Establishment of a Pharmacist-Managed Heart Failure Medication Titration Clinic

By: Mary Martin McGill, PharmD and Courtney Beindorf, PharmD
Birmingham Veterans Affairs Medical Center
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Section: Research

Introduction: The American Heart Association estimates that more than one million patients are hospitalized for a heart failure (HF) exacerbation annually, with readmission rates of 25% at one month.¹ Reducing readmissions has become a national priority.² It has been found that a multidisciplinary approach to management of HF improves clinical outcomes.³ The cardiology and pharmacy departments at Birmingham Veterans Affairs Medical Center (BVAMC) have collaborated to develop a pharmacist-managed heart failure medication management clinic in order to more closely follow-up with patients admitted to BVAMC with a HF exacerbation and reduce readmission rates.

Description: With the new clinic model, patients admitted with a diagnosis of heart failure exacerbation are visited by the Cardiology Clinical Pharmacy Specialist (CPS) for comprehensive heart failure education while inpatient. The patients are then enrolled into clinic and called within 48 to 96 hours post-discharge to re-educate and assess for HF signs and symptoms as well as dietary and medication compliance. A face-to-face clinic visit is scheduled within ten days post-discharge. Each patient enrolled into clinic is provided with the Cardiology CPS’s direct extension to call to report any weight gain or increase in symptoms as well as to use as a resource for medication refills and general questions and concerns.

Evaluation by the pharmacist during the appointments includes: optimization of medication therapy, modification or discontinuation of medication therapy based on current American College of Cardiology Foundation/American Heart Association Heart (ACC/AHA) HF guidelines and established scope of pharmacy practice, medical management of HF precipitating and exacerbating factors such as diabetes mellitus, coronary artery disease, atrial fibrillation, hypertension and dyslipidemia, allergies, contraindications and drug and disease state laboratory monitoring. In addition, the Cardiology CPS conducts a follow-up and plan to include prescription orders in the computerized patient record system (CPRS), evaluation or ordering appropriate laboratory tests (e.g. chemistry panel, lipid panel, HgbA1c and liver function tests) as necessary to monitor prescribed therapy, and consultation of
appropriate specialty clinics for management of comorbid conditions. If there is a concern for acute decompensation at the time of evaluation or an intervention is needed outside of the Cardiology CPS’s scope of practice, the Cardiology physician is consulted for further evaluation and management.

Results: The clinic launched on August 1, 2016 and has been consulted to manage more than 170 patients. Over 500 interventions in 6 months have been made by the Cardiology CPS. A retrospective chart review was conducted that included 51 HF patients seen in clinic between August 1, 2016 and December 31, 2016. Thirty-day readmission rates of the 51 clinic patients were compared to the readmission rates of 51 randomly selected patients admitted to BVAMC for a HF exacerbation between August 1, 2015 and December 31, 2015. The review was deemed a quality improvement project by the Institutional Review Board and results were reviewed by the BVAMC Privacy Officer. Data revealed a reduction in 30-day readmission rates from 24% before implementation to 18% after implementation of the pharmacist-managed HF medication management clinic; representing a 25% relative risk reduction in 30 day HF readmission rates. Additionally, 31% of patients enrolled in the HF clinic had an improvement in New York Heart Association (NYHA) symptoms classification. Interventions made by the Cardiology CPS included initiating and adjusting HF medications and managing HF risk factors such as diabetes, hyperlipidemia, and tobacco abuse. Pharmacists’ interventions led to an increase in percentage of HF patients on guideline-directed medical therapy (GDMT) from 56% at enrollment to 67% by January 31, 2017.

Conclusion: The BVAMC cardiology pharmacist looks forward to serving even more veterans with heart failure and hopes to see an even more profound improvement in outcomes with time. Overall, a pharmacist-led HF clinic may reduce readmission rates and improve the overall health of the patient.

