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DCH Health System Antimicrobial Stewardship Program

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Section: Program Description

By improving antimicrobial use, antimicrobial stewardship programs confer multiple benefits to health systems and patients. These benefits include improved patient outcomes, improvements in pathogen susceptibility to antimicrobials, and decreases in adverse events related to antimicrobial use.[1] In addition, regulatory bodies are developing and implementing new antimicrobial stewardship requirements for providers. For example, The Joint Commission has established the new antimicrobial stewardship standard MM.09.01.01, which went into effect January 2017 for hospitals, critical access hospitals, and nursing care centers.[2]

Resources for starting and developing an antimicrobial stewardship program (ASP) have proliferated in recent years from various organizations. Noteworthy resources are offered from Infectious Diseases Society of America (IDSA)[1], The Centers for Disease Control and Prevention (CDC)[3], and from The Joint Commission.[2] The ASP at DCH Health System in Tuscaloosa, which formally started in January 2009, has employed many of the strategies cited in these resources. This article will describe the development and progression of the ASP at DCH, as well as results of the program and remaining challenges.

The ASP at DCH started small and only at the largest hospital in the DCH system, DCH Regional Medical Center, which typically has an inpatient census of 300-350 patients. DCH Health System already had certain basic ASP activities in place such as an intravenous (IV) to oral (PO) conversion program, pharmacokinetics program, and pharmacist-run renal dosing program. Late in 2008, Albert White, MD, FACP, Infectious Diseases (ID) physician at DCH, and Stephen Eure, RPh, BCPS, Critical Care Clinical Pharmacist, successfully lobbied for establishment of a formal ASP. The program kicked off in January 2009 with a letter to the medical staff and notices displayed on an electronic bulletin board in the medical staff lounge. Personal conversations were also held with certain key medical staff members to increase awareness. Both the electronic bulletin board and personal conversations with targeted medical staff members remain important educational methods for specific ASP initiatives.

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The primary activity of the ASP consists of daily prospective audits of patients on antimicrobials and feedback to the prescriber. No formal restriction or pre-authorization programs are used. A daily report is generated which includes all patients receiving systemic antimicrobials and antifungals. The list is screened daily by the ASP pharmacist for certain obvious misuse issues such as unnecessary duplication of coverage, excessive length of therapy, and overuse of targeted agents. The ID physician and critical care pharmacist meet three times per week to discuss challenging patients. Prescribers are contacted when opportunities for improvement are identified. Each ASP recommendation includes a clinical rationale to help permanently impact prescribing habits. During the first year of the program, more than $400,000 in cost savings in antimicrobial purchases was achieved, which opened the door to establishing a full time ASP pharmacist position. DCH also supported additional training for the ASP pharmacist by funding both the basic and advanced ASP certificate-based programs provided by the organization MAD-ID (Making a Difference in Infectious Diseases).

Prospective audit and feedback continues as the core activity of the DCH ASP, with over 300 ASP patient-specific interventions implemented each quarter. In addition, the program has grown to include many other activities, such as:

- Interdisciplinary involvement: The ASP coordinates activities with the microbiology lab, infection prevention department, information technology department, and others
- Expansion of the ASP to additional clinical pharmacists and two smaller hospitals in the DCH system. Targeted training and education has been carried out for pharmacists involved in ASP activities at these hospitals
- Development of annual ASP initiatives, usually as part of PGY1 pharmacy residency research
- Developing and maintaining intensive care unit specific antibiograms which are posted annually
- Involvement in developing ID treatment order sets
- Implementation of a data mining software application. This project, which is partially implemented, helps to efficiently identify opportunities for antimicrobial use improvements in specific patients. The application provides custom alerts for certain microbiology results and antimicrobial use events. DCH also plans to use the software to participate in the CDC sponsored antimicrobial use reporting option
- Semiannual ASP reports are presented to the Pharmacy and Therapeutics Committee and to the Infection Prevention Committee. These reports include ASP activities and metrics such as antibiotic use in days of therapy per 1000 adjusted inpatient days (DOT), and long-term pathogen susceptibility trends
- Implementation of rapid diagnostics in coordination with the ASP: In 2016, a rapid test which identifies Staphylococcal species in positive blood cultures was implemented. Once blood cultures become positive, this technology identifies the isolate as MRSA, MSSA, or coagulase negative Staphylococci within one hour. In early 2017, procalcitonin testing was implemented. This biomarker, which is specific for bacterial infections, can help facilitate earlier narrowing and discontinuation of antimicrobials. More rapid diagnostic tests are planned and will be closely coordinated with the ASP in order to achieve maximum impact and minimize waste

Results of the ASP at DCH have been significant from both antimicrobial use and pathogen susceptibility standpoints. At DCH Regional Medical Center, use of the MRSA agents linezolid and daptomycin has decreased to less than 2 days of therapy (DOT)/1000 inpatient days. Vancomycin remains the first line MRSA antimicrobial and the average course has decreased from 8.5 days in 2010 to 4 days in 2016. Clindamycin and levofloxacin use has decreased by over 50% and ceftriaxone use has decreased by 30%. Based on the local antibiogram, susceptibilities of typical pathogens has been stable over the eight years of the ASP and in the case of *Pseudomonas aeruginosa*, there has been improvement in susceptibilities.

Remaining Challenges with the DCH ASP:

- There is no formal CDC endorsed “antibiotic time-out” (reassessment of empiric regimens at day 2-3), so some courses remain broad longer than desired.

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- Lack of a formal antimicrobial restriction policy probably results in higher use of agents such as meropenem.
- Disease state order sets are not sufficiently used by the medical staff, resulting in empiric therapy which is often too broad or too narrow.

A major factor in the success of the DCH ASP is administrative resource commitment to both a physician and full-time pharmacist leader. Identification of specific prescribers with suboptimal antimicrobial use patterns can be achieved quickly with this level of resource commitment. Provision of feedback and education to those prescribers by either the ID physician, ASP pharmacist, or both has resulted in improved antimicrobial use. The ASP at DCH Health System looks forward to further improving antimicrobial use with full implementation of data mining software and alerts and with the expansion of rapid diagnostic tools.

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Delafloxacin for Acute Bacterial Skin and Skin Structure Infections

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Submitted: July 26, 2017; Accepted August 2, 2017
Section: Review

On June 19th, 2017, the FDA's approval of delafloxacin (*Baxdela*®), a fluoroquinolone antibiotic for the treatment of acute bacterial skin and skin structure infections (ABSSSI), marked the end of a 2-year drought of new antibiotics reaching the U.S. prescription drug market. Delafloxacin earned the status of Qualified Infectious Disease Product (QIDP), a distinction created by the Generating Antibiotics Incentives Now (GAIN) law created in 2012, which allowed for an expedited review for market approval and an additional 5-year term of market exclusivity.[1]

Delafloxacin's approval is based on the outcomes of two randomized, double-blinded, non-inferiority trials.[2,3] Both studies together enrolled over 1500 participants to establish non-inferiority of delafloxacin to dual-therapy vancomycin and aztreonam in the treatment of ABSSSI. The experimental arm of trial 1 received delafloxacin 300 mg intravenous (IV) twice daily for 5-14 days, while the same arm in trial 2 received delafloxacin 300 mg IV twice daily for 3 days before switching to a 450 mg oral tablet twice daily for 5-14 days. The control group participants in both trials received vancomycin 15 mg/kg IV every 12 hours and 2 grams of aztreonam IV every 12 hours for 5-14 days.[2,3] The primary outcome for both trials, a ≥ 20% reduction in primary lesion size at 48-72 hours after treatment initiation, was achieved in 81.3% of the delafloxacin group and 80.7% of the vancomycin and aztreonam group. Secondary outcomes evaluated participants for complete resolution of baseline signs and symptoms and the need for further antibiotics at follow-up. Results were similar for both treatment groups.

