotics.

In addition to the development and maintenance of Clinical Care Guidelines for common infections as discussed in detail in Goal 6, we developed a Clinical Care Resource for the management of patients with antibiotic allergies in 2011. The purpose of this resource is to guide the assessment and classification of antibiotic allergies and inform antibiotic selection in the setting of reported or confirmed allergies. This document has been approved by the Antimicrobial Subcommittee of P&T and will be submitted for institutional approval in 2012.



Goal 5. Collaborate with eHealth Services and data warehouse personnel to improve the appropriateness of antibiotic prescribing and the efficiency of daily case reviews and intervention documentation

Goal 5a. Develop an electronic, comprehensive, patient-specific daily report to improve the efficiency of case reviews.

Although this goal was not accomplished in 2011, we developed a template containing the desired data to make the process of prospective case reviews more efficient. We explored whether such a report could be developed through the data warehouse, and it was determined that this would not provide sufficiently real-time data. We also explored the capabilities and pricing of antibiotic stewardship software that increases the efficiency of prospective case reviews from 3rd-party vendors such as TheraDoc and MedMine. It was decided not to pursue such software until capabilities within LifeLink can be assessed.

Goal 5b. With the transition to LifeLink, evaluate for new IT-related opportunities to improve antibiotic prescribing.

Potential opportunities to improve antibiotic use with the transition to LifeLink were discussed throughout the year at antibiotic stewardship meetings. For example, when providers enter orders for an infection where a Clinical Practice Guideline is available, we may have the ability to prompt them to use the guideline. We will continue to evaluate opportunities to optimize antibiotic use during the expansion of LifeLink in 2012.

Goal 5c. Maintain and improve the system to electronically record and track Antibiotic Stewardship Program interventions.

Pharmacists continued to record antibiotic stewardship interventions in the Siemens pharmacy system during 2011. The data in Table 5 demonstrate the improved documentation and involvement of pharmacists in stewardship activities.

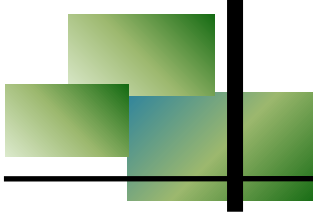


Table 5. Antibiotic stewardship interventions and provider acceptance, 2010 – 2011

| | 2010 | | | 2011 | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| | QTR2 (N=290) n (% accepted) | QTR3 (N=247) n (% accepted) | QTR4 (N=333) n (% accepted) | QTR1 (N= 465) n (% accepted) | QTR2 (N= 782) n (% accepted) | QTR3 (N=923) n (% accepted) | QTR4 (N=923) n (% accepted) |
| Streamline antibiotics | 88 (73) | 77 (75) | 91 (70) | 110 (77) | 142 (72) | 145 (82) | 166 (47) |
| Kinetics | 51 (59) | 57 (81) | 168 (71)** | 232 (91) | 415 (63) | 199 (97) | 270 (58) |
| Discontinue antibiotics | 58 (29) | 46 (33) | 25 (50) | 6 (33) | 40 (100) | 37 (84) | 48 (33) |
| Drug-drug interaction (significant) detected | 4 (100) | 6 (83) | 6 (83) | 14 (100) | 14 (100) | 29 (100) | 13 (92) |
| Drug info provided | 3 (100) | 5 (100) | 4 (100) | 9 (100) | 8 (100) | 6 (100) | 0 (0) |
| Dosing change | 58 (91) | 68 (85) | 87 (81) | 74 (95) | 121 (96) | 311 (96) | 138 (64) |
| Allergy detected | 95 (92) | 4 (100) | --- | 3 (67) | 18 (34) | 10 (90) | 5 (60) |
| Alternative antibiotic | 14 (79) | --- | 17 (41) | 6 (50) | 9 (88) | 23 (94) | 31 (42) |
| Approval of restricted antibiotic | 9 (67) | 18 (83) | 11 (73) | 11 (73) | 20 (80) | 16 (88) | 18 (28) |

*2010 Qtr 1 data not included due to an update to the Siemens pharmacy system in 3/2010

**Vancomycin Clinical Care Resource was approved and pharmacists' responsibilities for vancomycin monitoring on the floors was initiated

Goal 6. Implement or maintain cost containment strategies for high-impact antimicrobials

Goal 6a. Maintain the cefazolin substitution intervention to minimize use of nafcillin and penicillin G when cefazolin is an appropriate alternative.

We maintained an intervention initiated in January 2010 to replace nafcillin and penicillin G (high-cost drugs) with cefazolin, a low-cost but efficacious antibiotic, in selected cases of methicillin-sensitive *S. aureus* infection and beta-hemolytic streptococcal infection. Table 6 displays data from the 2-year period after the start of this intervention (2010-2011) compared with the 2 years prior to the intervention (2008 – 2009). Of note, we were able to secure a lower price for penicillin G during 2010 which accounted for some of the cost savings with this drug.

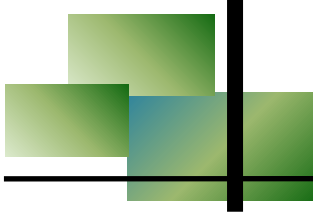


Table 6. Comparison of nafcillin, penicillin G, and cefazolin utilization and costs

| | Antibiotic utilization* | Antibiotic acquisition costs |
|--------------------------------------|--------------------------------|-------------------------------------|
| Nafcillin | | |
| 2008-2009 | 8.1 | \$127,826 |
| 2010-2011 | 4.0 | \$58,031 |
| Change | -50.6% | -\$69,795 |
| Penicillin G | | |
| 2008-2009 | 13.1 | \$164,928 |
| 2010-2011 | 10.3 | \$73,609 |
| Change | -21.4% | -\$91,319 |
| Cefazolin | | |
| 2008-2009 | 47.8 | \$20,677 |
| 2010-2011 | 48.4 | \$23,145 |
| Change | 1.3% | \$2,468 |
| Net cost savings over 2 years | | \$158,646 |
| Annualized cost savings | | \$79,323 |

*days of therapy administered per 1000 patient-days

Goal 6b. Ensure appropriate indications for use of linezolid and daptomycin and continue daily surveillance of patients receiving these agents.

Given the high cost of linezolid and daptomycin and the absence of data suggesting their superiority over vancomycin, we have continued to promote selective use of these agents for patients with resistant gram-positive infections. Use of linezolid or daptomycin requires approval via the Antibiotic Stewardship pager, and we perform daily review of patients receiving these antibiotics to ensure an appropriate indication. Utilization over time is displayed in Figure 12. In 2011, combined use of these agents was 47.7% lower than the year prior to the Antibiotic Stewardship Program (3.4 vs. 6.5 DOT/1000PD) equating to \$40,055 in cost savings (\$59,995 vs. \$100,050) in 2011.

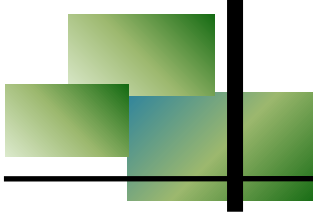
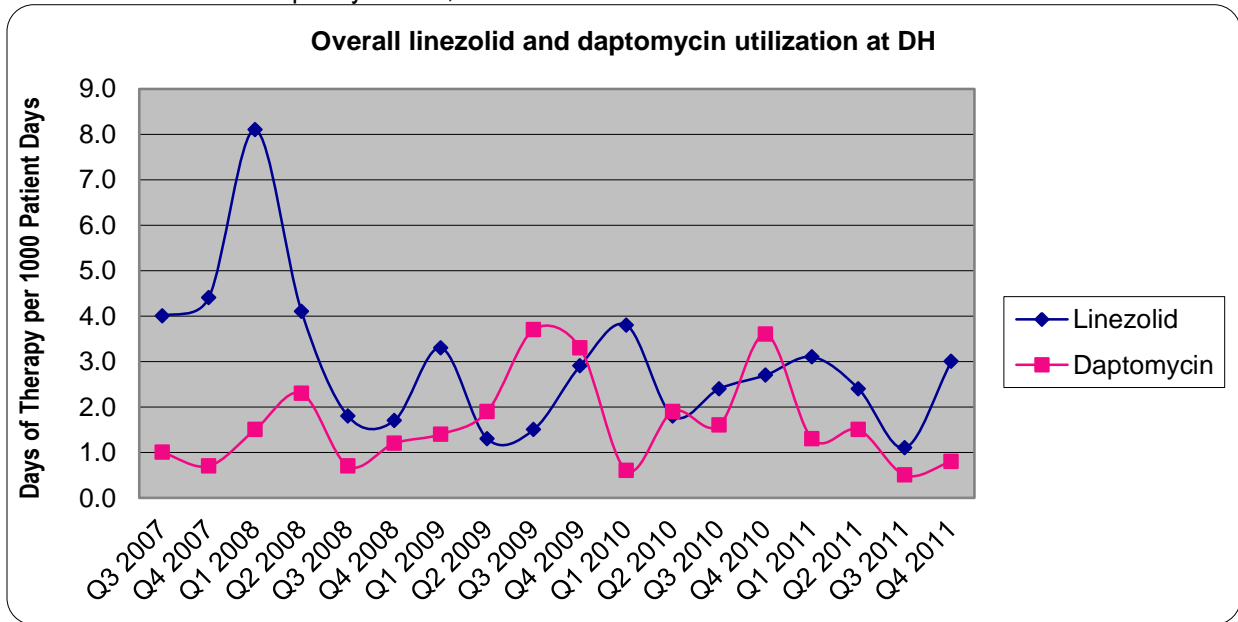


Figure 12. Linezolid and daptomycin use, 2007 - 2011



Goal 6c. Ensure appropriate indications for use of caspofungin and fluconazole; utilize Candidal susceptibility testing to decrease use of caspofungin for azole-susceptible infections.

Caspofungin is an expensive antifungal agent used to treat infections caused by fluconazole-resistant candidal strains such as *C. glabrata* and *C. krusei*. Given its financial impact to the institution, approval via the Antibiotic Stewardship pager is required for use, and we perform daily review of patients receiving caspofungin to ensure an appropriate indication. Caspofungin and overall antifungal use over time are displayed in Figure 13. Despite an observed increase in the incidence of *C. glabrata* infections over time at Denver Health, caspofungin use has remained low, increasing by only 8.7% compared with the year prior to the Antibiotic Stewardship Program (2.5 vs. 2.3 DOT/1000PD). Overall antifungal use has decreased by 16.2% (16.0 vs. 19.1 DOT/1000PD).

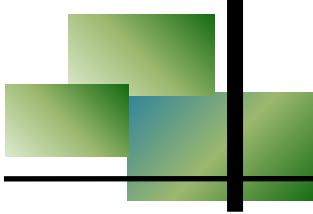
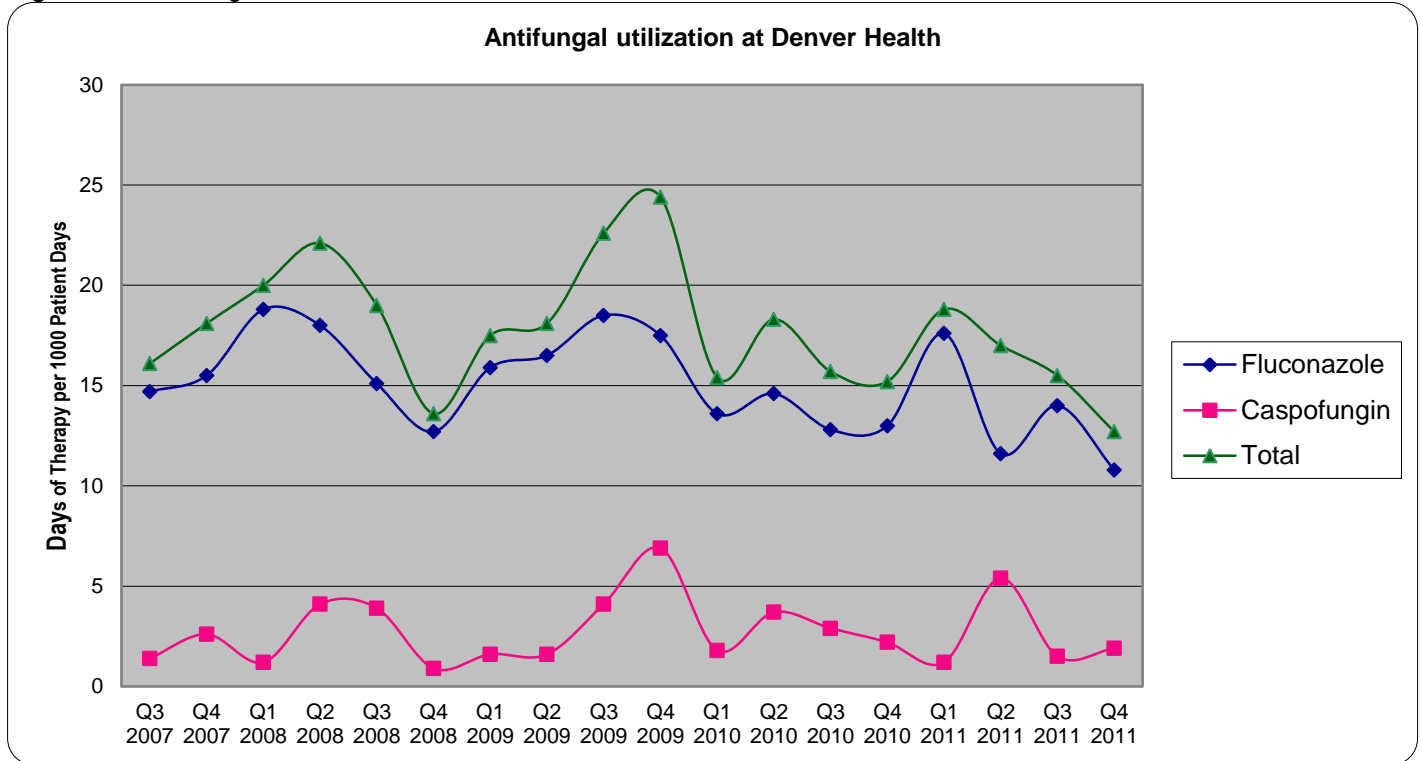


Figure 13. Antifungal use at Denver Health, 2007 – 2011.



In 2011, the Antibiotic Subcommittee of P&T requested that the Microbiology Laboratory perform in-house susceptibility testing for fluconazole on candida isolates from sterile body sites to guide antifungal selection. After a long validation period, this has been implemented as of January 23, 2012. Since approximately 35% of *C. glabrata* isolates are fluconazole-susceptible, this timely susceptibility testing may allow for reduced use of caspofungin in such cases.

Goal 6d. Update and review the relative costs of antimicrobial agents twice yearly and re-evaluate antibiotic utilization strategies based on current costs.

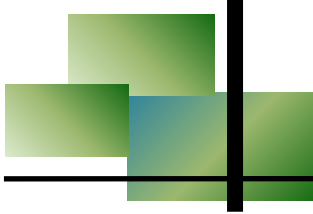
Antimicrobial costs were monitored throughout the year, and action was taken when beneficial to Denver Health. As an example imipenem-cilastatin went off-patent in 2008, and once it became available through a generic supplier in June 2011, our Pharmacy took the appropriate steps to obtain the drug from this supplier at a reduced cost.

Goal 7. Improve the Antibiotic Stewardship subsite on the Pulse and increase its utilization

Goal 7a. Reformat the Antibiotic Stewardship subsite so that Clinical Care Guidelines and the antibiogram are immediately visible upon navigation to the site.

In early 2011, the Antibiotic Stewardship subsite on the Pulse was reformatted so that upon navigation to the site, all Clinical Care Guidelines for common infections and the Denver Health antibiogram were immediately visible. This ensures that these resources can be quickly and easily located by clinicians and pharmacists.