Delafloxacin is an anionic fluoroquinolone that exhibits a concentration-dependent, bactericidal activity against

Table 1: Delafloxacin Spectrum of Activity[4]

Gram-positive	Gram-negative
Staphylococcus haemolyticus *Staphylococcus lugdunensis* *Streptococcus agalactiae* *Streptococcus anginosus* Group: *Streptococcus anginosus* *Streptococcus intermedius* *Streptococcus constellatus* *Streptococcus pyogenes* *Enterococcus faecalis*	*Escherichia coli* *Enterobacter cloacae* *Klebsiella pneumoniae* *Pseudomonas aeruginosa*

Gram-positive and Gram-negative pathogens (Table 1).[4,5] The anionic nature of delafloxacin is unique among currently available fluoroquinolones. This property allows delafloxacin concentrations to easily diffuse through bacterial membranes and therefore increase antimicrobial activity of the drug in the acidic environment commonly found with ABSSSI lesions.[6,7] The minimum inhibitory concentration (MIC) of delafloxacin against *Staphylococcus aureus* isolates decreases considerably as the acidity of the bacterial environment rises, while minimal inhibitory concentration (MICs) of certain other anti-staphylococcal antibiotics may either rise or remain unchanged under like conditions.[3,8] Delafloxacin is available both in intravenous and oral tablets which require dose adjustments in those with renal impairment (Table 2).[9]

The most commonly reported adverse effects (incidence ≥ 2%) of delafloxacin were nausea, vomiting, diarrhea, headache, and elevation of hepatic enzymes, all of which rarely led to treatment discontinuation (0.9%).[9-11] Like all other FDA approved fluoroquinolones, delafloxacin has a boxed warning of tendinitis, tendon rupture, peripheral neuropathy, central nervous system effects, and exacerbation of myasthenia gravis.[3] The label also warns of the risk of hypersensitivity reactions and *Clostridium difficile*-associated diarrhea.[3] In addition to informing patients about potential adverse reactions, they should also be informed about potential drug interactions and advised to separate any concomitant medications such as antacids containing magnesium, or aluminum, with sucralfate, with metal cations such as iron, or with multivitamin preparations containing zinc or iron, or with didanosine buffered tablets for oral suspension or the pediatric oral solution at least 2 hours before or 6 hours after ingestion of oral delafloxacin.[3]

Melinta Therapeutics, delafloxacin's manufacturer, has explored other indications for use of delafloxacin. A phase 3 study of its use in uncomplicated gonorrhea was terminated in 2014 due to a lack of efficacy, despite promising *in vitro* MICs against *Neisseria gonorrhea*.[12]

Studies are ongoing to evaluate its effectiveness in community-acquired bacterial pneumonia (CABP) and complicated urinary tract infections (cUTIs).[13] For now, the antimicrobial spectrum of delafloxacin is broader than all current guideline-recommended empiric monotherapy for the management of ABSSSI, providing bacterial coverage most similar to dual-therapy vancomycin and piperacillin-tazobactam for the treatment of severe non-purulent infections.[14] It is therefore reasonable that delafloxacin's most suitable place in therapy is for this indication. Guideline-directed therapy of severe purulent infections is aimed toward eradication of *Staphylococcus* species, as these infections do not generally warrant the use of agents with broad gram-negative efficacy.[13] However, guidelines name multiple patient populations whose infections call for broad-spectrum antibiotic therapy with substantial gram-negative coverage (e.g., immunocompromised patients), and the use of delafloxacin for these patients is likely to be appropriate.[15]

Table 2. Delafloxacin Dosing Recommendations[3]

Estimated Glomerular Filtration Rate (mL/min/1.73m2)[a]	Recommended Dose[b]	
	Oral	Intravenous[c,d]
> 30	450 mg every 12 hours	300 mg IV every 12 hours
15-29	450 mg every 12 hours	200 mg IV every 12 hours
< 15, including hemodialysis	Not recommended[e]	

Based on a Modification of Diet in Renal Disease (MDRD) equation
Total treatment duration of 5 to 14 days.
All intravenous doses of are administered over 60 minutes.
Compatibility with IV medications, additives, or substances other than D5W or 0.9% NaCl has not been established.
Not recommended due to insufficient information to provide dosing recommendations.

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How many patients must receive an influenza vaccine to prevent one case of influenza?

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Section: Short Communication

Question: How many patients must receive an influenza vaccine to prevent one case of influenza? Is there number-needed-to-treat data available?

Background: A question from a clinical practitioner so that the information would help convince patients to receive the vaccine.

Response: An internet search was conducted via PubMed, Google Scholar and Google using the search terms "NNV influenza vaccine" (NNV- number needed to vaccinate), "number needed to vaccinate influenza vaccine" and "NNT influenza vaccine".

This search led to a Cochrane review article that summarized the efficacy, effectiveness, and harm of influenza vaccines in healthy adult patients. The review included 90 reports containing 116 data sets; 69 were clinical trials of over 70,000 people, 27 were comparative cohort studies (about 8 million people) and 20 were case-control studies (nearly 25,000 people). There were also 23 reports of the effectiveness and safety of vaccine administration in pregnant women (about 1.6 million mother-child couples). A summary of their findings are listed below:[1]

- NNV for prevention of influenza-like illness (ILI) with parenteral inactivated vaccine: 40
- NNV for overall efficacy in preventing confirmed influenza with inactivated vaccines: 71
- NNV for prevention of ILI in pregnant women: 92
- NNV for prevention of confirmed influenza in newborns from vaccinated women: 27
- NNV for live aerosol vaccines: 46

Table 1: A review of additional meta-analyses and reviews reported the number needed to treat (NNT) for trivalent influenza vaccine in patients aged 16-65 years.[2]

Patients aged 16-65 years
- Meta-analysis of 17 flu-shot randomized controlled trials (RCTs)
  a. NNT for influenza with a well-matched vaccine: 37
  b. NNT for a poor or uncertain vaccine match: 77
- Systematic review of 8 RCTs revealed
  a. NNT: 67

Patients aged ≥65 years
- NNT from single RCT in 1,838 seniors in the community: 40

Another article of interest, although dated, was published in *Vaccine* (2004) that analyzed national data from Australia to determine the impact of influenza and pneumococcal vaccine programs:[3]

- Patients aged 65 years and older NNV: 43

The CDC website yielded no specific mention of the NNV or NNT for influenza vaccination, but it does contain very useful information regarding vaccine effectiveness. This information has been linked below: http://www.cdc.gov/flu/professionals/vaccination/effectivenessqa.htm

Summary: Based upon the available literature, there the NNV is based on a variety of situations. Factors that are likely to alter the NNV are how well-matched a vaccine is to the influenza strains, yearly variations, and focus on specific patient populations. However, based on the above data a reasonable estimate for the NNV for the influenza vaccine is approximately 40-50.

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Call for Poster Presentations at the Annual ALSHP Meeting

This year, ALSHP is sponsoring a Poster Session at the Annual Clinical Meeting on Thursday, September 28 from 11:30am to 1:00pm.

This is a great opportunity to share innovative ideas with others and likewise learn about up and coming trends in Alabama health-system pharmacy practice. Please note the new poster categories when considering submission. All ALSHP members and students are eligible to submit abstracts to be considered for presentation. Primary student/resident presenters will receive complimentary registration to the annual clinical meeting. Completed abstracts will be published in ALSHP's e-clinical journal: *InPharmative* Quarterly after the meeting.

Please see the website ALSHP.org for guidelines and submission. Abstracts are due by August 30, 2017 at 11:59 CT.

2017 ALSHP Annual Summer Meeting Poster Abstracts

Pilot study to assess outcomes of a 4-week drug allergy clarification program on a general medicine floor

Practitioners Category 1st Place

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Purpose: The purpose of this study was to evaluate a 4-week program designed to uniformly interview patients on a general medicine floor for the purpose of clarifying medication allergy histories and communicating any discrepancies noted between the medical record and patient interview.

Methods: This pilot study received IRB designation as a quality improvement project and was non-randomized in design, utilizing a convenience sampling of adult patients admitted to a general medicine floor at St. Vincent's Birmingham during fall of 2016. Patients who were nonverbal, non-English speaking, or diagnosed with dementia or classified as a "poor historian" in the medical record were excluded. Prior to program implementation, two Advanced Pharmacy Practice Experience (APPE) students completed competency-based training on interviewing patients and determining the presence of a drug allergy or intolerance. During the 4-week pilot, APPE students conducted patient interviews and evaluated medical record documentation to determine if any of the following discrepancies were present: (a) drug allergy documented in medical record without description of reaction; (b) drug intolerance/sensitivity or known adverse effect of therapy documented in the medical record as an allergy; (c) drug allergy documented in medical record that patient does not endorse on interview; or (d) undocumented allergy discovered upon patient interview. Discrepancies identified were communicated to the rotation preceptor and hospitalist, and the medical record was updated. Additionally, students provided patient education on drug allergy vs. drug intolerance at the conclusion of the interview. Descriptive statistics were utilized for data analysis.