Goal 7b. Utilize opportunities to reeducate providers regarding the availability and resources of this site.

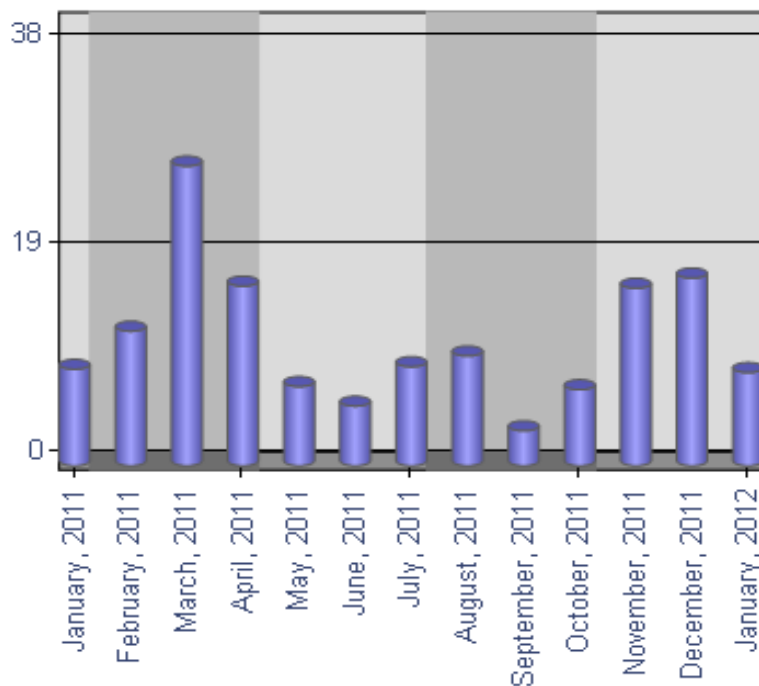


Education regarding the availability of Clinical Care Guidelines and antibiogram on the Antibiotic Stewardship subsite of the Pulse was incorporated into the weekly new employee orientation during 2011. At this orientation, the Infection Prevention team showed screen-shots of the subsite including where to find important resources to improve antibiotic prescribing. In addition, we reminded providers about the resources located on the subsite in all electronic mail communications to clinicians and pharmacists.

Goal 7d. Track visits to the Antibiotic Stewardship subsite; formulate and carry out an action plan to further promote its use if indicated.

We continue to track visits to the Antibiotic Stewardship subsite over time. In 2011, although use varied significantly throughout the year, we observed 4 months with an average of at least 15 visits per day to the subsite (Figure 14) compared with only 1 such month in 2010. We continue to expect visits to this subsite to increase as we expand the available resources to improve antibiotic prescribing.

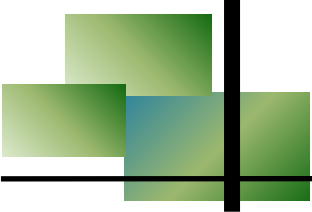
Figure 14. Average visits per day to the Antibiotic Stewardship subsite, by month



Goal 8. Develop, implement, and measure uptake of Clinical Care Guidelines for the management of important infections to improve antibiotic and health care resource utilization and update existing Clinical Care Guidelines as appropriate

Clinical Care Guidelines continue to be an important intervention to improve the use of antibiotics at Denver Health. Guidelines for the following infections were developed, revised, or maintained in 2011:

- 1) Inpatient and outpatient community acquired pneumonia (developed, approved, and disseminated)
- 2) Inpatient skin and soft tissue Infections (revised)
- 3) *Clostridium difficile* infection (revised)
- 4) Uncomplicated gonorrhea and chlamydia (revised)
- 5) Urinary tract infection in outpatients (revised)

- 
-
- 6) Complicated intra-abdominal infections (maintained)
 - 7) Invasive candidal infections (maintained)

Goal 8a. Implement the Clinical Care Guidelines for inpatient and outpatient community-acquired pneumonia and begin tracking metrics to assess uptake and effect.

Clinical Care Guidelines for the management of community-acquired pneumonia in the hospital and ambulatory care setting were approved in June 2011, distributed to clinicians and pharmacists, and posted on the Antibiotic Stewardship subsite of the Pulse. The goals of these guidelines are to: 1) prevent hospitalization for low-risk patients, 2) decrease use of early chest CT when a diagnosis of CAP without complications is apparent, 3) prevent exposure to a new antibiotic class on hospital discharge (e.g., ceftriaxone+azithromycin followed by levofloxacin), and 3) decrease the duration of antibiotic therapy (5 days recommended for patients responding to therapy). We are in the process of developing an automated, electronic surveillance system to monitor quarterly use of chest CT, antibiotic selection, duration of therapy, and clinical outcomes (mortality and 30-day readmission rates) in cases of CAP over time. In addition, we plan to perform a pre-intervention post-intervention study in 2012 to describe changes in antibiotic and hospital resource utilization and clinical outcomes in more detail.

Goal 8b. Collect data regarding present management of healthcare-associated/hospital-acquired pneumonia and use these data to develop a Clinical Care Guideline with goals of decreasing unnecessary broad-spectrum and prolonged therapy and use of health care resources.

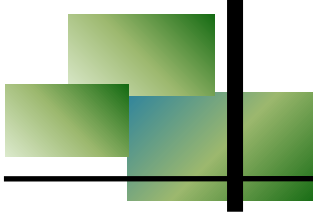
In 2011, a database of patients with healthcare-associated or hospital-acquired pneumonia was extracted from the Denver Health data warehouse. In addition, a data abstraction tool was developed to standardize the collection of data elements regarding the diagnostic evaluation, treatment, and outcomes of such cases. In 2012, a random sample of cases will be reviewed using the abstraction tool to provide detailed data on current diagnostic and management practices at Denver Health. Based on these data, a Clinical Care Guideline will be developed to standardize and streamline the care of patients with healthcare-associated or hospital-acquired pneumonia. The goals of this guideline will be to maximize the chance for a good clinical outcome while preventing unnecessary antibiotic and health care resource utilization.

Goal 8c. Develop a Clinical Care Guideline for inpatient management of complicated urinary tract infection with goals of preventing treatment of asymptomatic bacteriuria and promoting short-course therapy (will extend into 2012)

Work on this goal was not initiated in 2011; however, unnecessary antibiotic utilization for asymptomatic bacteriuria and excessive durations of antibiotic therapy for urinary tract infections in the hospital setting remain important targets to improve antibiotic use at Denver Health in 2012.

Goal 8d. Develop a Clinical Care Guideline for febrile neutropenia (will extend into 2012)

The Antimicrobial Subcommittee of P&T reviewed the paper order set for the treatment of febrile neutropenia and will make recommendations to the Oncology group regarding suggested changes to align this document with current evidence and Denver Health antibiotic utilization strategies. A Clinical Care Guideline will be developed in 2012 to standardize empiric therapy for febrile neutropenia as well as the timing and choice of additional antimicrobials for patients not responding to initial therapy. We will collaborate with the Oncology group on this guideline.



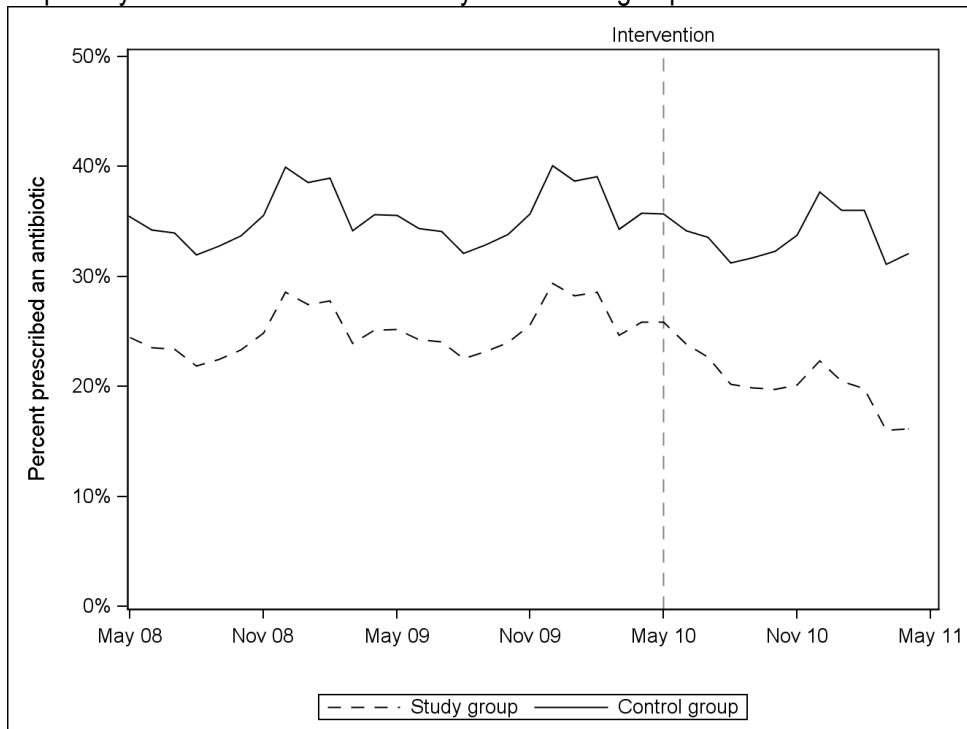
Goal 8e. Obtain institutional approval for and implement Clinical Care Guidelines for common outpatient infections (acute bronchitis, acute sinusitis, non-specific URI, acute pharyngitis, acute otitis media, and skin and soft tissue infections)

As part of an AHRQ-sponsored study to reduce unnecessary antibiotic utilization in primary care practices, we previously developed management algorithms for 8 common outpatient infections, including:

- 1) Acute bronchitis
- 2) Non-specific upper respiratory infection
- 3) Acute sinusitis
- 4) Pharyngitis
- 5) Acute otitis media
- 6) Urinary tract infection
- 7) Skin and soft tissue infection
- 8) Community-acquired pneumonia

These algorithms were the basis of a cluster-randomized trial in which Westside, Lowry, and two clinics from outside institutions were randomized to use of the guidelines (study group), while Westwood, Level One Physicians, and two additional outside clinics were randomized to no intervention (control group). May 2011 marked the end of the one-year study period after implementation of the intervention. In the study group, antibiotic prescriptions for non-pneumonia acute respiratory tract infections – conditions where antibiotics provide little benefit and typically are not indicated – declined moreso than in the control group during the intervention period (Figure 15)

Figure 15. Mixed effects piecewise logistic regression models predicting antibiotic prescriptions for acute respiratory infections over time for study and control groups



In addition, use of broad-spectrum antibiotics declined moreso in the study group than in the control group during the intervention period (Figure 16).

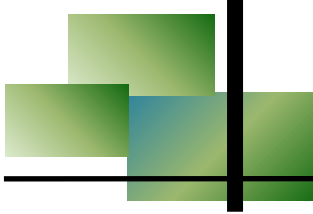
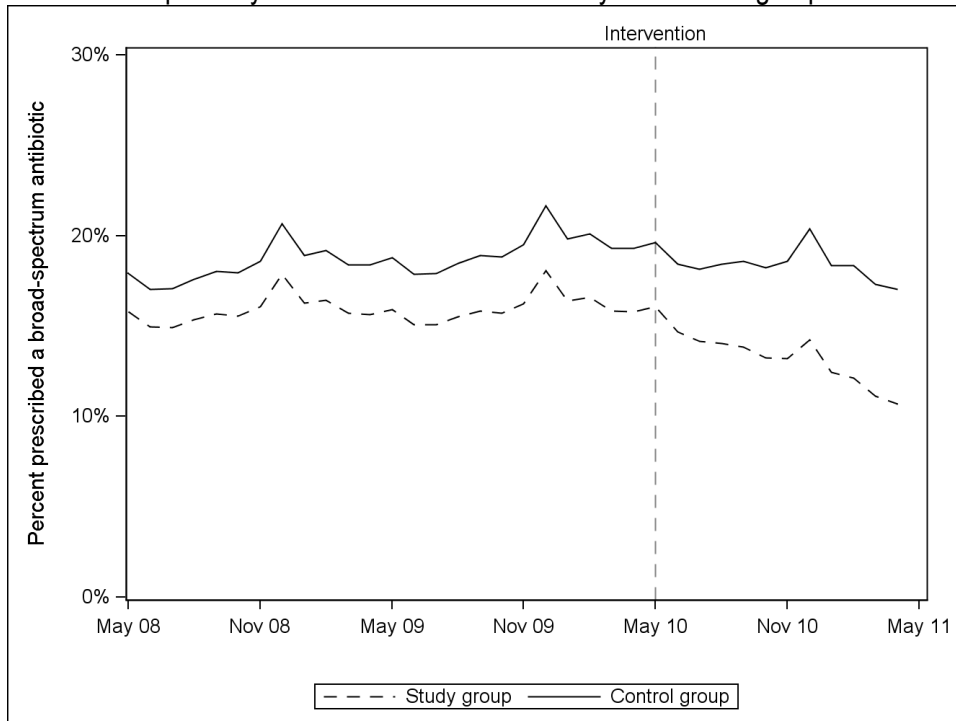


Figure 16. Mixed effects piecewise logistic regression models predicting broad-spectrum antibiotic prescriptions for all clinical pathway conditions over time for study and control groups



Given the reduced antibiotic use observed over the first year of this intervention, the study period will be extended for an additional year to determine the longer-term impact on antibiotic prescribing. In addition, use of the algorithms was expanded to all Denver Health Internal Medicine and Family Medicine clinics in December 2011 as part of efforts to understand uptake of guidelines. In 2012, we will formally submit the algorithms for approval as Denver Health Clinical Care Guidelines.

Goal 8f. Update existing Clinical Care Guidelines as appropriate

Clinical care guidelines for inpatient skin and soft tissue infections, *C. difficile* infection, gonorrhea and chlamydia, and outpatient urinary tract infections were revised and updated during 2012.

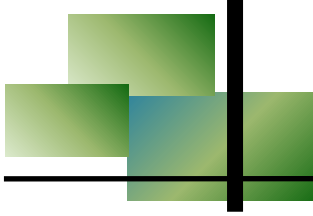
Goal 9. Maintain an active P&T Antimicrobial Subcommittee

Goal 9a. Continue to hold monthly meetings with distribution of a pre-meeting agenda and post-meeting minutes

The Antimicrobial Subcommittee of P&T held monthly meetings throughout 2011 with distribution of a pre-meeting agenda and post-meeting minutes.

Goal 9b. Discussion topics include (but not limited to) clinical care guideline development, review of other clinical guidelines that involve antimicrobial therapy, antibiotic utilization strategies, and review of new antimicrobial agents

Discussion topics at Antimicrobial Subcommittee meetings during 2011 included prioritization of Clinical Care Guideline development, updates/revisions to existing Clinical Care Guidelines, review of antimicrobial resistance patterns at Denver Health, general antibiotic utilization strategies, antimicrobial shortages and alternative



recommendations during shortage periods, antimicrobial formulary review and modification, antifungal susceptibility testing for sterile-site candidal isolates, development of a Clinical Care Resource for the management of antibiotic allergies, interventions to increase safety of patients receiving nephrotoxic outpatient IV antibiotics, and in-house *C. difficile* PCR testing.

An important emerging issue for Denver Health involves the treatment of patients with hepatitis C genotype 1 infection with the new direct-acting antiviral agents, telaprevir and boceprevir. These agents have changed the standard of care for hepatitis C genotype 1 treatment due to their excellent clinical success rates but are very expensive. Given their potential financial impact to Denver Health, the Antimicrobial Subcommittee organized a Hepatitis C working group comprised of stakeholders from Gastroenterology, Infectious Diseases, HIV Primary Care, Pharmacy, P&T committee, and Executive Staff. The group reviewed the safety and efficacy of these agents, chose telaprevir as the preferred agent, developed criteria for use, and assisted with modeling the financial impact to Denver Health. The group's work has helped to ensure that telaprevir will be used in appropriate clinical settings with fiscal responsibility.

Goal 9c. Continue to report business items to P&T, as appropriate

Topics reported by the Antimicrobial Subcommittee to P&T during 2011 included substitution of Abelcet (amphotericin B lipid complex) with Ambisome (liposomal amphotericin B) to improve patient safety, approval of the Clinical Care Guidelines for inpatient and outpatient community-acquired pneumonia, revised Clinical Care Guidelines for inpatient skin and soft tissue infection, *C. difficile* infection, gonorrhea, chlamydia, and outpatient urinary tract infections, and use of telaprevir for treatment of hepatitis C genotype 1 at Denver Health.

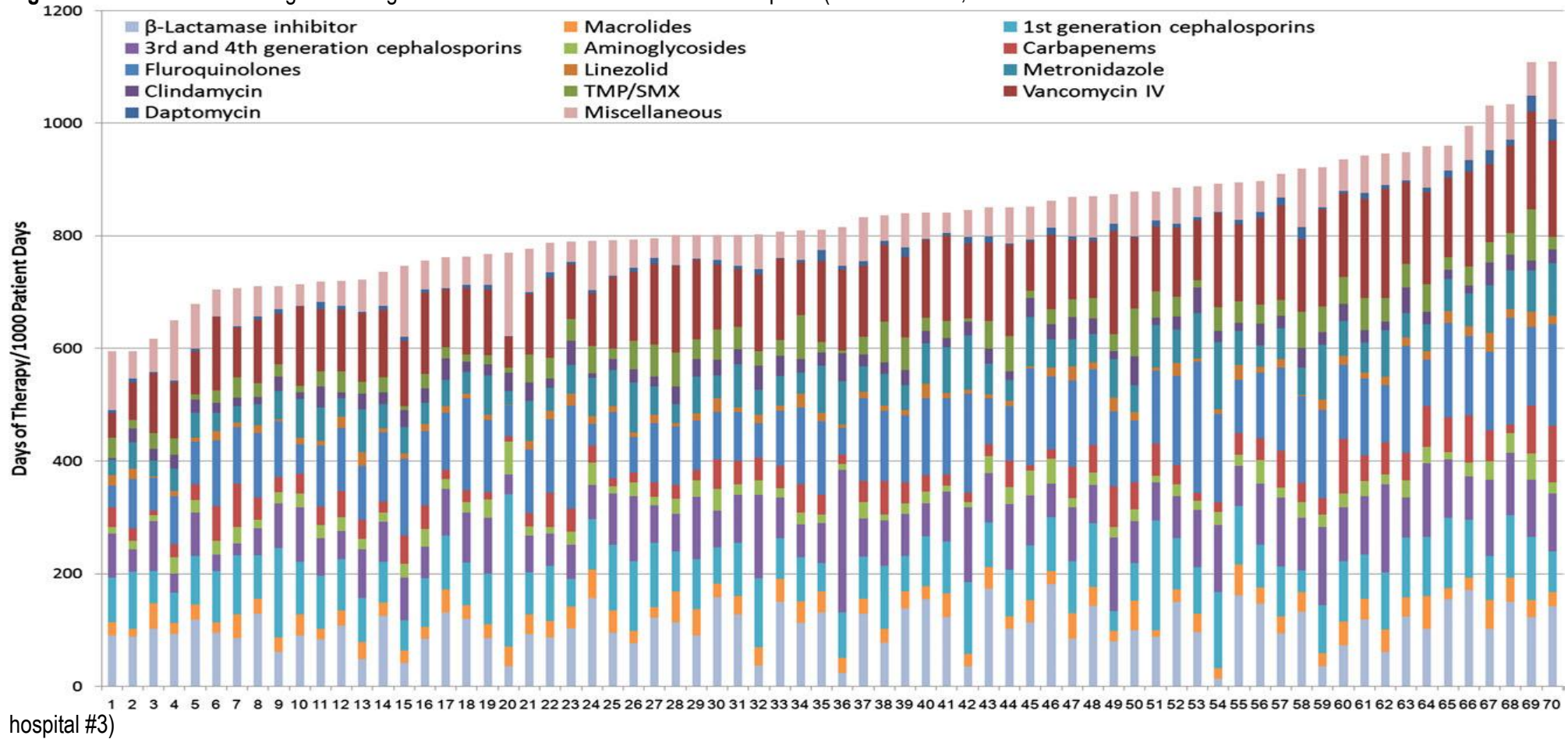
Goal 10. Expand efforts to benchmark Denver Health antibiotic utilization and costs over time

Goal 10a. Review the antibiotic utilization and cost data available through UHC and determine whether they are appropriate for benchmarking for the Denver Health Antibiotic Stewardship Program

The University Health Systems Consortium (UHC) database was explored as an option to provide antibiotic utilization and cost benchmarking data for Denver Health. Unfortunately, the current format of the data does not allow for readily available benchmarking. However, a recent study of 70 UCH academic medical center hospitals (Polk R, Clin Infect Dis 2011, published online Oct. 13, 2011) revealed Denver Health to be among the hospitals with the lowest antibiotic utilization. The following figure, in which Denver Health is represented as hospital #3, shows our antibiotic use to be third-lowest among the 70 hospitals.



Figure. Total antibacterial drug use during 2009 in 70 academic medical center hospitals (Denver Health,



After standardization of expected antibiotic use based on Medicare Severity Diagnosis Related Group, Denver Health had the lowest observed to expected antibiotic use ratio of the 70 hospitals as displayed in the following figure where Denver Health is represented as hospital #1.

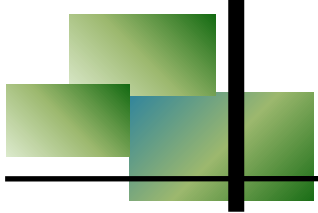
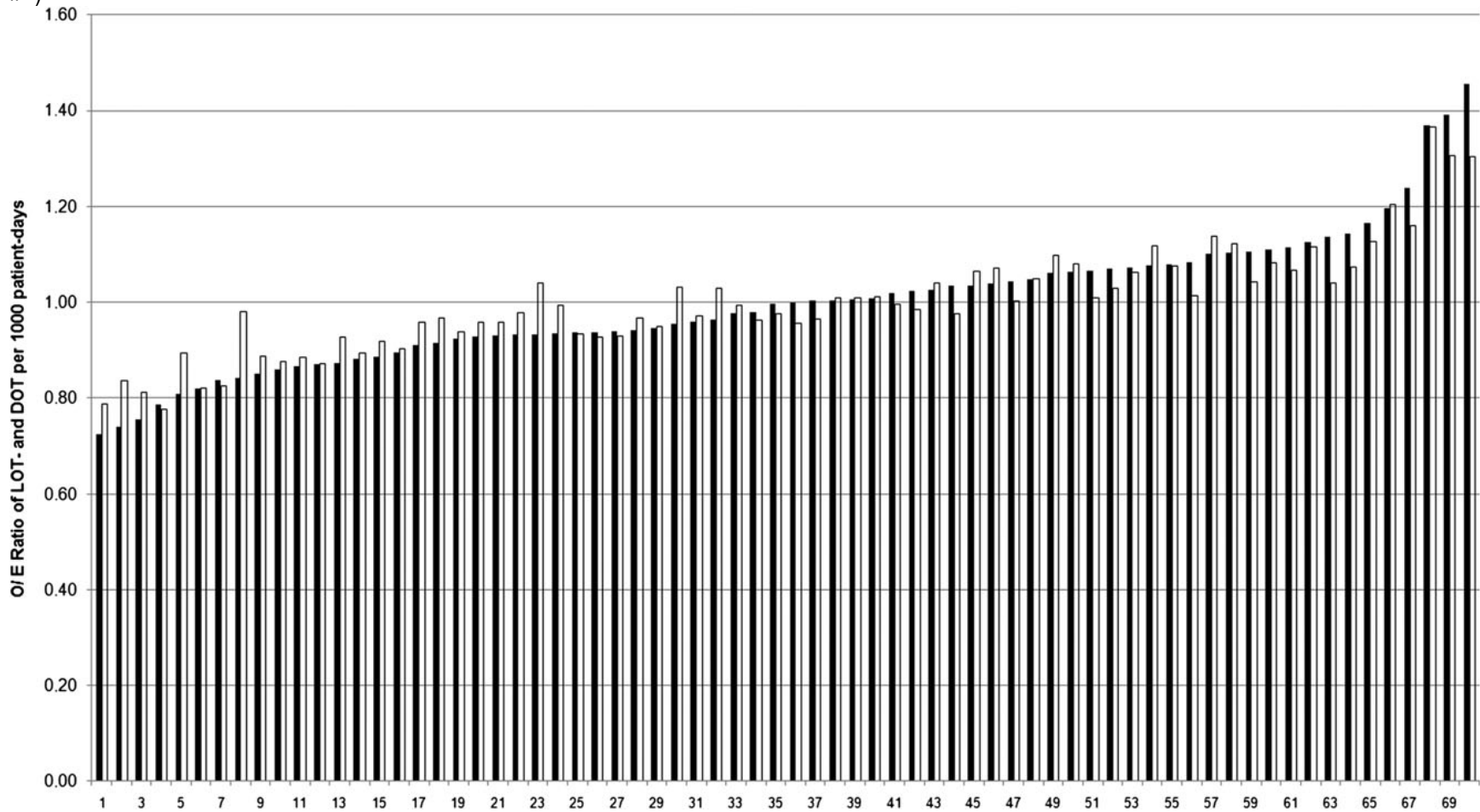


Figure. Ratio of hospital-wide observed antibacterial drug use and expected use for 70 academic medical center hospitals (Denver Health, hospital #1)



Goal 10b. If determined to be appropriate, develop and carry out a plan for periodic benchmarking of Denver Health performance

We continue to strive to obtain real-time, ongoing antibiotic utilization benchmarking data to help direct antibiotic stewardship initiatives and will continue to work with UHC experts during 2012 to work toward this goal.

RISK ASSESSMENT FOR ANTIBIOTIC STEWARDSHIP IN 2012

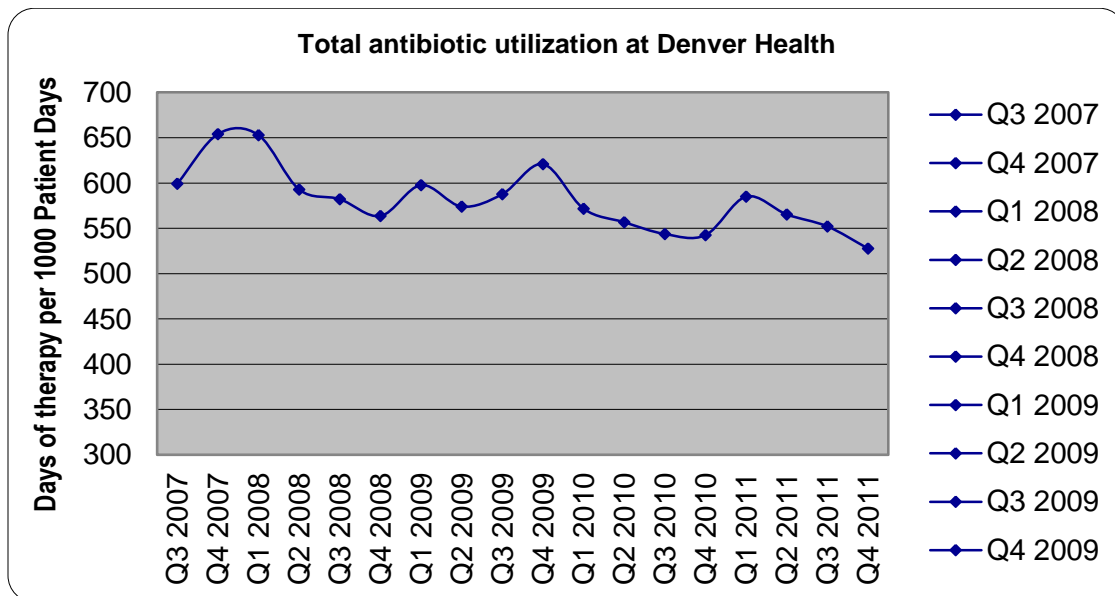
Summary of 2011 Antibiotic Utilization and Cost Data

The following is a summary of changes in antibiotic utilization and costs in 2011 associated with the Antibiotic Stewardship Program (all figures adjusted for census days):

Total Antibiotic Use

- 557.5 days of therapy (DOT) per 1000 patient-days (PD) in 2011
 - 0.7% increase compared with 2010 (553.6 DOT/1000PD)
 - 10.8% reduction compared with the 1-year period (7/1/07 – 6/30/08) prior to the stewardship program (625.4 DOT/1000PD)
 - Figure 1 shows that total hospital antibiotic use in the 4th quarter of 2011 was at the lowest level since this metric has been tracked

Figure 1. Total hospital antibiotic use, 2007 - 2011. Antibiotic stewardship program implemented in July 2008.



Broad-Spectrum Antibiotic Use

Progressive antimicrobial resistance is one of the major threats facing hospitals in the United States. Stewardship efforts to decrease unnecessary antibiotic use are critical to slow or reverse trends of antimicrobial resistance. Antibiotics with a broad spectrum of antimicrobial activity are more likely to promote resistance than narrower-spectrum antibiotics. Agents with anti-pseudomonal activity are universally broad in spectrum and represent the last line of defense against resistant gram-negative pathogens. Given this, a major goal of the Denver Health Antibiotic Stewardship Program has been to reduce use of antibiotics with activity against *Pseudomonas aeruginosa*.