Results: Fifty-five patients were included in the study. Of the patients interviewed, 54.5% (n=30) had a documented allergy in the medical record. Among these 30 patients, a total of 44 discrete drug allergies were documented; 79.5% (n=35) of the documented allergies were determined to be a true allergic reaction (e.g. anaphylaxis, angioedema, hives). The majority (96.6%) of patients with a documented allergy in the medical record were found to have at least one discrepancy. Thirty-four (77.2%) cases of a "drug allergy documented in medical record without description of reaction" were identified. In all of these cases, upon interview, the students obtained a description of the reaction and updated the medical record. Additionally, eight (18.1%) cases of "drug intolerance/sensitivity or known adverse effect of therapy documented in the medical record as an allergy" were noted. Of these eight cases, 87.5% did not include a description of the reaction. There was one identified case of an "undocumented allergy discovered upon patient interview." There were no cases of "drug allergy documented in medical record that patient does not endorse on interview."

Conclusions: The primary discrepancy noted was drug allergies documented in the medical record without a description of the reaction. Patients with incorrect allergy documentation may receive alternative therapy, which may be more costly, less effective, and associated with unexpected adverse drug effects. Thus, more comprehensive documentation of drug allergies is warranted at the time of hospital admission. Based on the study findings, the pilot program will remain in effect and provide the pharmacy department an additional opportunity to positively impact patient care.

Medical trainee perceptions of clinical pharmacists

Practitioner Category 2nd Place

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Coauthors: Allison M. Helmer, PharmD; Michael J. Scalese, PharmD

Purpose: Clinical pharmacists (CPs) are often involved with medical trainees, including student and resident physicians and often are incorporated into the medical training program itself. Despite close interactions with medical trainees and a wealth of data supporting the value of clinical pharmacy, little is known about medical trainees' perceptions and expectations of clinical pharmacy services. The aim of this study is to evaluate perceptions and attitudes of medical trainees towards clinical pharmacy services provided by pharmacy faculty within an academic medical center.

Methods: This is an anonymous, cross-sectional, internet-based survey study administered using Qualtrics survey software and emailed to all potential participants. The study population included all internal medicine residents (including preliminary and categorical residents), medicine sub-specialty fellows, and third and fourth year medical students at an academic medical center and associated college of medicine. The survey addressed the medical trainee's exposure to clinical pharmacy services at any point during medical school and residency training regardless of institution. Additionally, it assessed perceived roles of CPs, benefits, and potential roles of CPs in the trainee's practice. To encourage participation, respondents were randomly entered into a drawing for two online gift cards. Data was analyzed using descriptive statistics.

Results: The survey was completed by 53 trainees (41 medical students, 12 medical residents), though some did not provide answers to all questions. While the majority (80%, n=40) of trainees had previous exposure to CPs in the inpatient setting, only 35% (n=17) had exposure in the outpatient setting. Among those trainees who had worked with a CP in the past, 63%, 50%, and 48% of trainees found that antibiotic consults, medication safety monitoring, and medication selection/dosing, respectively, were the most beneficial services provided by CPs in the inpatient setting. In the outpatient setting, 59%, 71%, and 53% of trainees found that chronic disease management, patient education/counseling, and polypharmacy or pharmacoeconomic review, respectively, were most beneficial. Among trainees who had not worked with a CP previously, 90%, 50%, and 40% believe that antibiotic consults, medication safety monitoring, and pain management consults, respectively, would be most beneficial in the inpatient setting. In the outpatient setting, 59%, 53%, and 41% responded that polypharmacy or pharmacoeconomic review, medication safety monitoring, and patient education/counseling, respectively, would be most beneficial. Trainees rated antibiotics, diabetes, and pain management as the topic areas where the most drug-related education was needed. Ninety percent and 81.6% of trainees would utilize CPs 1-2 times per week or more if CPs were part of the inpatient or outpatient healthcare team, respectively. An inconsistent presence on the inpatient medical team or in clinic was the biggest barrier towards utilizing CPs in 53.2% (n=25) of trainees.

Conclusions: Medical trainees acknowledge gaps in therapeutic knowledge and patient care where CPs can have a significant role, and most would utilize a CP at least weekly. Trainees are not consistently exposed to a pharmacy presence across different levels of care. Clinical pharmacists should focus on identifying ways to produce a consistent pharmacy presence in both inpatient and outpatient settings.

Profitability of single-dose oritavancin infusion in the home setting

Resident Category 1st Place

Whittney Howell Matthews, PharmD
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Coauthors: Brad Gilchrist, PharmD; Ed Eiland, PharmD, MBA, BCPS, FASHP

Purpose: This original research project will evaluate the profitability of utilizing oritavancin in the home infusion setting.

Methods: The institutional review board approved this retrospective study. Fourteen patients over the age of 18 who were treated with Orbactiv® (oritavancin) during June 2016 through February 2017 were subjects of this study. The electronic medical record system was used to examine drug and supply acquisition costs and nursing costs in comparison to the associated reimbursement through major medical or pharmacy benefits to derive the profit margin. The profit margin will be calculated as a percent.

Results: The results of this study proved that single-dose oritavancin can be a profitable therapy for home infusion pharmacies. The average profit margin of oritavancin therapy without taking nursing fees into account was 33% (12% - 65%). Average profit margin by payer type was 27.5% with Medicare/Medicaid and 35.5% with commercial insurance. Accounting for nursing fees reduced overall profit margins by 10% to an average of 23% (2% - 55%).

Conclusions: Oritavancin is a profitable home infusion antimicrobial therapy for this organization. It is also convenient for patients to only need one three hour antibiotic infusion versus daily or multiple daily doses of an infused antimicrobial for the total treatment duration. The provider represented in this analysis has nurses on staff that can infuse patients either in infusion suites or in the patient's home as opposed to contracting out nursing services. The benefit of having nursing services available through the provider versus contracting out nursing services allows for an additional 10% of the overall gross profit margin to be maintained. Depending on the duties of the onsite nurse, the cost of salary and benefits for staff nurses can be offset when infusing oritavancin.

Acknowledgements: Abstract has been previously presented at the NHIA Conference 2017.

Outcomes of outpatient parenteral antimicrobial therapy in a pediatric hospital

Resident Category 2nd Place

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Coauthors: April Yarbrough, PharmD, BCPS, Shannon Ross, MD, MSPH

Purpose: The objective of this study is to characterize outpatient parenteral antimicrobial therapy (OPAT) use and clinical outcomes at community oncology alliance (COA).

Methods: This study is a retrospective chart review of patients discharged from COA, a 350-bed, free-standing children's hospital, on parenteral antibiotics primarily followed by the infectious disease service between 2015 and 2016. The primary endpoint is complication rate from parenteral therapy leading to emergency department (ED) visit or hospital readmission due to catheter associated infections, deep vein thromboses, or other line complication. A secondary endpoint analyzed was adverse drug reactions (ADRs).

Results: Of 84 distinct OPAT patients analyzed, 52% were male and 67% white. Patients ranged from 4 months of age to 20 years of age with a median age of 9 years. The most common primary indication for OPAT was osteomyelitis without bacteremia with the most common cultured organism being methicillin-sensitive Staphylococcus aureus (MSSA). Thirteen patients had a line associated complication requiring an ED visit or hospital readmission (15%). Neutropenia and rash were the most common medication related adverse effects,

occurring in 9.5% and 7% of patients respectively. A group of patients followed by the infectious disease service during the same period who were discharged on oral antibiotics had a similar incidence of neutropenia (8%). Overall ADR rates were 13% in the OPAT group, 12% in the group oral antibiotic group, and 6% in those on OPAT and oral antibiotics concomitantly.

Conclusions: Line complications observed in this small study with a pharmacist-directed OPAT program are at the low end of the range of rates published in previous studies (15%). ADR rates were similar in patients receiving IV (13%) vs. oral (12%) antibiotics. The incidental finding of similar rates of eutropenia between groups has led to more frequent absolute neutrophil count (ANC) monitoring of those only receiving oral antibiotics.

The management of Staphylococcus aureus bacteremia at Princeton Baptist Medical Center

Resident Category 3rd Place

Mary Katherine Stuart, PharmD
Princeton Baptist Medical Center

Coauthors: Matthew Brown, PharmD, BCPS, Kenda Germain, PharmD, BCPS, Nathan Pinner, PharmD, BCPS

Purpose: Due to the significant morbidity and mortality associated with Staphylococcus aureus bacteremia (SAB), the investigators sought to assess the management of SAB at Princeton Baptist Medical Center (PBMC) as compared to evidence-based standards of care.

Methods: Following IRB approval, cases of SAB between September 2014 and August 2016 were retrospectively reviewed. The primary outcome was to determine the percentage of cases managed in full concordance with evidence-based standards of care, defined as: appropriate selection of definitive antibiotics, appropriate duration of antibiotics, collection of repeat blood cultures within 2-4 days of the initial positive culture, documentation of sterile blood cultures, and echocardiography completion. Source control, incidence of metastatic infections, in-hospital mortality and the percentage of cases with an infectious disease consult were also assessed.

Results: One hundred and thirty-eight cases were included, and 41% were managed in full concordance with evidence-based standards of care. Appropriate definitive antibiotics were chosen in 90% of cases and continued for an appropriate duration 56% of the time. Blood cultures were repeated appropriately in 82% of cases with documentation of sterile blood in 90%. Echocardiography was performed in 66% of cases. Metastatic infections occurred in 9% of cases and in-hospital mortality was 10%. When a removable source was identified, control was achieved 81% of the time. Infectious disease followed 72% of cases, and consultation was not associated with improved adherence to evidence-based standards of care.

Conclusions: Management of SAB at PBMC can be enhanced by improving duration of antibiotic therapy, collection of repeat blood cultures and completion of echocardiography. Investigators intend to implement strategies to improve SAB management such as an evidence-based treatment bundle, prospective monitoring by an antimicrobial stewardship team, formalized pharmacy protocol for ordering repeat blood cultures, and physician education on appropriate antibiotic duration and the need for echocardiography.

Acknowledgements: Abstract has been previously presented at the Southeastern Residency Conference.

Levetiracetam monotherapy use in the pediatric intensive care unit for the treatment and prophylaxis of status epilepticus

Student Category 1st Place

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Auburn University Harrison School of Pharmacy

Coauthor: Allison Chung, PharmD

Purpose: There have been limited safety and efficacy studies in pediatric critically ill patients who receive levetiracetam as a monotherapy agent. Open label studies have examined the use of levetiracetam as adjunctive therapy in pediatric populations, and have reported at least a 50% reduction in seizure frequency. Safety studies and clinical trials that involve levetiracetam monotherapy use have showed promising results; however, there's limited data regarding its use as a first line monotherapy agent in the pediatric population. To address this deficit, the efficacy of levetiracetam as a monotherapy agent among the pediatric population (0-18 y/o) with status epilepticus in a PICU was evaluated.

Methods: A two year retrospective observational study was conducted of medical records in patients under the age of eighteen who were admitted to the PICU at an academic stand-alone pediatric institution. Patients were identified by utilizing a pharmacy derived list of all patients who received levetiracetam during the targeted two years. Chart reviews were conducted to identify those patients from the initial list who were in the PICU and who met the inclusion/exclusion criteria. For a patient to be included in the study, the patient had to be admitted to the PICU, be under the age of eighteen, and exhibited signs and symptoms of status epilepticus. Exclusion criteria of this study included patients greater than the age of eighteen, patients who exhibited no signs or symptoms of status epilepticus, and patient who received antiepileptic polytherapy during their PICU stay. The etiologies of seizures were classified according to the documented cause of seizures. Data collected included the length of PICU stay, reason for admission, prior levetiracetam use, levetiracetam dose, and indication of use. The primary outcome was incidence of seizures while in the PICU. Secondary outcomes included length of stay in PICU, length of treatment, and the optimal dose range of levetiracetam. Descriptive statistics were used to analyze the data.

Results: Over the 2-year study period, 59 patients in the PICU were identified on levetiracetam, 12 of which received levetiracetam monotherapy with an age range of 0-18 (mean age of 4.92). In terms of demographics, of the 12 subjects that were studied, 58% were male and 42% were female. The percentage of Caucasian, African American, and Hispanic patients were 33%, 58%, and 8%, respectively. The average weight of the participants was 32.04 kg ranging from 3.2-116 kg. The average dose given to subjects was 44.7 mg/kg/dose ranging from 17.2-107 mg/kg/dose with a corresponding daily dose of 55.3 mg/kg/day ranging from 20.4 -107 mg/kg/day for status epilepticus and acute control of seizures. Sixty-seven percent of these patients received oral levetiracetam and 33% received intravenous levetiracetam for either treatment or prophylaxis of status epilepticus. The average length of stay spent in the PICU with patients on levetiracetam monotherapy was 6.25 days which ranged from 2-27 days. The average length of treatment was 9.5 days ranging from 1-36 days. Of the 12 patients, 4 were treated acutely and seizures were controlled. Three of those 4 patients had no seizure history prior to treatment. One patient was treated prophylactically. The remaining 7 of the 12 patients were treated for seizures orally once the admission disease state was controlled.

Conclusions: It is of utmost importance to control status epilepticus as expediently as possible in an acute setting. This study presents pertinent data from a 2 year retrospective observation study that was conducted at an academic stand-along pediatric institution. Higher doses of levetiracetam were utilized in this study compared to previous studies. The efficacy of levetiracetam monotherapy was determined by the amount of seizures that were controlled acutely and prophylactically. It would be recommended to obtain further data in regards to seizure controlled in acutely treated patients and prophylaxis in acutely ill patients for future studies.

Applying the Pharmacist Patient Care Process (PPCP) through the use of an electronic medical record simulation

Student Category 2nd Place

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Samford University McWhorter School of Pharmacy

Coauthors: Jessica Skelley, Pharm D, BCACP, Jordan Wulz, Pharm D, BC-ADM

Purpose: To implement and evaluate the effects of a simulated patient encounter using an electronic medical record (EMR) on student comprehension and application of the Pharmacist Patient Care Process (PPCP).

Methods: An EMR simulation activity was included in a first-year ambulatory care elective course. An activity-specific rubric was used to provide formative and summative feedback on student SOAP notes input directly into an EMR, reflecting the student's ability to implement the Joint Commission of Pharmacy Practitioners' PPCP. A 16-item pre/post-activity survey was completed by students involved in the course.

Results: Student assessment scores ranged from 76% to 96% among the nine groups of two students each, with highest performance on the subjective portion of the SOAP note. Results from the pre- and post-assessment surveys indicated 100% of students strongly agreed that using an electronic medical record in didactic coursework will benefit students in preparing for the P4 professional year.

Conclusions: Utilization of an electronic medical record simulation allowed pharmacy students to gain confidence in navigating an electronic medical record and significantly improved students' abilities to apply the Pharmacists' Patient Care Process to a complex patient case.

Pharmacy and nursing student perceptions and attitudes of smoking by healthcare providers

Student Category 3rd Place

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Auburn University Harrison School of Pharmacy

Coauthors: Kimberly B. Garza, PharmD, MBA, PhD, Christopher J. Correia, PhD, MS, Kimberly Braxton Lloyd, PharmD

Purpose: Tobacco use remains the primary leading cause of preventable death in the United States. However, healthcare professionals' use of tobacco and perceptions about tobacco use by professional colleagues and other healthcare providers has not been widely studied. This study aims to determine students' perceptions and attitudes about tobacco use by different types of healthcare providers and how those perceptions vary between different programs of study. The perceptions studied include how tobacco use influences a healthcare provider's effectiveness and trustworthiness. This study also intends to determine differences between pharmacy and nursing students' personal health habits, including tobacco use.

Methods: The institutional review board approved this cross-sectional online survey that was emailed to all students enrolled in either a Doctor of Pharmacy program or multiple School of Nursing degree programs (BSN and MSN) at one University. All enrolled students were eligible to participate and were recruited via electronic mail (n=1079 students). Items in the survey were acquired from the Fagerström nicotine dependence measure, Behavioral Risk Factor Surveillance System (BRFSS), and the National Institutes of Health (NIH) for assessing students' personal health habits. Items newly developed for this survey were also included that measured current tobacco use and perceptions of tobacco use among healthcare provider students.

Results: A total of 220 students completed the survey yielding a response rate of 20%. The majority were female (87%), single (77%), and Caucasian (93%). Three percent of students reported current use of tobacco. There was very high agreement (>96%) seen among students in both programs that it is important for those in their respective fields to serve as examples by avoiding unhealthy behaviors. Varying levels of agreement among the students based on their field of study in questions assessing how smoking affects healthcare provider effectiveness and trustworthiness. Nursing students expressed greater agreement regarding how smoking habits influence practitioner effectiveness within their field compared to pharmacy students (p=0.004). There was also varying levels of agreement with statements depending on what type of healthcare professional was being asked about (e.g. physician versus nurse versus pharmacist). Some personal health habits also varied between the two groups of students, such as current tobacco use

(p=0.041) and frequent exercise (p=0.005), while others were not statistically significant.