- Antibiotics with anti-pseudomonal activity: 148.1 days of therapy per 1000 patient-days in 2011
 - 1.0% increase compared with 2010 (146.7 DOT/1000PD)
 - 23.2% reduction compared with the 1-year period prior to the stewardship program (192.8 DOT/1000PD)
 - Figure 2 shows use of anti-pseudomonal agents over time

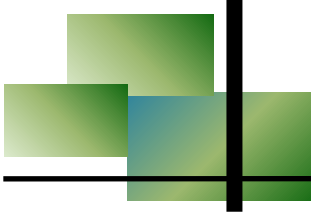
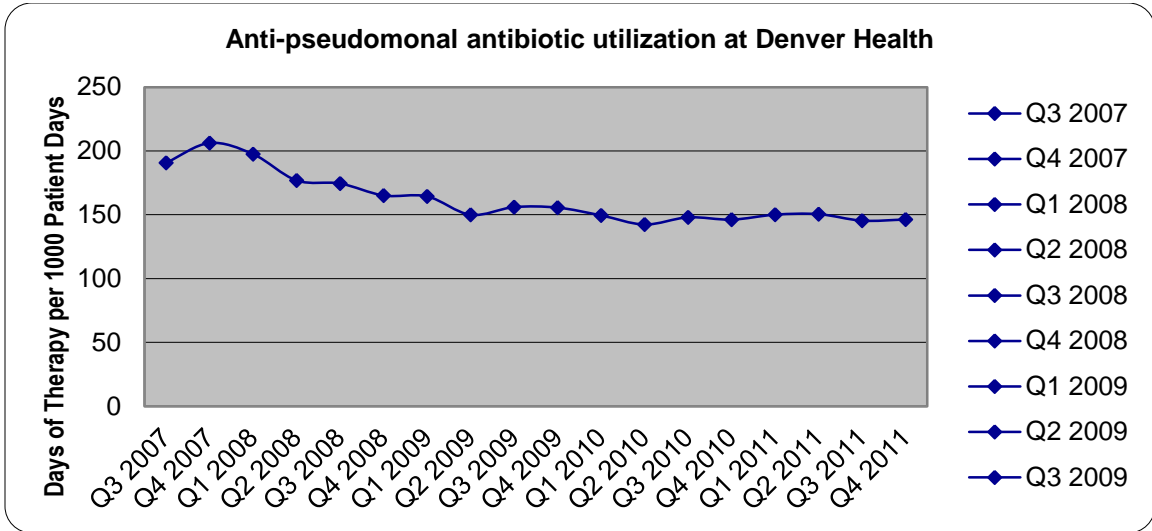


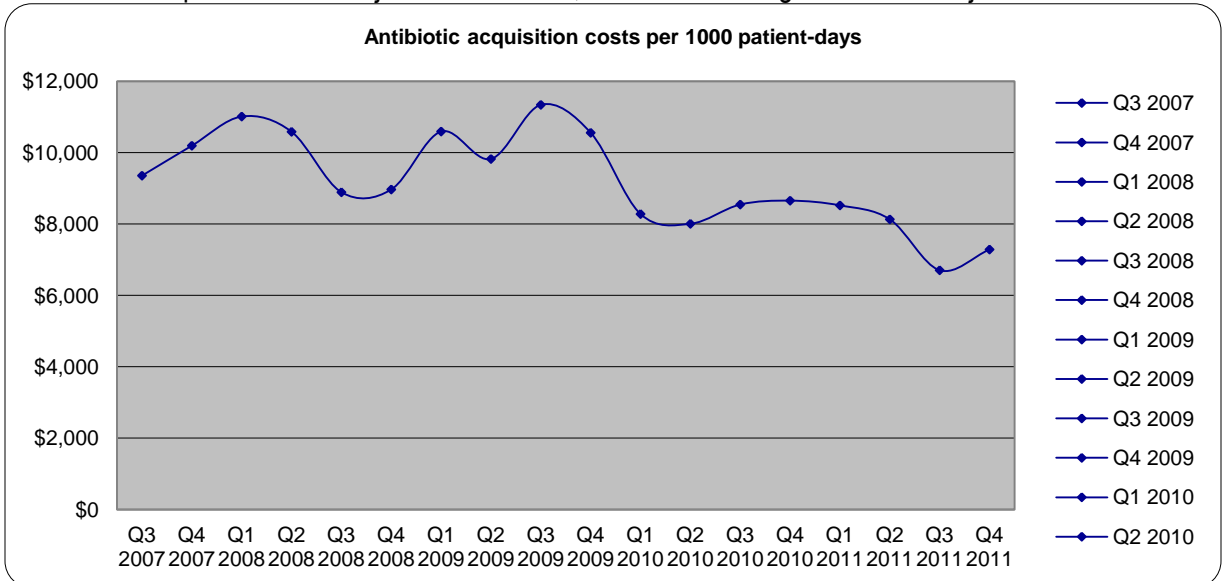
Figure 2. Anti-pseudomonal antibiotic utilization, 2007 - 2011. Antibiotic stewardship program implemented in July 2008.

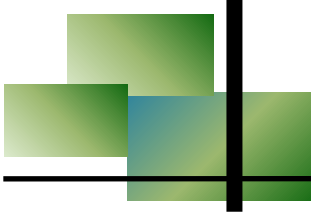


Cost Savings

- Total antibiotic acquisition costs to Denver Health were \$840,007 in 2011 and \$880,966 in 2010. Adjusted for the increased hospital census in 2011, this represents a \$73,030 cost savings or 8.3% reduction in costs in 2011.
- Antibiotic acquisition costs during the year prior to the Antibiotic Stewardship Program were \$1,085,343. Adjusting for census, this represents a \$277,407 cost savings or 25.6% reduction in cost in 2011.

Figure 3. Antibiotic acquisition costs adjusted for census, 2007 – 2011. Figures are not adjusted for inflation.

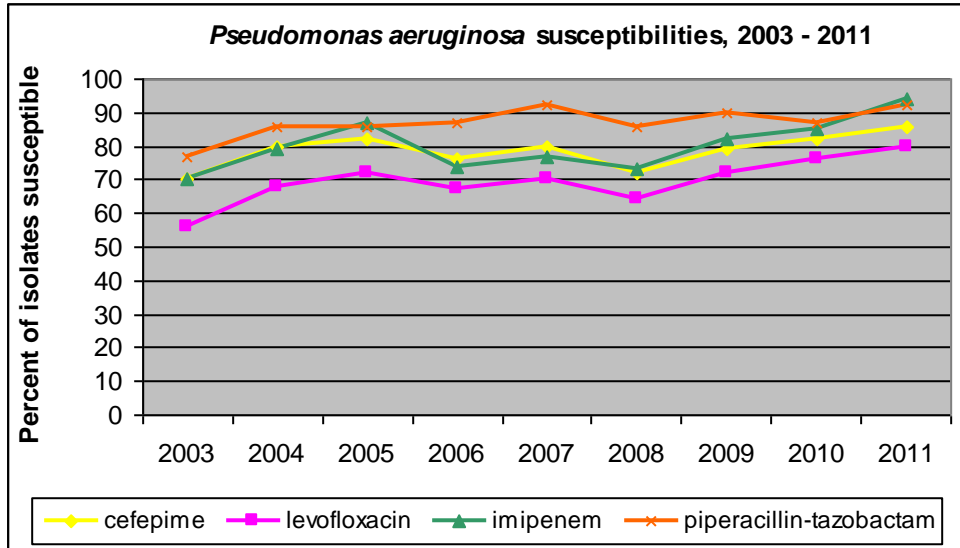




Antimicrobial Resistance at Denver Health

Microbiology data reveal that the susceptibility of *Pseudomonas aeruginosa* isolates to levofloxacin, imipenem, and cefepime has steadily improved over the last 4 years (Figure 4) corresponding with implementation of the Antibiotic Stewardship Program and overall reduced use of anti-pseudomonal agents. Compared with 2007, the proportion of isolates susceptible to levofloxacin has increased from 70% to 80%, 77% to 94% for imipenem, and 80% to 86% for cefepime. Susceptibility to piperacillin-tazobactam has remained stable.

Figure 4. Proportion of *P. aeruginosa* isolates susceptible to antibiotics, 2003 – 2011.



Corroborating these data, rates of imipenem-resistant *P. aeruginosa* infections have progressively declined at Denver Health over time and remain low (Figure 5.)

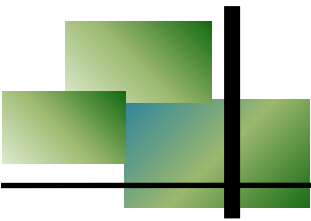
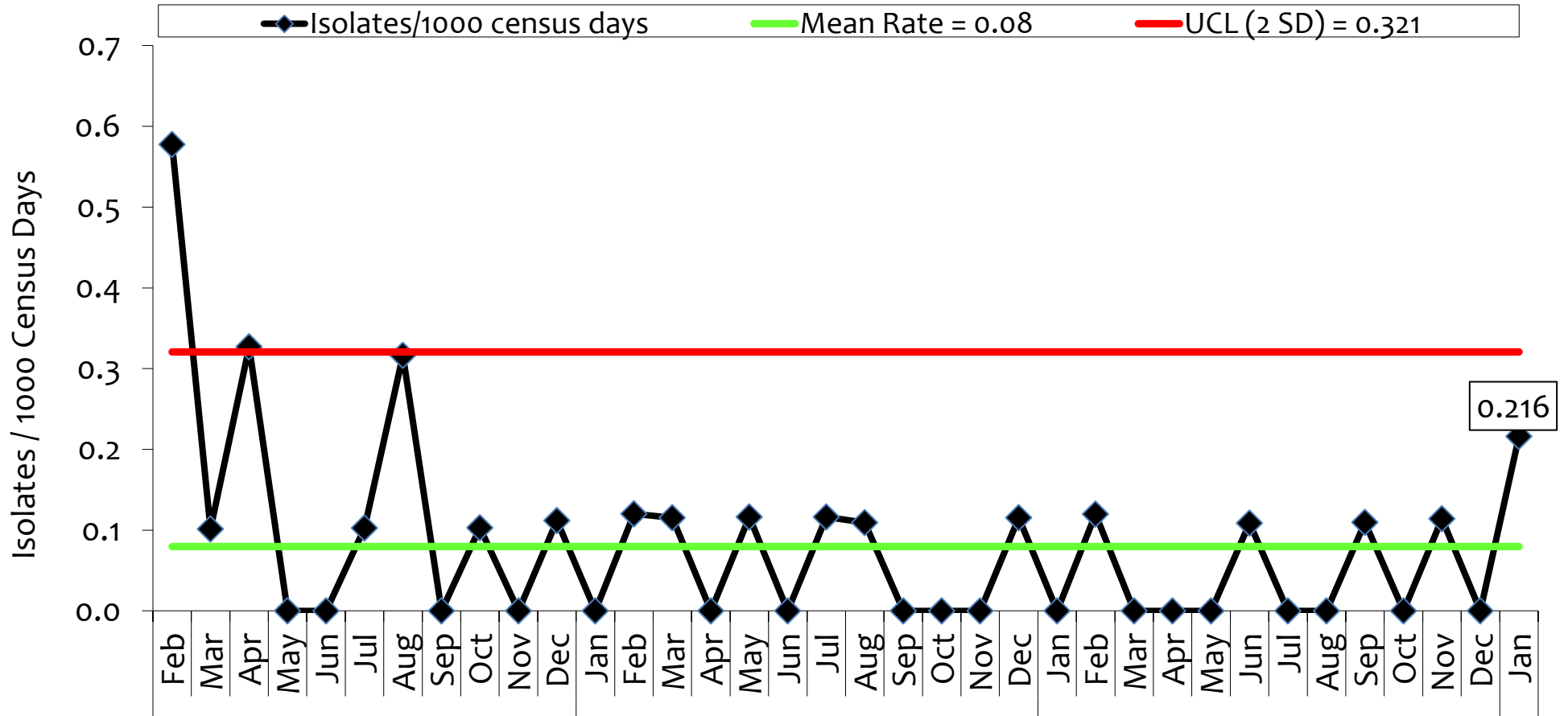
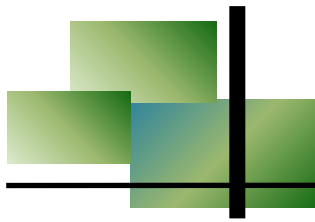


Figure 5. Rate of imipenem-resistant *P. aeruginosa* infections from February 2009 – January 2012

Imipenem Resistant Pseudomonas





In addition to improvements in *P. aeruginosa* susceptibility patterns, we have observed encouraging susceptibility trends in other key pathogens (Table 1). For example, from 2005 to 2009, *E.coli* susceptibility to levofloxacin in the hospital setting was stable at 76 – 77%. By 2011, 83% of isolates were susceptible to levofloxacin. It is likely that fluoroquinolone-sparing treatment strategies in both the inpatient and outpatient settings have contributed to the increased susceptibility in this important pathogen. Rates of multi-drug resistant gram-negative organisms such as extended-spectrum beta-lactamase (ESBL)-producing *E.coli* and *Klebsiella pneumoniae* carbapenemase (KPC)-producing organisms have remained stable despite increasing trends nationally. In addition, we have observed lower proportions of MRSA and VRE over the last 3 years (Table 1).

Table 1. Antimicrobial susceptibility trends for key pathogens at Denver Health

| | 2009 % | 2010 % | 2011 % |
|--|-----------|-----------|-----------|
| <i>Pseudomonas aeruginosa</i> (% susceptible) | | | |
| Levofloxacin | 72 | 76 | 80 |
| Imipenem | 82 | 85 | 94 |
| Cefepime | 79 | 82 | 86 |
| Piperacillin-tazobactam | 90 | 87 | 92 |
| <i>E. coli</i> (inpatient isolates, % susceptible) | | | |
| Levofloxacin | 76 | 81 | 83 |
| <i>S. aureus</i> (% MRSA) | 45 | 41 | 40 |
| Enterococcus (% VRE) | 25 | 20 | 10 |

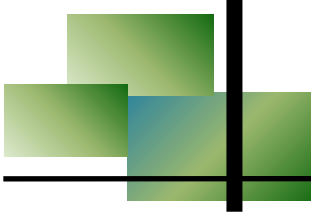
GOALS FOR 2012 AS PROGRAM

Goal 1. Maintain an effective Antibiotic Stewardship Program during changes to current staffing

- Develop and execute a plan to continue active, daily stewardship activities during the 3-month maternity leave of Claire Swartwood, ID PharmD.
- Develop and execute a plan for continued oversight of the Antibiotic Stewardship Program as the percent effort of Dr. Jenkins is reduced from 50% to 15% with initiation of K23 career development funding.

Goal 2. Continue quarterly antibiotic utilization and cost surveillance; develop and maintain strategies to optimize antibiotic use accordingly

- Perform quarterly hospital-wide and ICU-specific surveillance for overall antibiotic use and commonly-used agents/classes.
- Develop and maintain strategies to prevent unnecessary use of anti-pseudomonal agents.
- Evaluate reasons for increasing MICU anti-pseudomonal use and collaborate with MICU staff in efforts to reduce use as appropriate.

- 
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- Maintain strategies to prevent unnecessary use of vancomycin and other agents with activity against resistant gram-positive organisms.

Goal 3. Continue to perform prospective case reviews with provider feedback and prescribing recommendations and evaluate new opportunities to expand this intervention.

- Develop a pilot intervention where antibiotic stewardship case reviews are performed for all patients on surgical sub-specialty services (e.g., Plastic Surgery, ENT, Maxillofacial Surgery, Urology)
- Continue to promote involvement of the floor pharmacists in daily antibiotic stewardship activities through education, competency training, and electronic documentation of interventions.
- Continue to develop a patient-specific daily report including medications, allergies, vital signs, laboratory values, and microbiology data to improve the efficiency of prospective case reviews and provider feedback.

Goal 4. Develop, implement, and measure uptake of Clinical Care Guidelines for the management of common infections and update existing Clinical Care Guidelines as appropriate

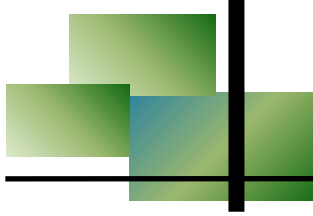
- Assess uptake and effect of Clinical Care Guideline for the management of community-acquired pneumonia
- Collect data regarding present management of healthcare-associated/hospital-acquired pneumonia and use these data to develop a Clinical Care Guideline with goals of decreasing unnecessary broad-spectrum and prolonged therapy and use of health care resources.
- Develop a Clinical Care Guideline for inpatient management of complicated urinary tract infection with goals of preventing treatment of asymptomatic bacteriuria and promoting short-course therapy (will extend into 2013)
- Develop a Clinical Care Guideline for febrile neutropenia (will extend into 2013)
- Obtain institutional approval for and implement Clinical Care Guidelines for common outpatient infections (acute bronchitis, acute sinusitis, non-specific URI, acute pharyngitis, acute otitis media, and skin and soft tissue infections) and develop strategies to promote use in the acute care setting (Emergency Department and Urgent Care)

Goal 5. Perform a comprehensive review of antimicrobial resistance at Denver Health; review and update antibiotic utilization strategies accordingly

- Develop the 2011 Denver Health hospital-wide antibiogram, MICU, SICU, and Pediatric antibiograms, identify important trends in antimicrobial resistance, and disseminate results to clinicians and pharmacists.
- Discuss overall antibiotic utilization strategies in the Antibiotic Subcommittee with input from appropriate stakeholders (e.g., critical care physicians, pediatricians, hospitalists) and disseminate results to clinicians and pharmacists.