Conclusions: Varying perceptions on tobacco use in healthcare providers based on field of study were seen in this survey of future healthcare providers. There were notable differences in how students agreed with statements depending on which type of healthcare provider was being asked about. Differences in students' personal health habits were also seen based on field of study.

The use of international medical mission trips as an interprofessional learning experience

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Coauthor: Leigh Booth, Ed.D, RN, CNL

Purpose: Interprofessional education occurs when students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes. Interprofessional education is a necessary step in preparing a 'collaborative practice ready' health workforce that is better prepared to respond to local health needs. Beginning interdisciplinary training during educational settings establishes a pool of knowledge and mutual respect that will continue during practice, and will benefit patients and the entire healthcare system. The purpose of this study is to explore the use of international medical mission trips as an interprofessional learning experience for pharmacy and nursing students, and to evaluate student perspectives on working together in medical mission clinics.

Methods: A recruitment request and link to a Qualtrics survey was emailed to all pharmacy and nursing students participating in a medical mission trip to Cambodia. Students voluntarily completed a pre- and post-survey with open ended comments sections regarding their perceptions of interdisciplinary education. Students also ranked their opinions regarding interprofessional relationships using questions adapted from the Interprofessional Learning Scale (RIPLS) Questionnaire. Students' overall perceptions and reflections were compared and discussed to evaluate the impact of the trip on their educational experience, and also provided meaningful feedback to help design the international trip/clinic structure to maximize learning activities. Approval was granted by both the University of Alabama and Samford University IRB committees.

Results: There were 17 students who completed the survey, including 11 nursing and 6 pharmacy students. The majority of students were female (14/17), and the average age was 21.7 years. When asked if they had previous interprofessional teaching or learning, most students responded no (14/17). When asked if "Learning with other students/professionals will make me a more effective member of a health and pharmacy care team", and "Patients would ultimately benefit if nursing and pharmacy students/professionals worked together", 16 students ranked their response as strongly agree. When asked "Do you feel better prepared to work with members of the interprofessional team because of your experience during the international medical trip", all students responded yes with various free-text responses including being able to see the strengths of the members of other professions, and recognize the opportunities in which we can work together.

Conclusions: Overall, this was a positive learning experience for both student groups. Prior to this international mission trip, most of the students had not participated in interprofessional learning, and felt this was a great environment to foster relationships between disciplines. Nursing student reflections indicated they learned that pharmacists do more than dispense medications. Pharmacy students indicated they learned that they were valuable members of the team because they had been educated on performing an assessment and could collaborate to give a diagnosis for the patient and choose related medications. Increasing the number of educational medical mission trips as interprofessional learning activities will give more students an opportunity to work with other professions, explore different cultures, and will foster a mutual respect in career practice.

Evaluation of hospital acquired methicillin-resistant *Staphylococcus aureus* infection rates in a surgical ICU setting

Rachel Simons, PharmD
Mobile Infirmary

Coauthors: Sara Utley, PharmD, BCPS, Charles DuRant, PharmD

Purpose: To evaluate the current hospital acquired methicillin-resistant *Staphylococcus aureus* (HA-MRSA) infection rate in a surgical intensive care unit (SICU) and determine if this population would benefit from implementation of a decolonization strategy.

Methods: A retrospective chart review was conducted on fifty randomly selected patients admitted to the SICU from May 1, 2015 to July 31, 2015. Charts were reviewed for MRSA risk factors, MRSA positive cultures, and use of anti-MRSA antibiotics. Hospital acquired infection was defined as an infection with onset greater than 48 hours from admission to the SICU.

Results: Thirty patients (60%) had at least two MRSA risk factors. Three patients (6%) had a positive MRSA culture with only one meeting the criteria for hospital acquired. MRSA PCR was performed for three patients (6%) with none being positive for MRSA. PCR results led to de-escalation of antibiotic therapy in two of the three patients tested. Anti-MRSA antibiotic use was appropriate based on culture for 40% of the patients reviewed. The remaining anti-MRSA antibiotic use was either empiric (47%) or represented a change in selection of anti-MRSA agent (13%). Of the patients who received empiric therapy, 34% were appropriately de-escalated and 13% had non-cultured infections.

Conclusions: The occurrence of HA-MRSA infection in this patient population is low. MRSA risk factors would not have been a reliable tool for targeting patients for decolonization. Use of PCR testing for targeting decolonization efforts is limited by its cost, which is approximately $95 per sample. The current HA-MRSA infection rate in this SICU is not substantial enough to implement a decolonization protocol.

Impact of Structured Query Language (SQL)-driven pharmacist medication review on heart failure-related quality measures

Taylor Tran, PharmD
Mobile Infirmary

Coauthors: Hong Duong PharmD, BCPS, Michael Scalese, PharmD, BCPS, CACP, Charles DuRant, PharmD.

Purpose: To implement and evaluate the effect of Structured Query Language (SQL)-driven, pharmacist medication review on heart failure-related quality measures.

Methods: Eligible patients are those ≥ 18 who have a diagnosis of heart failure. Reports written in Epic® EHR were created to identify: Patients with a principle diagnosis of heart failure and a documented EF of ≤ 35% without an aldosterone antagonist; Black/African American patients with a principle diagnosis of heart; failure and a documented EF of < 40% without hydralazine/nitrate; Patients with a principle diagnosis of heart failure history and atrial fibrillation without an anticoagulant. Upon identification, a pharmacist will conduct a targeted medication review to assess the patient's heart failure regimen and address any potential concerns and/or recommendations. Recommendations will be tracked and documented in the pharmacists clinical interventions database (iVent®) within the EHR (Epic®). The primary outcome will be the American Heart Association's Get with the Guidelines – Heart Failure Quality Measures scores following implementation and the differences in scores pre- and post-intervention rates will be used to examine effectiveness.

Results: Two of the three measures (hydralazine/nitrates and anticoagulants) saw improvements in quality scores. Quality measure regarding aldosterone antagonist decreased.

Conclusions: Use of SQL-reporting to identify patients in need of interventions may serve as a useful tool, however, to maximize efficiency, paring down to specific parameters is key.

The impact of a pharmacist managed smoking cessation program within two university affiliated clinics

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Coauthors: Michele Richardson, PharmD, Brook Yordy, PharmD, Miranda R. Andrus, PharmD, BCPS, Haley Phillippe, PharmD, BCPS

Purpose: One out of every five adult deaths in the United States occurs due to cigarette smoking. According to the CDC, in 2014, nearly 40 million adults smoked cigarettes. Cigarette smoking is the leading cause for preventable disease and death, which is why smoking cessation counseling is a key component to a patient's overall health. The purpose of this study is to evaluate the impact of pharmacist provided smoking cessation services in two university-affiliated outpatient clinics.

Methods: This institutional review board approved retrospective cohort study evaluated pharmacist and physician provided smoking cessation services in the University of Alabama Birmingham internal medicine and family medicine clinics. Patient-physician encounters in these clinics are typically 15 to 30 minutes in length, while patient pharmacist encounters are scheduled in 30 to 60 minute appointments and include extensive behavioral counseling. Patients aged 21-80 years old who received smoking cessation counseling and therapy from pharmacists or physicians and had documentation of smoking status post-counseling documented in the electronic health record were included. Patients within the clinic were identified from the electronic health record based on documentation of prescriptions for smoking cessation therapy, including bupropion, varenicline, or nicotine replacement therapy. Patients were placed into a pharmacist or physician provided counseling group based on the provider who provided counseling at the time therapy was prescribed. The primary outcome measure was documented successful abstinence at a clinic visit after the patient's smoking cessation counseling visit. Data collection occurred via the electronic health record and included: age, sex, race, success of quit attempt, and smoking cessation therapy prescribed.

Results: Thirty patients were included in the pharmacist group and 60 patients in the physician group for this analysis. The average age of the pharmacist group was 58 years old and 51 years old for the physician group. Therapy initiated between counseling groups followed a trend of more patients receiving nicotine replacement therapy for treatment with 46.7% in the pharmacist group and 56.6% in the physician group. Bupropion was initiated in 36.7% of patients in the pharmacist group and 28.3% in the physician group. Varenicline was initiated in 13.3% of patients in the pharmacist group and 10% in the physician group. Combination therapy was initiated in 3.3% of patients in the pharmacist group and 5% of patients in the physicians group. Abstinence rate was higher in the patients counseled by pharmacist (40%) versus physician's (10%). Regarding therapies in patients achieving abstinence, in the pharmacist group 50% achieved abstinence using bupropion and 41.3% using nicotine replacement therapy. In the physician group, 50% achieved abstinence using bupropion and 50% achieved using nicotine replacement therapy. No patients achieved abstinence on combination therapy in either group.

Conclusions: Patients receiving smoking cessation counseling from pharmacists resulted in greater rates of abstinence when compared with patients only counseled by physicians in the UAB Family medicine and internal medicine clinics. Limitations of this retrospective study include reliance on documentation by providers of smoking status post smoking cessation counseling in the electronic health record. Future studies are needed to further evaluate the clinical impact of pharmacist provided counseling and follow-up on smoking cessation.

Acknowledgements: Abstract has been previously presented at the American Society of Health-System Pharmacist Mid-Year Meeting 2016.

Clinical Severity of Venous Thromboembolism Patients Presenting to a Community Hospital: A Retrospective Chart Review

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Coauthors: Zach Burns, PharmD, BCPS, Amy Clark, PharmD, BCPS

Purpose: The 2012 ACCP CHEST guidelines were updated in 2016 to recommend outpatient management of acute pulmonary embolism using one of the new oral anticoagulants. The Simplified Pulmonary Embolism Severity Index (sPESI) is a validated risk stratification score that assists with determining whether pulmonary embolism patients could be a candidate for outpatient therapy based on a 30-day risk of recurrent thromboembolism or non-fatal bleeding. The purpose of this project was to assess the clinical severity of patients presenting to the emergency department with either a deep vein thrombosis or pulmonary thromboembolism and describe the treatment patterns for these patients.

Methods: A retrospective chart review of adults at least nineteen years of age and older who were diagnosed with deep vein thromboembolism or pulmonary thromboembolism was conducted at a community hospital between October 2015 and May 2016. The hospital's electronic medical record system utilized International Classification of Diseases (ICD-9) codes to identify patients who presented in the emergency department and diagnosed with a venous thromboembolism. Patient demographic information, sPESI criteria, drug therapy, and potential contraindications to outpatient management were collected. The mean length of stay, sPESI scores, and admission rates were calculated for all VTE patients.

Results: A total number of 76 patients were identified by using the ICD-9 codes from the electronic medical record system. Seventy met the inclusion criteria, 35 diagnosed with a deep vein thrombosis and 35 diagnosed with a pulmonary embolism. The six that did not meet the inclusion criteria were those who were diagnosed with both a pulmonary thromboembolism and deep vein thrombosis upon arrival to the emergency department. The mean age of the patients was 61 years old, 52.8% male, and 85.7% Caucasian. Of the 35 patients with an acute pulmonary embolism, 16 (45.7%) had a sPESI score of 0 or low risk for recurrent thromboembolism or non-fatal bleeding and therefore qualified for outpatient therapy. Of the 35, 13 (81.3%) patients were admitted to the hospital. Based on sPESI scores, 11.4% of those who presented with a thromboembolism met the criteria for an admission, however, 31.4% were actually admitted.

Conclusions: Patients who present to the emergency department and are diagnosed with a deep vein thrombosis or pulmonary embolism and classified as low risk for recurrent thromboembolism or non-fatal bleeding based on the validated sPESI score are often still admitted to the hospital.

Assessment of the effectiveness of a novel vancomycin nomogram at achieving steady-state trough concentrations of 15-20 mg/L

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Coauthors: Jessica Starr, PharmD, FCCP, BCPS, Sarah Blackwell, PharmD, BCPS, BCCCP, Hillary Holder, PharmD, BCPS

Purpose: The majority of vancomycin nomograms currently available target trough concentrations of 10-15 mg/L. Guidelines recommend higher target trough concentrations of 15-20 mg/L to improve penetration, increase the probability of optimal target serum concentrations, and improve clinical outcomes of complicated infections, such as bacteremia, endocarditis, osteomyelitis, meningitis, and hospital acquired pneumonia caused by S. aureus. This study aims to investigate the effectiveness of a novel vancomycin nomogram at achieving trough concentrations of 15-20 mg/L.

Methods: This retrospective chart review conducted at a 500 bed community teaching hospital includes 306 patients ages 18-89 who received vancomycin dosed to target trough concentrations of 15-20 mg/L before (pre-protocol group) and after (post-protocol group) implementation of a vancomycin nomogram based on age, weight, and serum creatinine (SCr). Patients with the following are excluded: receipt of renal replacement therapy, acute kidney injury (defined as an increase in baseline SCr by 0.5 mg/dL or 50% in the past 12 months), SCr less than 0.5 or greater than 2 mg/dL, BUN:SCr ratio greater than 40:1, cystic fibrosis, cirrhosis, paraplegia, or quadriplegia. The primary endpoint is percentage of patients with steady-state vancomycin trough concentrations between 15-20 mg/L. Secondary endpoints include percentage of patients with steady-state trough concentrations between 14-21 mg/L, less than 15 mg/L, and greater than 20 mg/L. Additional secondary endpoints include percentage of patients within three subgroups with steady-state trough concentrations between 15-20 mg/L, 14-21 mg/L, less than 15 mg/L, and greater than 20 mg/L: age 80-89, weight greater than or equal to 100 kg, and critical care patients. The chi-square test is used to analyze primary and secondary endpoints, and descriptive statistics are used to analyze patient baseline characteristics.

Results: After implementation of the nomogram, no statistically significant difference in incidence of goal trough concentrations of 15-20 mg/L occurred (23.5% versus 17.3%, P= 0.26). Trough concentrations between 14-21 mg/L occurred at similar rates (31.1% versus 30%) as well as trough concentrations greater than 20 mg/L (18.9% versus 18.2%). Trough concentrations less than 15 mg/L occurred most often within both groups (57.7% versus 64.5%). Patients ages 80-89 achieved goal trough concentrations less frequently, though this was not statistically significant (16.7% versus 26.7%), and patients greater than or equal to 100 kg achieved goal trough concentrations at a similar rate (14.3% versus 11.5%). Critical care patients achieved goal trough concentrations more frequently, though this was not statistically significant (30.6% versus 12.9%). Trough concentrations less than 15 mg/L occurred most frequently within both the pre- and post-protocol groups for all subgroups, though these values occurred significantly less often within the post-protocol group of the critical care subgroup compared to the pre-protocol group (44.9% versus 71%, P=0.04).

Conclusions: The novel vancomycin nomogram and traditional pharmacokinetic dosing strategies have similar efficacy in achieving trough concentrations of 15-20 mg/L. The nomogram remains implemented as the standard dosing protocol at our institution. Modifications to help improve the efficacy of the nomogram are under review.

2016 ALSHP Winter Poster Abstracts

Impact of targeted pharmacotherapy on hospital readmissions in heart failure with diastolic dysfunction

Category: Best Student-Rated Poster

Keith J. Polovich, II, PharmD
Auburn University Harrison School of Pharmacy

Coauthors: Kaitlin McGinn, PharmD, Michael Scalese, PharmD, BCPS, CACP

Purpose/Background: The use of angiotensin converting enzyme inhibitors (ACE-I's), angiotensin receptor blockers (ARB's), beta-blockers, aldosterone antagonists, and isosorbide dinitrate/hydralazine have well documented morbidity and mortality benefits in heart failure with systolic dysfunction. However, the role of these agents in diastolic dysfunction is less clear. Currently, the 2013 ACCF/AHA Heart Failure

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Guidelines recommend these therapies for symptomatic relief or management of comorbid conditions rather than slowing disease progression or preventing hospital readmissions. The objective of this study is to determine the impact of targeted heart failure therapy on hospital readmission rates in patients with diastolic dysfunction.

Methods: The effect of heart failure targeted medication therapy on hospitalizations was evaluated in this retrospective, single-center, observational study of patients admitted for acute decompensated heart failure from January 2004 through December 2014. Patients were excluded if their ejection fraction was less than or equal to 40% without echocardiogram evidence of diastolic dysfunction or if they died during the index hospital admission. Descriptive statistics were used to evaluate baseline characteristics and re-hospitalization rates based on medication use. Medications analyzed included diuretics, ACE-I's, ARB's, beta-blockers, aldosterone antagonists, isosorbide dinitrate/hydralazine, and digoxin. Subgroup analyses were performed to evaluate the impact of medications on patients with diastolic dysfunction only and those with combined systolic & diastolic dysfunction.