Goal 6. Maintain and expand resources to promote optimal antibiotic prescribing

- Develop and maintain Clinical Care Guidelines and Resources for important infections and antibiotics.
- Maintain the Antibiotic Stewardship pager as a resource for providers with questions regarding antibiotic prescribing and for approval of use of restricted antibiotics.
- Maintain and improve the Antibiotic Stewardship subsite on the Pulse and track utilization over time



Goal 7. Implement or maintain cost containment strategies for high-impact antimicrobials

- Maintain the cefazolin substitution intervention to minimize use of nafcillin and penicillin G when cefazolin is an appropriate alternative.
- Ensure appropriate indications for use of daptomycin and linezolid for known or suspected resistant gram-positive infections and continue daily surveillance of patients receiving these agents.
- Ensure appropriate indications for use of caspofungin and fluconazole; utilize candidal susceptibility testing to prevent unnecessary use of caspofungin for azole-susceptible infections.
- Update and review the relative costs of antimicrobial agents twice yearly and re-evaluate antibiotic utilization strategies based on current costs.

Goal 8. Maintain an active P&T Antimicrobial Subcommittee

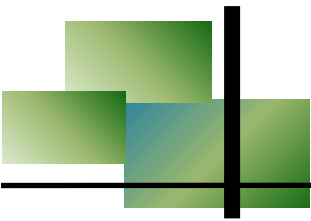
- Continue to hold monthly meetings with distribution of a pre-meeting agenda and post-meeting minutes and discussion of topics that impact antibiotic use at Denver Health
- Continue to report business items to P&T, as appropriate

Goal 9. Benchmark Denver Health antibiotic utilization and costs over time

- Use antibiotic and cost data from UHC to benchmark Denver Health with other academic hospitals.

Goal 10. Lead efforts to expand antibiotic stewardship in Colorado hospitals

- Collaborate with the Colorado Hospital Association in a project to improve antibiotic stewardship practices at Denver Health and other Colorado hospitals.



REPORTING OF INFECTION PREVENTION AND ANTIBIOTIC STEWARDSHIP DATA

The following table displays the infection prevention reporting calendar for the 2012 year. Data will be posted on the Infection Prevention Subsite according to the schedule below:

| Date | | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 | Dec-12 | |
|-------------------------------|--|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Data and Time Period Reported | Device-Related Infections | CLAB | 4thQ11 | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | | |
| | | VAP | 4thQ11 | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | | |
| | | CAUTI | 4thQ11 | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | | |
| | Surgical Site Infections | BREAST | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | PROSTATE | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | AHYST | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | VHYST | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | KPRO | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | HPRO | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | CRANI | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | FUSION | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | HERNIA | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | | BARIATRICS | 4thQ11 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | | | |
| | Healthcare Associated Organism Monitors | MRSA | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 |
| | | VRE | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 |
| | | C-Diff | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 |
| | | ACINETOBACTER | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 |
| | | ASPERGILLUS | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 |
| | | MDR P | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 |
| AERUGINOSA | | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 | |
| ESBL | | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 | |
| Process Indicators | KPC | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 | |
| | HAND HYGIENE + STEWARDSHIP PERIOPERATIVE ANTIBIOTICS | 4thQ10 | | | 1stQ12 | | 2ndQ12 | | 3rdQ12 | | 4thQ12 | | | |



IX. DIVISION OF HEALTH SERVICES RESEARCH 2011 ANNUAL REPORT

This annual report summarizes the 2011 activities and accomplishments of the department of Health Services Research, including the degree to which 2011 goals as outlined in the 2010 annual report were met, and is presented in sections as follows:

- Overview of Health Services Research at Denver Health
- HSR 2011 Strategic Objectives
- HSR 2011 Grant and Contract Funding (Continuing, New, and Pending)
- HSR Publications

In addition, this report addresses alignment with the strategic imperatives of *maintaining financial viability*, *recruiting and retaining a highly trained workforce*, and *building critical partnerships*.

A. OVERVIEW HEALTH SERVICES RESEARCH

Denver Health's Health Services Research Division (DH HSR) is a division within the Department of Patient Safety and Quality. HSR implements and supports research serving the broad goals of identifying the most effective ways to organize, manage, and finance the delivery of health care services and assess the process and health outcomes of care in order to improve quality and reduce errors.

Research projects involving HSR personnel are supported primarily through grant and contract awards received from government agencies and private foundations. Present funding sources include the National Institutes of Health (NIH), the Agency for Healthcare Research and Quality (AHRQ), the Centers for Disease Control and Prevention (CDC), and the Center for Medicare and Medicaid Innovation (CMMI).

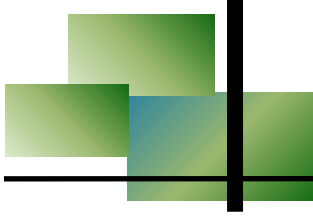
HSR in 2011 was comprised of 3.0 FTEs:

| | |
|--------------------------|--|
| Edward P. Havranek, MD | Director (0.2 FTE) |
| Susan L. Moore, MSPH | Assistant Director |
| M. Josh Durfee, MSPH | Research Project Coordinator (0.8 FTE) |
| Deborah J. Rinehart, PhD | Research Project Coordinator |

Within the Division, our research interests have four foci:

- Evaluation of health information technology
- Maternal/child health, particularly its interactions with substance abuse and violence
- Chronic disease management
- Causes and solutions to health disparities based on race/ethnicity

The Division also supports research activities in the organization across a diverse array of additional topics, including infection control, emergency preparedness, public health, and family planning.

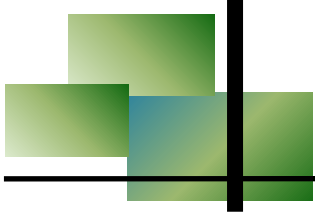


B. STRATEGIC OBJECTIVES

The activities of the Division of Health Services Research in 2011 supported four of Denver Health's eight strategic objectives:

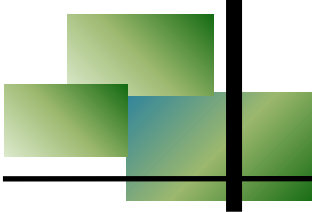
3. Recruit and retain a high quality workforce:

- Within DH HSR, there have been no personnel losses and there are no vacancies. One of the group's members, Deborah Rinehart, completed her PhD degree in health and behavioral sciences during 2011 and has decided to remain with Denver Health. This development is considered an important milestone in the evolution of DH HSR, putting us on a path to increase the number of principal investigators in the group and thus broaden the group's reach. Successfully integrating a new investigator will likely be assisted by creating opportunities for auxiliary appointments at the University of Colorado Denver. HSR also ensures that its members maintain current and develop new methodological skills and collaborative contacts in the field through supporting targeted training and conference opportunities. For example, DH HSR staff completed an advanced statistical methods program in propensity score analysis.
- More broadly, DH HSR has an important role in recruiting and retaining talented medical staff and physicians across the organization. Involvement with HSR can increase academic productivity and thus augment academic promotion and retention, can broaden funding support for faculty through successful grant awards, and can give staff the tools to analyze and change the organization of care within their departments. Equally as important, a cross-disciplinary enterprise like HSR can build professional social ties within the medical staff. Such ties are known to increase commitment and longevity within organizations. Activities during 2011 in this area include:
 - twice monthly meetings of a health services research interest group involving physicians from ambulatory internal medicine, family medicine, pediatrics, and obstetrics/gynecology. The purpose of the group is to critique and revise members' work in progress, particularly with regard to supporting research projects and grant applications,
 - focused assistance with the development and submission of grant applications. Examples in 2011 include:
 - collaboration with OB/GYN for the development and submission to the ACTION lead partner of a concept paper for an innovative program for inter-conception care for gestational diabetes;
 - collaboration with Nursing Research and Patient Safety and Quality nurses for the development and submission to AHRQ of a proposal for a fall risk reduction and fall prevention program;
 - collaboration with Infection Control for the development and submission to AHRQ of a proposal to reduce healthcare associated infections through an analysis of work system factors and of a proposal to CMMI for participation as an active partner in a hospital engagement network;
 - collaboration with Managed Care and Internal Medicine for the development and submission to AHRQ of a proposal to reduce hospital readmissions for Medicaid patients;
 - collaboration with eHS and Community Health Services for the development and submission to NIH and to the American Diabetes Association of two proposals to reduce disparities and improve the delivery of care through the use of technology in diabetes management.



- participating in mentorship plans for incoming junior faculty in public health and in rheumatology.
- 5. Identify and mature critical partnerships: DH HSR has expanded partnerships with four important networks of outside organizations during 2011:
 - ACTION (Accelerating Change and Transformation In Organizations and Networks) II: Denver Health is a collaborating organization within one of AHRQ's networks of provider organizations that conduct rapid-cycle field-based research. The ACTION II network program is designed to promote innovation in health care delivery by accelerating the diffusion of research into practice. Denver Health is a principal member of the network led by Intermountain Healthcare. The other principal members are Mayo Clinic, Providence Health & Services, Baylor Health System, Dartmouth-Hitchcock, the Colorado Health Outcomes center (COHO), and the Veterans Affairs Medical Centers in Denver and Salt Lake City. In 2011, Denver Health participated in a broad range of network-collaborative projects, with particular focus on infection control and shared decision making; further details are available in Appendix I (Grant Funding).
 - HVHC (High Value Health Collaborative): Denver Health is a founding member (along with The Dartmouth Institute/Dartmouth-Hitchcock, Mayo Clinic, Cleveland Clinic, and Intermountain) of the Collaborative, which expanded in late 2011 to include MaineHealth, Baylor Health Care System, Beaumont Hospitals, Providence Health & Services, Scott & White Health Care, Sutter, UCLA Health System, University of Iowa Health Care, and Virginia Mason Medical Center. The purpose of the collaborative is to compare processes and outcomes of care across institutions, to identify practices that reduce cost without reducing quality, and to spread those practices across institutions. Ongoing projects focus on hip and knee replacement surgery and on diabetes care. A project focused on heart failure is scheduled to begin in 2012.

Expertise in health services research is a key component of participation in the Collaborative, and DH HSR personnel are members of the Department of Patient Safety and Quality team working on the effort. Dr. Havranek represents Denver Health on the Collaborative's Operations Management Committee and its Scientific Review Board, and was recently selected to serve as co-chair of the Collaborative's heart failure project. Ms. Moore and Mr. Durfee assist the diabetes project.
 - University of Colorado affiliates: DH HSR collaborates on grant-funded projects with a wide variety of groups at the University of Colorado Anschutz Medical Campus and the University of Colorado Boulder Campus, and with affiliates at the Denver VA Medical Center and the Kaiser Permanente of Colorado Institute for Health Research. Growth and maintenance of these collaborative relationships will remain critical for successful future funding applications.
 - HIT Industry and Academic Partners: DH HSR collaborates on grant-funded projects with eHS and a number of private industry technology partners, which in 2011 included Siemens Healthcare, EMC Consulting, Microsoft Corporation, and local startup Access.Health, as well as an academic collaboration with the Center for Healthcare Informatics and Policy at Weill Cornell Medical College.
- 6. Maintain high quality patient care: DH HSR is probably under-utilized in the work towards achieving this objective. HSR groups in other integrated healthcare delivery systems (Kaiser Permanente is an excellent example) are largely externally-funded but play a role in the rigorous evaluation of internal programs and in the design of evidence-based interventions. DH HSR remains available to expand its internal role in program design and evaluation. Examples of some current efforts include:
 - Ms. Moore is assisting eHS as part of the Siemens-funded team in an ongoing project led by a contract research team from the Center for Healthcare Informatics and Policy at Weill Cornell Medical College to evaluate the impact of health IT at Denver Health.
 - Ms. Moore is assisting Community Health Services in an ongoing AHRQ-funded ARRA grant led by Dr. Henry Fischer as Principal Investigator, the purpose of which is to expand data capacity for research and services to



improve targeted and personalized outreach to complex patients with comorbid chronic diseases. In 2011, she worked with the project team to manage the ongoing project and to identify and enroll a cohort of patients in an ongoing pilot study to demonstrate feasibility and usefulness of the new services under the expanded infrastructure.

- Mr. Durfee and Dr. Rinehart have assisted DH Managed Care in an ongoing Colorado Health Foundation Grant. Starting in 2011, they identified a cohort of patients newly diagnosed for depression or newly prescribed SSRI medications. A baseline of hospitalizations and ED visits and several clinical outcomes such as A1c and LDL levels were determined. They continue to track this cohort for changes by time and according to location to identify potential differences in quality between the integrated care clinics and the non-integrated clinics.
- Dr. Rinehart is assisting Denver Public Health with analyses and research support in the area of maternal and child health including analyses on fetal-infant mortality rates, participating in a workgroup identifying rates and feasible interventions to reduce alcohol-exposed pregnancies, and identifying funding and research needs of community based organizations targeting teen dating violence. She is also working across DH departments to identify needs related to child abuse prevention and other violence and injury research.

8. *Participate in and capitalize on health reform*: DH HSR participated in the submission of Denver Health's Health Care Innovations Challenge application to the Center for Medicare and Medicaid Innovation (CMMI). The group provided background and preliminary data, content, critical review of content, and administrative assistance. This participation grew out of DH HSR's longstanding engagement with Dr. Tracy Johnson, the CEO's special assistant for health reform.

C. HSR 2011 GRANT AND CONTRACT FUNDING (CONTINUING, NEW, AND PENDING)

1. Continuing

Using Nursing Home Antibiograms to Improve Antibiotic Prescribing and Delivery

DH PI: Thomas D. MacKenzie, MD

Partners: Denver Health, University of Maryland School of Medicine

Period: July 26, 2010 – July 25, 2012

Sponsor: AHRQ ACTION Contract No. HHS290200600020, Task Order No. 9

HSR: Susan Moore (10% FTE, through 12/11); Josh Durfee (10% FTE, 1/12-7/12)

The overall objectives of this project are: (1) to determine antibiotic susceptibility patterns for bacteria isolated in clinical cultures from nursing home (NH) residents and generate NH-specific antibiograms; and (2) to develop a toolkit that will aid NHs and affiliated laboratories in creating and maintaining NH-specific antibiograms. (3) to assess whether NH-specific antibiograms can be implemented for use both within the facility and transmitted to local EDs to impact the empiric management of presumed bacterial infections in NH residents.

Expanding CER Capability through Complex Patient Relationship Management

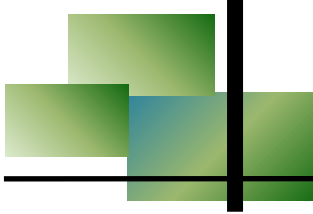
DH PI: Henry H. Fischer, MD

Period: August 1, 2010 – July 31, 2012

Sponsor: AHRQ ARRA grant 1R24HS019453-01

HSR: Susan Moore (40% FTE); Josh Durfee (15% FTE)

This project proposes to build data capacity for research by integrating the PRM solution into Denver Health's administrative and clinical data warehouse. This will not only better support targeted and personalized outreach to



complex patients with comorbid chronic diseases such as mental health disorders, HIV, and cardiovascular disorders, but will also facilitate comparative effectiveness research in a healthcare system serving a large, diverse metropolitan population. A pilot research study will be conducted to demonstrate the feasibility and usefulness of the expanded PRM infrastructure by: 1) utilizing linked pharmacy and laboratory data to assist provider outreach to diabetic patients; 2) offering frequent personalized self-management support to diabetic patients through text messaging and collecting patient-reported data such as home weights and step counts; 3) supporting the collection of PHQ-9 depression screen data from at-risk, non-adherent diabetic patients.