Results: An interim analysis of 100 patients was performed from December 2012 through December 2014. Of those included, the average age was 57.2±14.9 years, 49% were female, and 72% were African American. The most common comorbid conditions included hypertension (81%), diabetes type 2 (50%), and hyperlipidemia (45%). Most patients were prescribed appropriate medication therapy at discharge including loop diuretics (82%), beta-blockers (81%), and ACE-I/ARB (68%). Ten and seven patients also received aldosterone antagonists and combination hydralazine and isosorbide dinitrate respectively. The average length of index hospital admission was 4.4 ±4.0 days with mean time to re-hospitalization occurring at 284.2± 295.5 days. Of the 46 patients with diastolic dysfunction only, the average age was 60.8 ±12.6 years, 65.2% were female, and 69.6% were African American. Heart failure therapy at discharge included loop diuretics (80.4%), beta-blockers (80.4%), and ACE-I/ARB (56.5%). The average length of index hospital admission and mean time to re-hospitalization was similar between patients with diastolic dysfunction alone and combined heart failure (3.7 ±2.9 days vs 4.9±4.7 days, p=0.147; 232.7± 257.9 days vs 329.6±322.0 days, p=0.193, respectively).

Conclusions: The interim analysis demonstrates that index hospitalizations and time to readmission appear to be similar in patients with diastolic dysfunction alone versus those with combined heart failure. The majority of patients in our cohort were prescribed appropriate targeted therapy.

Healthcare providers' perceptions of pharmacist integration into a rural community health center

Category: Best Student-rated Poster

Katelin M. Lisenby, PharmD, BCPS
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Coauthor: Ashley Stokes, PharmD

Purpose/Background: To assess healthcare providers' perceptions on clinical pharmacy services at a rural community health center in Gordo, AL.

Methods: This was a cross-sectional survey of healthcare providers and learners in training that may have interacted with a clinical pharmacist at a rural community health center between August 2014 and December 2015. Institutional review board exemption was obtained. Healthcare professionals and students (n=22) were asked to complete a voluntary and anonymous survey to assess their perceptions of pharmacy clinical services on patient care. The survey consisted of 23 questions (22 multiple-choice and 1 open response), and was distributed via Qualtrics computerized response system via email. After the initial survey distribution, a two-week and four-week follow-up email was sent to those who were non-responders. Participants were only allowed to complete the survey once. Survey questions included responder demographics

and perceptions of their interactions with the clinical pharmacist and impact on patient care. Survey items were scored on a five-point Likert scale (e.g. strongly agree to strongly disagree). Participants completed surveys between April and May 2016. Data was analyzed using descriptive statistics.

Results: A total of 17 out of 22 healthcare professionals and learners responded to the survey, yielding a response rate of 77%. All respondents verified interacting with the clinical pharmacist. Fourth year professional pharmacy students consisted of 35% of responders, followed by physicians at 24%. Other responders were third-year medical students, nurse practitioners, and pharmacy residents. Over half of the respondents (56%) had previously interacted with clinical pharmacists and 100% rated these interactions as positive. Pertaining to encounters at the community health center, 100% of respondents either strongly agree (93%) or agree (7%) that the clinical pharmacist was well-prepared for patient interactions. Similarly, 87% strongly agree and 13% agree that the pharmacist was easily accessible and responded to patient care or drug information requests in a timely manner. All respondents were very comfortable with the pharmacist's accuracy and appropriateness with recommendations. All respondents either strongly agree (87%) or agree (13%) that recommendations were evidence-based, cost-effective, and patient-specific and patient counseling was accurate, effective, and thorough, Most (87%) providers and learners rated patients' perceptions of the pharmacist as positive. Twelve respondents (n=15) confirmed the pharmacist recommendations would either always (27%) or very often (53%) influence their care plan while 7% stated rarely and 13% unable to comment. Fourteen (93%, n=15) respondents either strongly agree or agree that the pharmacist enhanced the care provided to patients and positively influenced their practice.

Conclusions: Healthcare providers and learners in training had positive perceptions of a clinical pharmacist in a rural health center. Most respondents perceived the pharmacist as being well prepared, easily accessible, and contributing medication information in a timely and accurate manner. The information provided to providers and patients was perceived as cost-effective, evidence-based, and thorough. Healthcare professionals would allow the expertise of the clinical pharmacist to influence their patient care decisions most of the time and agreed that the pharmacist positively impacted patient care and their future practice. These results support clinical pharmacists being perceived as valuable members of the healthcare team in rural patient care settings.

Frequency and management of secondary bacterial infection in pediatric patients with respiratory syncytial virus (RSV)

Category: Best Student Rated Poster

Anna Cochrane, PharmD
Samford University McWhorter School of Pharmacy; Children's of Alabama, Birmingham, AL

Coauthors: Kim Benner, PharmD, BCPS, FASHP, FPPAG; Michele Kong, M.D.

Purpose/Background: Respiratory syncytial virus (RSV) infection results in upper and lower respiratory tract illness in the pediatric population and is a common cause of hospitalization during the winter months. Studies suggest the increased intensity of symptoms seen in some children with RSV lung disease is caused by secondary bacterial infections as opposed to RSV alone. Understanding the relationship between co-infection with RSV and bacteria can help guide therapy decisions. The purpose of this study was to determine the incidence of secondary bacterial infections in patients with RSV as well as common pathogens and antibiotics use to treat the bacterial infection.

Methods: The institutional review board approved this retrospective chart review. All patients admitted to the Pediatric Intensive Care Unit (PICU) of Children's of Alabama with confirmed RSV infection from 2012-2016 were enrolled. Data collected

included patient demographics such as age, gender, race, and weight. Patients' lengths of hospital stay and treatment measures (including type and duration of antibiotics, need for mechanical ventilation, length of supplemental oxygen support) were also collected. When applicable, additional patient culture data was gathered. Data collected was used to determine incidence of secondary bacterial infection in patients with RSV. Results were analyzed using descriptive statistics in order to determine incidence of bacterial co-infection, common antibiotics used, and durations of antibiotics.

Results: A total of 130 patients were included in the study. Sixty-two patients (47.7%) were found to have a secondary bacterial infection. The most common sites of infection were the lungs, urine, and blood representing 26.3%, 24.6%, and 19.3% of infections respectively. Haemophilus species (except H. flu) and MRSA infection occurred with the same frequency and represent the most common bacterial pathogens. The next most common pathogens were Pseudomonas aeruginosa and MSSA. Of the 107 patients who received antibiotics, the antibiotic regimen included vancomycin for 84 patients (78.5%), ceftriaxone for 48 patients (44.9%), and cefotaxime for 40 patients (37.4%). Cefepime, clindamycin, and ampicillin were each used in approximately 19% of patients. The average treatment duration for all antibiotics was 7.3 days. The longest treatment duration was 29 days (for a patient on vancomycin).

Conclusions: Pediatric patients with RSV infection who are admitted to the PICU are at increased risk for having a secondary bacterial infection. Further prospective studies are necessary to determine the true incidence and disease burden of bacterial co-infection in the setting of severe RSV infection.

Reliability of atherosclerotic cardiovascular disease and Framingham risk scores in predicting cardiovascular events in patients of low socioeconomic status

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Background: The Framingham Heart Study identified major risk factors for cardiovascular disease, resulting in the development of the Framingham risk score that assesses patients' 10-year risk of developing a cardiovascular event. The study population was comprised primarily of upper-middle class, Caucasian residents from Framingham, Massachusetts. Additionally, researchers compiled data from National Heart, Lung, and Blood Institute (NHLBI)-sponsored cohort studies to formulate the atherosclerotic cardiovascular disease (ASCVD) pooled cohort equation. A small portion of participants in the cohort studies represented patients of low socioeconomic status.

Objective: To evaluate the reliability of the ASCVD and Framingham risk scores in predicting cardiovascular events among patients enrolled in Medicaid.

Methods: The institutional review board approved this retrospective chart review. Using the electronic medical record, men and women from a family practice clinic in Birmingham, Alabama were identified if they were at least 40 years of age at baseline and enrolled in Medicaid. Patients were selected if they experienced a cardiovascular event at the age of 40 or older and if the patients' charts contained the necessary data to calculate the Framingham and ASCVD risk scores prior to the cardiovascular event. Data collection included the necessary variables to calculate the Framingham and ASCVD risk scores, whether or not statin therapy was initiated, and the nature of the cardiovascular event. A cardiovascular event was defined as the incidence of myocardial infarction, nonfatal ischemic stroke, hemorrhagic stroke, transient ischemic attack, angina, and heart failure. Once data were

collected, patients were categorized into groups based on their risk scores. The groups included risk scores less than 5 percent, 5 to less than 7.5 percent, 7.5 to less than 10 percent, 10 to 20 percent, and greater than 20 percent. The primary outcome was to identify a correlation between risk scores and cardiovascular events. The secondary outcomes were to identify cardiovascular correlations between age, sex, and race.