A Model for Enhancing Throughput at Division of the Strategic National Stockpile (DSNS) Points of Dispensing (POD) Sites via use of Telehealth Technologies

DH PI: Gregory M Bogdan, PhD
Period: September 15, 2010 – March 14, 2012
Sponsor: AHRQ ACTION Contract No. HHS290200600020, Task Order No. 10
HSR: Susan Moore (40% FTE)

The intent of this project is to develop, implement and test a model to apply telehealth technologies as a tool to enhance the medical screening process at Points of Dispensing (PODs) in response to an anthrax attack. Using protocols and algorithms developed for an anthrax scenario, and taking appropriate social and cultural factors into account, the model shall provide an example to health departments of how to establish linkages to telehealth providers, to identify symptoms and provide medical advice for the population in the affected area that requires prophylaxis. The model should build upon and augment materials currently available from AHRQ and other trusted sources to support the efforts of medical countermeasure dispensing.

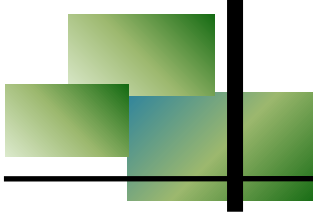
Comparative Effectiveness of Health Care Delivery Systems for American Indian and Alaska Natives Using Enhanced Data Infrastructure

DH PI: Edward P. Havranek, MD
Partners: Denver Health, University of Colorado Denver (CAIANH)
Period: September 27, 2010 – September 26, 2012
Sponsor: ACTION Contract No. HHS290200600020, Task Order No. 11
HSR: Edward Havranek (2.5% FTE); Josh Durfee (10% FTE)

The purpose of this task order is to support the development of data infrastructure that will accelerate comparative effectiveness research (CER) for the American Indian/Alaska Native (AI/AN) population and to support efforts to prioritize health system delivery strategies through comparative effectiveness research for chronic disease management. The goals of this task order are to use electronic clinical data from the IHS national health information system (RPMS - Resource and Patient Management System) to enhance the capacity to electronically measure quality of care consistent with national HIT standards and to conduct comparative analysis that will identify health care delivery approaches within the Indian Health System that result in improved health outcomes. The organizational data store created in this project should serve as a long term source of data capable of supporting future comparative effectiveness and other longitudinal studies.

Evaluating School-Based Influenza Vaccination Programs that Bill Health Insurance

DH PI: Judith Shlay, MD
Partners: Denver Health, Denver Public Schools, University of Colorado (Children's Outcomes Research Program and Colorado Health Outcomes Program)
Period: September 1, 2008 – December 31, 2011



Sponsor: Centers for Disease Control and Prevention #1 U01 IP000199-01
HSR: Debbie Rinehart (20% FTE)

The purpose of this study is to: (1) implement a school-based influenza vaccination program in collaboration with a partner who bills third parties; (2) evaluate the feasibility of providing influenza vaccination services in the school setting; (3) evaluate the feasibility of billing health insurance plans for reimbursement of school-based influenza vaccination services for insured students; (4) determine the cost of conducting school-based influenza vaccination activities; (5) evaluate the acceptability of school-based influenza activities from the perspectives of parents and examine factors associated with actually receiving influenza vaccinations at school; and (6) compare influenza vaccination rates in intervention schools with control schools that are not involved in the intervention.

Examination of the Feasibility of Obtaining 3rd Party Payer Reimbursements for Adolescent Vaccination in the School Setting

DH PI: Judith Shlay, MD
Partners: Denver Health, Denver Public Schools, University of Colorado (Children's Outcomes Research Program and Colorado Health Outcomes Program)
Period: September 1, 2008 – December 31, 2011
Sponsor: Centers for Disease Control and Prevention #1 U01 IP000196-01
HSR: Debbie Rinehart (30% FTE)

The purpose of this project is to: (1) implement a school-based vaccination program in collaboration with a partner who bills third parties; (2) evaluate the feasibility of providing adolescent vaccination services in the school setting; (3) evaluate the feasibility of billing health insurance plans for reimbursement of school-based vaccination services for insured students; (4) determine the cost of conducting school-based adolescent vaccination activities; (5) evaluate the acceptability of school-based vaccination activities from the perspectives of parents and examine factors associated with actually receiving adolescent vaccinations at school; and (6) compare adolescent vaccination rates in intervention schools with control schools that are not involved in the intervention.

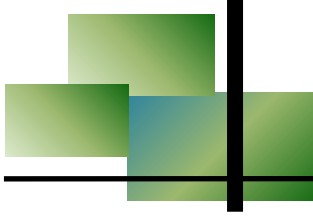
Integration of Family Planning Services into a STD Clinic Setting

DH PI: Judith Shlay, MD
Partners: N/A
Period: September 1, 2008 – August 31, 2011
Sponsor: Office of Population Affairs
HSR: Debbie Rinehart (7% FTE)

This study will investigate how providing integrated family planning with sexually transmitted disease (STD) clinical services in the Denver STD clinic affects quality of care, cost of services, staff duties, clinic flow, clients' family planning needs, satisfaction with services, and incidence rates of STDs and pregnancies. In addition, the findings will address the feasibility of replicating such integration approaches more broadly in STD clinics.

Power in Drug Use and HIV Risk Behavior Among Non-Injection Methamphetamine Using Women

DH PI: Deborah Rinehart, MA
Partners: University of Colorado
Period: May 15, 2009 – April 30, 2011
Sponsor: NIDA (R21 award)
HSR: Debbie Rinehart (20% FTE)



With the increase of HIV infection among women and the prevalence of high risk sex behaviors among methamphetamine (MA) using women, researchers must strive to better understand contextual issues that impact risk behaviors among this population. Through using mixed methods, this study proposes to operationalize and develop a scale to assess power issues for this population on four levels: structural, cultural, interpersonal and individual. Future research would include validating this scale among other subpopulations and using information from the study to develop an HIV prevention intervention founded on multi-level theory of power that could be tested in a larger clinical control trial.

The Association between Providers' Ethnic/Racial Biases and Hypertension Control.

DH PI: Edward Havranek, MD

Partners: University of Colorado (Principal Investigator, Irene Blair PhD). Kaiser Permanente of Colorado

Period: June 1, 2008 – May 31, 2012

Sponsor: NHLBI (R01 award)

HSR: Edward Havranek, MD (5% FTE)

This project investigates physicians' implicit racial and ethnic attitudes and their relationship to patient's trust in their physician, to their adherence with medication, and to their blood pressure control.

An Intervention to Reduce the Effect of Racial and Ethnic Bias in Hypertension Care.

DH PI: Edward Havranek, MD (Principal Investigator)

Partners: University of Colorado, Kaiser Permanente of Colorado, Stanford University

Period: September 1, 2009 – May 31, 2012

Sponsor: NHLBI (R21 award)

HSR: Edward Havranek, MD (10% FTE)

This project tests the effect of a novel intervention (a written values-affirmation exercise) on patient-provider interaction and subsequent patient self-care behavior.

2. New

A Hospital Engagement Network (HEN) with Intermountain and Collaborating Affinity Partners in Support of the Partnership for Patients

DH PI: Connie Savor Price, MD

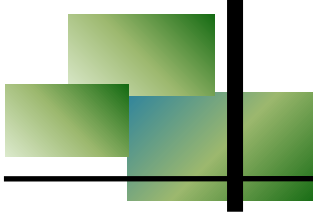
Partners: Intermountain Healthcare, Denver Health, Baylor Health Care System, Dartmouth-Hitchcock, Mayo Clinic, Providence Health & Services, Salt Lake City VA Medical Center

Period: September 28, 2011 – September 27, 2014

Sponsor: Intermountain Healthcare, with funding from CMS/CMMI

HSR: Susan Moore (2% FTE)

The purpose of this network collaborative project is to engage hospitals around the country in accomplishing coordinated and systematic improvements in patient safety that result in better care, more affordable care, and healthier people and communities. Initiatives will be led in 10 areas of safety improvement focus (ADEs, CLABSI, SSI, VTE, VAP, CAUTI, patient falls/immobility, OB trauma, pressure injuries, and preventable readmissions), with a goal of achieving 40% reduction in preventable healthcare acquired conditions and 20% reduction in 30-day readmissions over the next 3 years through shared learning and training in best practices.



3. Pending

LUCHAR-Mobile: User-Informed Design of Mobile Consumer Health Information Technology

DH PI: Edward P. Havranek, MD
Partners: University of Colorado Denver
Period: 07/01/2012 - 06/30/2017
Sponsor: University of Colorado Denver, with funding from AHRQ
HSR: Ed Havranek (5% FTE); Susan Moore (50% FTE)

This project will inform the development of consumer health information technologies (CHIT) – particularly mobile technologies – to help low-income Latino patients with cardiovascular disease (CVD) improve medication and lifestyle self-management. It will begin by developing an understanding of existing CVD self-management and personal health information management (PHIM) challenges and strategies. Based on this foundation, it will explore how to develop CHIT that is concordant with the culture and lifestyles of target users. Lessons learned will be synthesized into guidelines for CHIT developers. This process will address major gaps in our understanding of how to ameliorate a major cause of morbidity and mortality (non-adherence to CVD care) in a high-priority patient population.

Establishing a Framework for Research in Shared Decision Making (SDM)

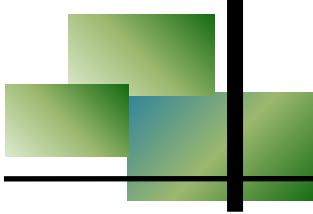
DH PI: Edward P. Havranek, MD
Partners: Baylor Health Care System, Mayo Clinic, Providence Health & Services, Intermountain Healthcare, Dartmouth-Hitchcock, Salt Lake City VAMC
Period: 06/01/2012 - 05/31/2014
Sponsor: Baylor Health Care System, with funding from PCORI
HSR: Ed Havranek (5% FTE); Josh Durfee (25% FTE)

This project involves a collaboration of seven health care systems to establish a framework for research in shared decision making (SDM). The Specific Aims of the proposal are: 1) To establish a frame of reference for the conduct of an environmental scan of SDM practices across seven health care delivery sites; 2) To conduct an environmental scan across seven health care systems to understand health care providers' perceptions of SDM and to gain an overview of SDM practices; and 3) To summarize and disseminate scan results while articulating the patient experience with SDM.

Care+ and Collaborative Care Circles: Coordinating Communities of Care with Novel Connected Health Devices

DH PI: Andrew W. Steele, MD, MPH, MSc
Partners: access.health
Period: 07/01/2012 - 06/30/2014
Sponsor: access.health, with funding from NIH (NIBIB)
HSR: Susan Moore (15% FTE in year 1, 20% FTE in year 2)

This project proposes to develop and assess the efficacy and effectiveness of low-cost, intuitive connected health devices, with associated secure, tiered messaging, in an urban safety net population prone to health disparities by creating and piloting a scalable, affordable, culturally acceptable, and sustainable technology-based solution for engaging patients and families in the ongoing treatment of chronic disease.



Using Health IT in Practice Redesign: Impact of Health IT on Workflow

DH PI: Edward P. Havranek, MD
Partners: Intermountain Healthcare, Baylor Health Care System, Salt Lake City VAMC, Dartmouth Medical School
Period: 05/01/2012 - 12/31/2014
Sponsor: Intermountain Healthcare, with funding from AHRQ
HSR: Ed Havranek (10% FTE), Susan Moore (25% FTE), Josh Durfee (10% FTE, year 2)

This project proposes to study the effect on workflow of a tailored clinical decision support instrument for hypertension care designed to meet the cognitive demands of use during a patient-provider visit. A preliminary tool will be subjected to testing and iterative improvement in a human factors laboratory setting, modified to interface with the IT environment at ten study sites, then analyzed in approximately 250 patient-provider visits to assess effect on visit workflow. Our overall hypothesis is that tailoring a clinical decision support instrument for integration into a patient visit improves patient-provider information transfer at an acceptable cost in lengthened visit to patient and provider.

D. PUBLICATIONS

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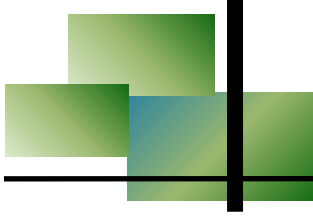
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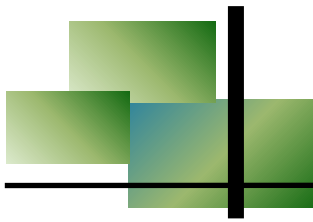
Young H, **Moore SL**, Savitz LA, Price CS, Biffi WL. "Surgeons' Acceptance of Surgical Site Infection Risk Adjustment Models." 1 – 4 April 2011. Poster presentation at the Society for Healthcare Epidemiology of America (SHEA), Dallas, TX.

Fischer HH, **Moore SL**, Ginosar D, Rice-Peterson C, **Durfee MJ**, Berschling JD, MacKenzie TD, Estacio RO, Steele AW. "Promoting chronic disease management through mobile technology." 4-7 May 2011. Poster presentation at 34th SGIM Annual Meeting, Phoenix, AZ.

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Fischer HH, **Moore SL**, Ginosar D, Rice-Peterson C, **Durfee MJ**, Berschling JD, MacKenzie TD, Estacio RO, Steele AW. "Promoting chronic disease management through mobile technology." 18-21 September 2011. Poster presentation at AHRQ 2011 Annual Conference, Bethesda, MD.



X. UTILIZATION MANAGEMENT 2011 ANNUAL REPORT

The Utilization Management (UM) department has 15 RN FTE's and 1 FTE Business Analyst. All inpatient service lines of business are covered by a dedicated UMRN and the outpatient areas such as ED, and the OB Screening room has at least some UM oversight. The coverage of 24/7 in the ED is still a challenge yet the recruitment efforts continue.

The Out Of County initiative spearheaded by Dr. Joel Hirsh continued to gain traction in 2011. The UM department was involved from the beginning and worked to develop the automated reports that are now being used on a daily basis. A dedicated 1.0 FTE was appropriated for the OOC project and the position was officially filled in June, 2011. 1.0 FTE Clerical Support was authorized for FY 2012 for the purpose of collecting multiple data sets going forward to better understand the patient origination and reason for coming to Denver Health if for other than emergency care. Recruiting for that position will commence in early 2012.

The department experienced one retirement, one resignation and one extended FMLA in 2011. The culmination of these staffing changes left staffing the department in a precarious position for nearly 4 months, but late year recruiting efforts paid off and we will be fully staffed again by the 2nd quarter of 2012.

A. UTILIZATION MANAGEMENT (UM GOALS AND OUTCOMES IN 2011)

1. Continue to develop partnership with Enrollment and Admissions:

- a. To expedite patient financial information in order to capitalize on reimbursement
- b. Enroll patients in programs prior to discharge
- c. Identify accurate demographics that facilitate appropriate follow-up for OOC patients.

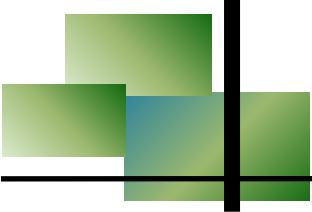
Multiple successful RIEs over the past year warranted the Patient Access department as well as Enrollment and UM to work together and understand the inter-dependability among the departments to achieve success. The Revenue Cycle stakeholders worked together to define a common language of what is actually needed "up front" in order to assure payment at the time of discharge.

2. Obtain granular information regarding denials.

This particular goal continues to remain elusive even after 4 years. We simply do not have the software to isolate a reason for denial based on UM failing to contact the Payor per contract. Out of a 4th Quarter RIE focusing on denials, an official UM Authorization code was created. That code will be applied to each patient account where a UM authorization was obtained. It is still work in progress but brings us closer to a solution than have had in the past.