Results: A total of 23 patients were included in the study. Once ASCVD scores were calculated, four patients were placed in the <5% group, four patients were placed in the 5 to <7.5% group, nine patients were placed in the 10 to 20% group, and six patients were placed in the >20% group. Once the Framingham scores were calculated, one patient was placed in the <5%, 5 to <7.5%, and 7.5 to <10% groups. Thirteen patients were placed in the 10 to <20% group, and seven patients were placed in the >20% group. The average Framingham score for females was 15.8% versus 33.7% for males (p=0.03).

Conclusion: There was a correlation between Framingham and ASCVD scores and cardiovascular disease among patients enrolled in Medicaid.

The pharmacist's role in preventable adult diseases: vaccines

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Background: Pharmacists play a huge role in the education and administration of vaccines in the community setting. Vaccines are vital in preventing diseases. Most adults are in need of at least one vaccine and are either unaware or do not feel that they have access to the vaccine. Pharmacists can play a critical role in disease prevention by advocating and administering immunizations. However to make these significant interventions, pharmacists must stay knowledgeable about vaccines and their recommendations. Special population groups such as diabetes, COPD, asthma, and pregnancy are subsets of the population where simple interventions could be made that would result in significant outcomes. However, not all pharmacists are comfortable recommending vaccines to these populations or in general.

Objectives: The goals of the study are to assess baseline knowledge of vaccine facts, guidelines and recommendations and also to determine the impact of a live continuing education session (CE). Pre and post-exposure surveys will be used to help determine the areas in which pharmacists have knowledge deficits and the effect of a live CE on short-term knowledge.

Methods: Two identical one hour-long ACPE-accredited continuing education sessions were presented on November 12, 2016 to 110 pharmacists. Upon registration for the event the participants received an email containing a pre-exposure survey. The survey assessed their baseline knowledge of vaccine facts, guidelines, and recommendations. Upon completion of the presentation, participants received an email with an identical post-exposure survey.

Results: Of the 110 pharmacists who attended the continuing education sessions, 79 completed both the pre and post survey, resulting in a 71.8% response rate. The mean test scores increased significantly from 22% to 27% (p= 0.0007).

Conclusion: Although there were significant improvements of mean test scores following the continuing education session, the need for more education still exists. Major knowledge deficits were identified and further instruction is necessary.

Evaluation of safe medication practices in community pharmacies

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Introduction: Per research published in the Chicago Tribune, 52% of pharmacies missed common, significant drug interactions and dispensed interacting drugs together without warning the patient. Overall, of the 255 pharmacies tested for these errors, independent pharmacies failed 72% of their tests, while chain pharmacies failed 49%. The objective of this project was to identify poor medication safety trends within community pharmacies for future quality initiatives.

Methods: The Institute of Safe Medication Practices Self-Assessment for Community Pharmacies served as the needs assessment to identify the areas prone to medication errors. The ISMP Self-Assessment was conducted at four independent pharmacies identified through a practice-based research network. The ISMP Self-Assessment for Community/Ambulatory Pharmacies is divided into ten elements that most significantly influence safe medication practices and include: Patient information, Drug information, Communication of drug orders and other drug information, Drug labeling, packing, and nomenclature, Drug standardization, storage, and distribution, Use of devices, Environmental factors, workflow, and staffing patterns, Staff competency and education, Patient education, and Quality process and risk management. The 216-question self-assessment utilizes an A-E answer selection, with A representing "no activity", B representing "discussed for possible implementation", C representing "partially implemented", D representing "fully implemented in the pharmacy for some", and E representing "fully implemented in the pharmacy for all patients". For the presentation of results, the A-E answer choices correlate to 1-5, respectively. Descriptive statistics were utilized to identify the variations within the practice sites.

Results: As a practice based research network, the average overall score for the ISMP Self-Assessment was 3.01. An ideal rating for a pharmacy would be a score of 5, indicating full implementation of all practices that can reduce medication errors. Out of the ten domains assessed, there were five domains that fell below the average score for the network, which included Domains 1, 2, 3, 4, and 10. These five domains assess availability of patient information, drug information, communication of the drug orders and other drug information, drug labeling, packaging, and nomenclature, and quality processes and risk management.

Conclusion: The goal of this project was to identify areas of improvement for community pharmacies to reduce medication errors. This project is ongoing, and the follow-up portion of this project will be to return the assessment results to each of the pharmacies with a proposed plan for the identified areas where improvement is needed. There are plans to include more pharmacies in this project as it continues, along with further analyzing various measures of the results.

Relationship of lithium in drinking water to suicide and Alzheimer's mortality across fifteen Alabama counties

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Purpose/Background: Lithium is currently used as a treatment for bipolar disorder and depression and has shown reduced suicide in those patients. Recent studies have supplied evidence that lithium may also be effective at reducing suicide at much lower doses, such as those found in drinking water. Additionally, some research has found stabilization of Alzheimer's at similar low levels. The purpose of this study is to compare suicide and Alzheimer's mortality rates to natural lithium levels in the drinking water of Alabama. Due to the modern increase in bottled water consumption, lithium levels in seventeen brands and one spring were also determined.

Methods: Water samples were collected from 15 Alabama counties: the 5 with the highest suicide rates, the 5 with the lowest suicide rates and the 5 counties with the highest population. These counties were chosen to provide as much variety in demographic characteristics as possible, while ensuring a broad range of rates. Five water samples from each county were collected using uniform containers from homes, restaurants and other public spaces. Lithium levels were measured using an inductively coupled plasma emission spectrophotometer. The average of the five measurements was used to represent the lithium level for each respective county. Suicide and Alzheimer's mortality rate data was collected from the Alabama Center for Health Statistics and the Centers for Disease Control and Prevention (CDC) for the years 1999-2013. The average rate for this 15 year range was then plotted against the mean lithium level for each county to determine the correlation coefficient (r). Significance was decided using Spearman's rank correlation test with an alpha value of 0.05. Several potential confounding variables were also compared to suicide rate including: age, sex, income, poverty and divorce. For the bottled and spring water one sample from each source was collected and measured using inductively coupled plasma emission spectrophotometry.

Results: The plot of suicide rate versus lithium concentration showed an inverse linear relationship with a correlation coefficient of r equals -0.6286. Two counties were distinct major outliers; when removed the new r equals -0.8781. Spearman's rank correlation test gave a two-tailed p value of 0.0141 and without outliers p equals 0.0003. The correlation coefficient for suicide rate versus age-standardized Alzheimer's mortality rate was -0.2714 and p equals 0.3278. The male only suicide rate versus lithium concentration data remained significant, however, female only was significant only without the presence of outliers. Other confounders, with the exception of poverty, were not significant. Of the bottled waters sampled only 8 had a lithium concentration greater than 1 part per billion (ppb). The range of lithium concentrations for the counties was 0.4166 ppb to 32.88 ppb. The bottled water lithium concentrations ranged from 0 ppb to 12.5 ppb.

Conclusions: Lithium concentration in drinking water is inversely correlated with suicide rate but not with Alzheimer's mortality rate in 15 Alabama counties. The majority of sampled bottled water brands do not contain significant amounts of lithium. Further research into the nutritional essentiality of lithium is warranted.

Submission Guidelines for ALSHP's *InPharmative Quarterly* Clinical e-Journal Publication

InPharmative Quarterly Clinical e-Journal publication provides a forum for communication of relevant information for the practice of pharmacy. The publication encourages manuscripts from pharmacists, non-pharmacist in a pharmacy setting or academia, residents, and students. Types of contributions including original research papers, reviews, program descriptions, and short descriptions of clinical controversies or patient cases. The journal encourages new authors to submit manuscripts, and foster engagement in sharing of expertise.

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The journal will publish the following types of communications:

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Research papers
Research articles describe experimental or observational investigations that used formal methods for data collection and reporting of results of studies related to pharmacy practice (maximum 2000 words).

Reviews
Reviews are comprehensive, well-referenced descriptive papers on topics directly related to the practice of pharmacy such as new drug updates, disease state reviews or change in practice (maximum 2000 words).

Program descriptions and legislative updates
Program descriptions are descriptive papers outlining specific programs or service descriptions, upgrades and software changes, administrative items, and medication safety issues. To help promote practice development and progress, practice site descriptions and successful strategies implemented are very valuable as the role of pharmacy continues to grow in our state. Legislative updates are also welcomed to help keep members informed of changes affecting pharmacy practice. (maximum 1000 words).

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