3. Continue to work on and report the accuracy of appropriate admission status.

Collaboratively working with the departments of HIM, Patient Accounts, Admissions, and Legal, UM has identified several points of failure starting at the time of admission including Inpatient vs. Observation designation through and including discharge. A significant improvement has been accomplished, by doing a post discharge review of all Medicare and Medicaid patients for appropriateness of patient admission status. If a patient is found to not meet Inpatient status at the time of discharge, PA is notified and the bill is not dropped as an inpatient stay. This review process is referred to internally as the "Mousetrap" and



addresses all Medicare and Medicaid one day, same day and retro review patients with a one day or same day stay.

4. Better define the UM role in the OOC (Out of County) initiative.

The OOC initiative has been an area of great improvement and innovation. Starting with a committed 1.0 FTE, there is now meaningful data and reports, standard of work and a blueprint of what is a more efficient repository of patient information for identification, notification and clinic follow-up process. This will continue to grow and develop and will be carried over to a 2012 goal as well.

5. Participate meaningfully in the RAC audit.

The RAC audit activity has not yet been started in Colorado; however, there have been numerous other audits that emulate a RAC audit and the UM department has been fully engaged in the process.

6. Provide 24/7 coverage in the ED

Recruitment efforts continue. Currently, the ED is covered 7 days a week, 10 hours a day.

7. Support the PES to ultimately reduce denials.

Through a 2-P LEAN event in preparation for a Behavioral Health Value Stream RIE, we were able to articulate and write standard work that ultimately defines how to avoid administrative denials by meeting the requirements for getting reimbursed for Behavioral Health services. The entire process was finished but the results won't likely be seen until 1st quarter, 2012.

8. Continue education efforts in clinics and the OR re: ambulatory surgical cases appropriately discharged from the PACU. Provide immediate feedback to the areas involved.

Intermittent positive results. This requires constant monitoring and will be a goal carried into 2012

9. Clearly define meaningful and equitable productivity measures for all UMRNs.

A carry over goal in 2012. There is no real good information, even from UHC, that defines a productivity measure.

10. Increase staff UM participation in LEAN events

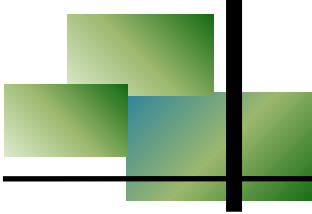
Five (5) LEAN events were attended by UM staff in 2011 with hopes have having even more participation next year.

11. Evaluate the ROI of multiple monthly audits collected by UM.

Routine audits were discontinued in lieu of other data collection that took precedent. The most significant audit done in 2011 was done in the ED. The UMRNs reviewed every patient with telemetry ordered measuring appropriate use against Denver Health telemetry protocols. Dr. Aaron Eberhardt provided feedback to the physicians who fall outside of established protocols.

12. Continue to try to understand and improve DH standing in the Action OI report.

The UM Director continued to work with the Finance department to compare the UM department with other UHC UM departments. The findings lead DH to change some of our formula, which has moved us to the yellow category. There is a plan to review this with Finance again in the 2nd quarter, 2012.



13. Standardize the Managed Care Transfer/Admission flow

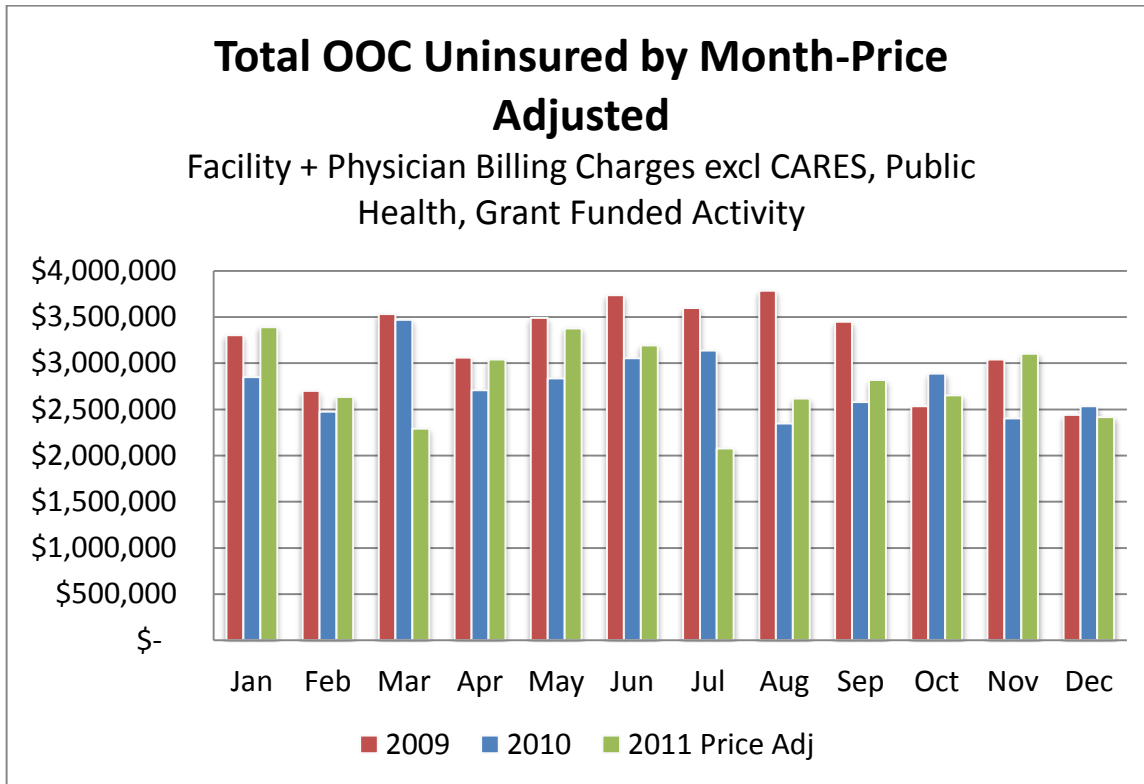
The Directors of Patient Flow, Managed Care and Utilization Management developed standard work that expedites the transfer of DH Managed Care patients to Denver Health from outside facilities. It is near fool proof but continues to be monitored.

14. Identify accurate demographics that facilitate appropriate follow-up for OOC patients

CHC (Community Health Clinic) Referrals: OOC UMRN has archived Community Health Clinic referrals over the past year identifying which OOC Patients have received follow-up care. The information displayed below addresses some of the OOC initiative successes.

(Metrics provided by Dr. Joel Hirsh)

I. 2011 OOC financials

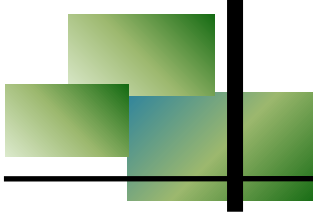


Adjusted facility charges for 2011 were \$29.5m. This is 0.6% higher than 2010. Total adjusted charges for 2011 were \$33.6m. This is a 1.0% increase from 2010.

II. CHC partnerships

96 OOC hospital discharges in 2011 left DH with a scheduled appointment at a community health center in their home county.

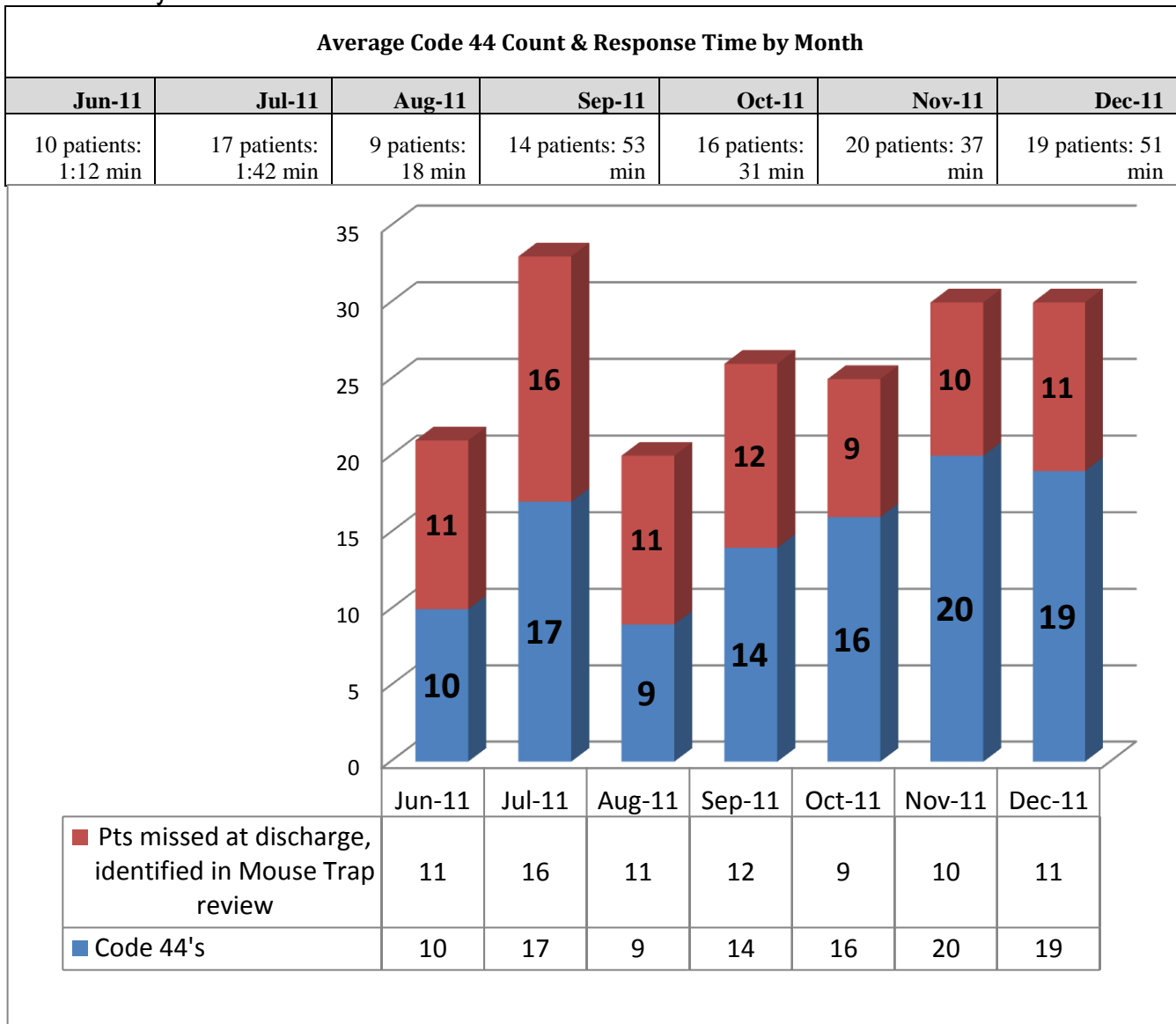
| | |
|----------|----|
| Clinica | 21 |
| Grace | 15 |
| MCPN | 52 |
| Salud-CC | 8 |

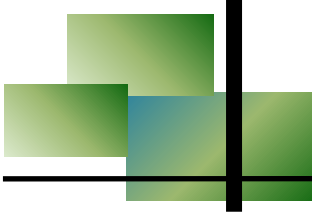


B. UTILIZATION MANAGEMENT LEAN ACTIVITIES 2011

- The UM Department has one Black Belt
- 1st Floor VSA-Jan 2011
- NICU surge Capacity RIE- July 2011
- BHS denial planning- Sept 2011
- BH VSA Consultant- Oct 2011
- Transfer Center RPE Consultant- Oct 2011
- Revenue Cycle RIE: Managing Facility denials- Oct 2011
- Revenue Cycle RPE: BHS denials- Nov 2011

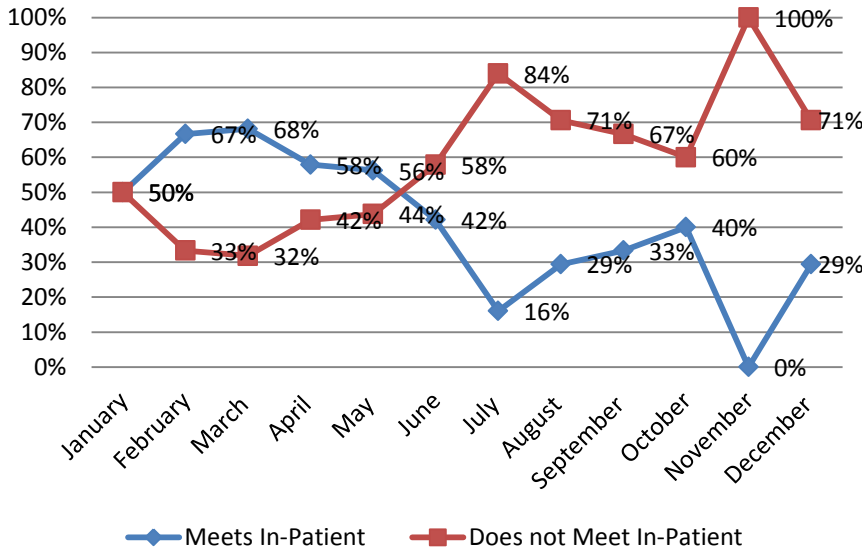
UM Monthly Metrics: June-December 2011





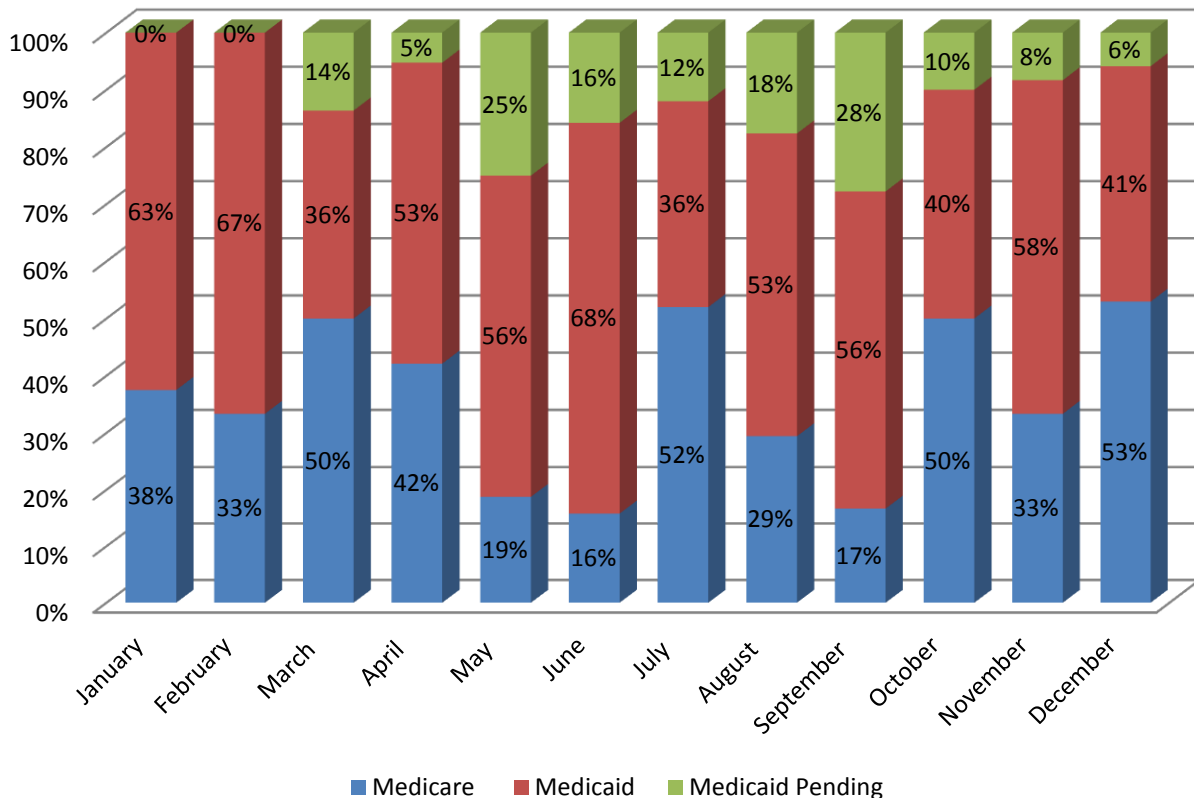
Discharged Same Day January - December 2011

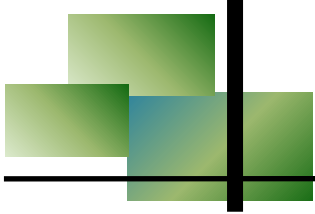
Pt's d/c Same Day by Criteria



| Month | Pts. per month |
|-----------|----------------|
| January | 8 |
| February | 12 |
| March | 22 |
| April | 19 |
| May | 16 |
| June | 19 |
| July | 25 |
| August | 17 |
| September | 18 |
| October | 10 |
| November | 12 |
| December | 17 |

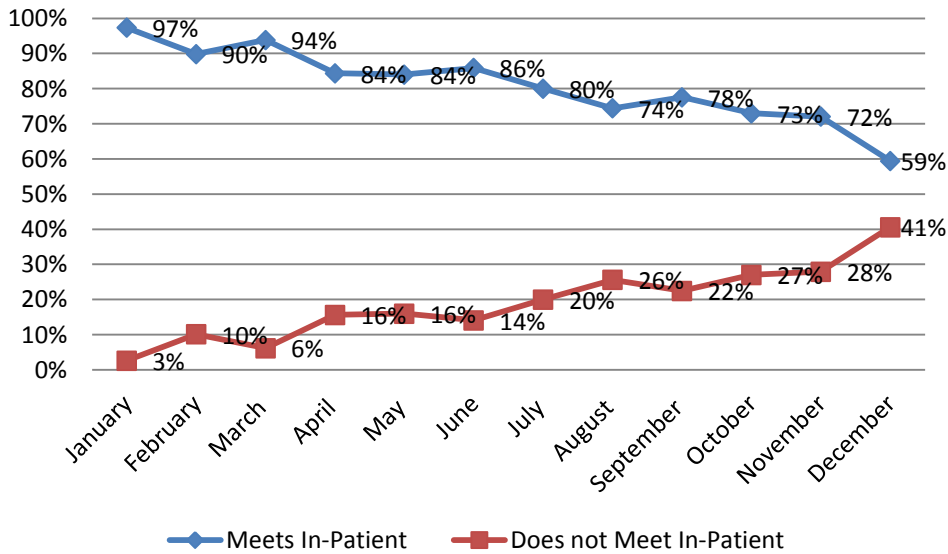
Pt's d/c Same day by Insurance





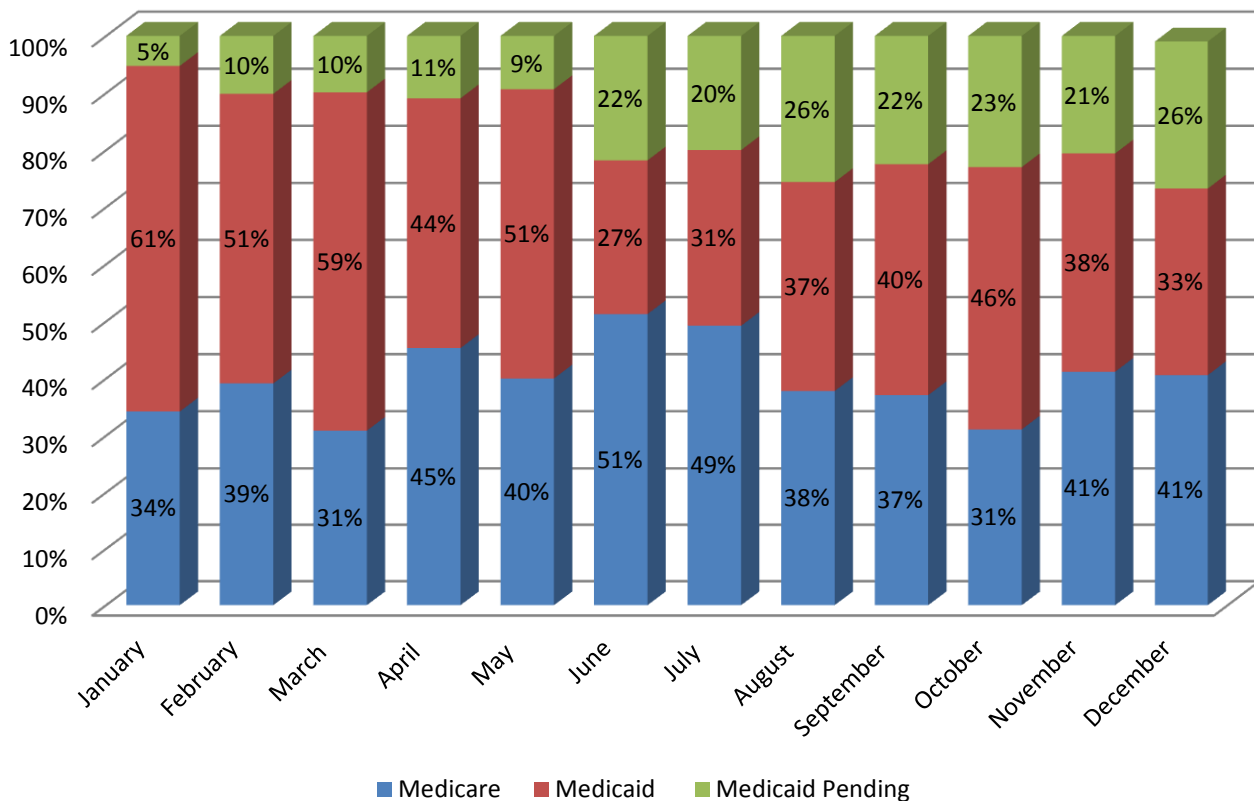
Discharge Following Day January - December 2011

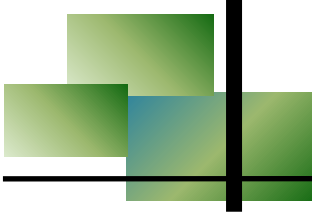
Pt's d/c Following day by Criteria



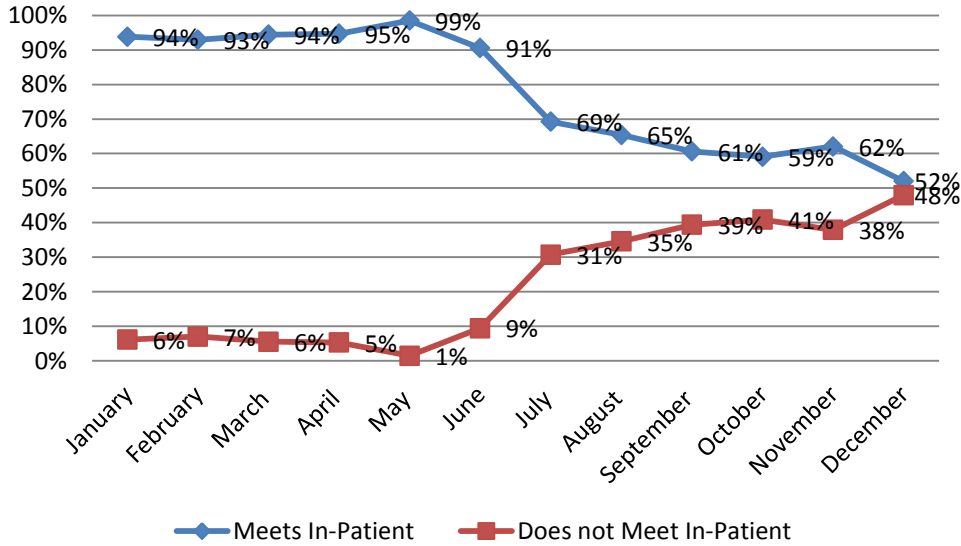
| Month | Pts. per month |
|-----------|----------------|
| January | 38 |
| February | 69 |
| March | 81 |
| April | 64 |
| May | 75 |
| June | 78 |
| July | 65 |
| August | 82 |
| September | 89 |
| October | 74 |
| November | 68 |
| December | 101 |

Pt's d/c Following day by Insurance



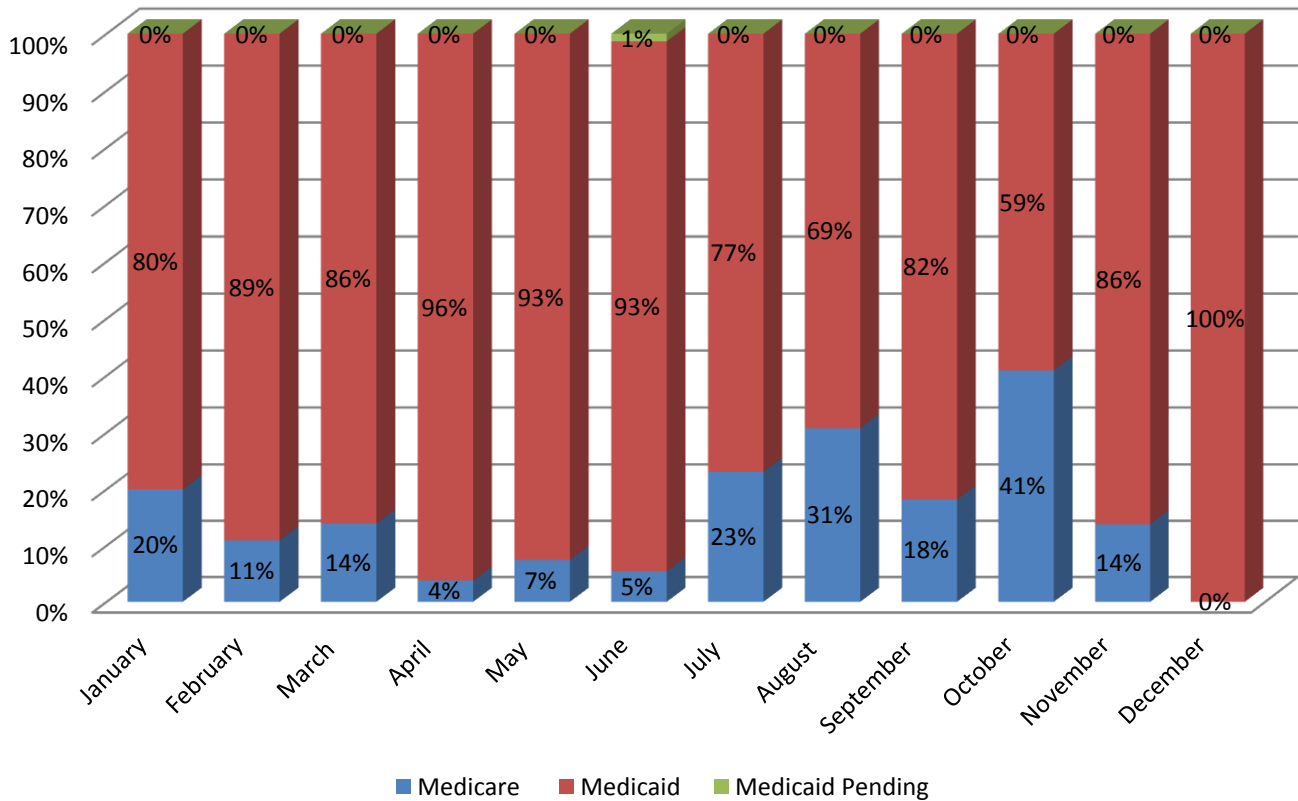


Pt's Retro reviewed by Criteria



| Month | Pts. per month |
|--------------|----------------|
| January | 65 |
| February | 128 |
| March | 72 |
| April | 132 |
| May | 67 |
| June | 74 |
| July | 39 |
| August | 26 |
| September | 33 |
| October | 22 |
| November | 29 |
| December | 25 |
| Total | 712 |

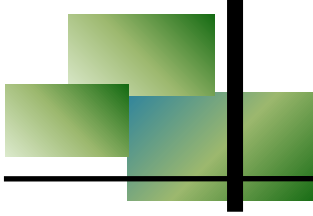
Pt's Retro reviewed by Insurance



- 3 new employees joined the team: 2 RNs 1 Business Analyst
- A new Physician Advisor was appointed
- The “mousetrap” became more effective and transparent as a reporting tool.
- Reviewed/ revised the ESRD Guidelines with Dr. Stu Linas
- Enhanced the bandwidth of the OOC initiative to 1 FTE, twice daily automated reports and creating standard work.
- Changed the standard admission orders to include the capability of the admitting MD in the ED indicate that the patient is going to the OR, but without having to writing orders for an inpatient stay. Also participated with the surgery clinics to revise their “score package” so as NOT to pre-write admission orders unless otherwise identified as acceptable cases by CMS guidelines.
- Developed the “official” UM review note that will be archived in an identified file in EDM for ease of access for all to use for appeals, audits, information etc.
- Participated in successful Joint Commission and CMS surveys.
- Participated in creating standard work for providing care to patients undergoing renal biopsies in the CTU vs. being admitted to a bed in the inpatient area.
- Participated in data retrieval to support the need to create a Vascular Access Team. (That was partially funded and will be created in early 2012.
- Participate in the Multidepartment effort to open the CTU February 2011.
- Co-authored an article submitted for publication describing the outcomes of the Complex Discharge Committee.

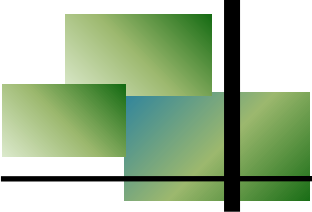
D. UTILIZATION MANAGEMENT GOALS 2012

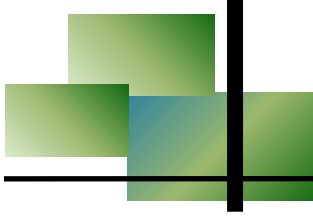
1. Define productivity measures for all UM nurses.
2. Create a meaningful presence in the surgical clinics in an effort to minimize the errors caused by inappropriately writing admission orders prior to surgery, except where authorized by CMS.
3. Along with the UM Physician Advisor, schedule meetings with all physicians with admitting privilege to provide continual education on the MD role as it pertains to upholding CMS regulations.
4. Work with the Physician director responsible for Out of County service to achieve meaningful success through the efforts of the OOC UMRN as well as the clerical support staff.
5. Schedule two (2) days of on-sight Milliman education days that all RNs will attend.
6. Re-configure reports using weekly data from the 10 day report and Complex Discharge Committee.



XI. PUBLICATIONS (manuscripts compiled from all sections)

1. Biffi WL, Beno M, Goodman P, Bahia A, Sabel A, Snow K, Steele AQ, Swartwood C, Thienelt C, MacKenzie T, and Mehler PS. "Leaning" the Process of Venous Thromboembolism Prophylaxis. *The Joint Commission Journal on Quality and Patient Safety*. 2011 Mar; 37(3):99-109.
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15. Mehler PS. Caring for the Medically-Sickest Patients with Anorexia Nervosa. *Up To Date*, 2011.
16. Mehler PS. Medical Complications of Anorexia Nervosa. *Up To Date*, 2011.
17. Mehler PS. Refeeding the Patient with Anorexia Nervosa; Avoiding the Refeeding Syndrome. *Up To Date*, 2011.
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