References:

Impact of an interdisciplinary diabetes self-management education program in an underserved community

Morgan Alonzo, PharmD
Angela R Thomason, PharmD, BCPS
Samford University, McWhorter School of Pharmacy
Date Submitted: February 15, 2017; Accepted May 8, 2017

Introduction: Diabetes is a serious health condition that affects millions of Americans. Diabetics have to juggle not only the disease, but also the various complications associated with diabetes. Indigent populations are underserved and have a harder time accessing diabetes care. Therefore, pharmacists have the opportunity to fill this void by providing diabetes education and medication therapy management for this patient population. Also, there is limited data available on the impact pharmacists have on diabetes health outcomes of patients in indigent care. The purpose of the study was to determine the impact of an interdisciplinary diabetes self-management education (DSME) program on hemoglobin A1c (A1c) levels at six months post completion of the session compared to a control group in an underserved community.

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Methods: A retrospective chart review was conducted at County-managed Health Services ambulatory care, Center of Diabetes Excellence over a 10-month period (October 2014-July 2015). Patients were enrolled in the study based on the following inclusion criteria: at least 19 years of age, a diagnosis of type 2 diabetes mellitus, and a recorded baseline A1c. Subjects were referred from the primary care clinics within the health services’ ambulatory care center. The participants that attended the one-day interdisciplinary DSME program were noted as the intervention group. Topics that were covered are in Table 1. Patients that were scheduled, but did not attend were used as the control group. The primary endpoint was mean change in A1c at 6 months between the control and intervention group. The secondary endpoints included mean change in A1c at 3 or 6 months, systolic and diastolic blood pressure, and weight at 6 months post-DSME session. A1c levels were recorded if within a 45-day period of the date attended or scheduled to attend the DSME program by the participant. The same 45-day rule was used to record A1c values at 3 or 6 months. If a patient had both 3 and 6 month A1c value, then the 6 month A1c was included in the data set. Samford University’s Institutional Review Board approved the study. The data was analyzed using t-tests (PASW® Statistics 23 program).

Results: A total of 544 charts were examined. Of the 544 patients, 132 were excluded due to lack of baseline A1c. The average age was 51 years old with majority of the participants being female (64%) and African American (86%). There was no difference in the baseline A1c values between the intervention and control group (Table 2). At 6 months post-DSME program, the values were similar, respectively. In addition, the intervention group achieved a decline in A1c compared to the control group at 3 or 6 months post-DSME program (7.79 versus 8.32%, p=0.06). The intervention group attained a slightly lowered systolic and diastolic blood pressure compared to the control group at 6 months (Table 3). No statistical difference was noted in the participants’ weight between the control group and intervention group at 6 months post-session (Table 3).

Table 2: The average baseline and 6-month following of A1c (%) of the control compared to the DSME group.

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline (%)</th>
<th>At 6 months (%)</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>9.05</td>
<td>8.42</td>
<td>-0.63</td>
</tr>
<tr>
<td>DSME Intervention</td>
<td>8.95</td>
<td>8.04</td>
<td>-0.91</td>
</tr>
</tbody>
</table>

P-value was 0.363 based on t-test

Discussion: The results of this study showed that a mean reduction in A1C of 0.9% at 6 months with patients that attended a DSME session. Landmark trials have shown that with each 1 percent reduction in A1C, a 37% decrease in risk for microvascular complications and a 21% reduction in the risk of any end point or death related to diabetes can be achieved. In a study by McBrien, et.al, patients with an A1C greater than 10% reported more financial barriers to health care compared to patients with a lower A1C. Some of the barriers most commonly noted were not having access to drug insurance, medications, medical supplies or healthy foods. In addition, patients with A1C greater than 10% reported more encounters with other health professionals with pharmacist being the most prevalent. Other healthcare professional encounters reported by patients with diabetes were diabetes nurse, dieticians, social workers, and mental health worker. Lastly, diabetic patients reported lack of confidence and skills for self-management as a barrier to glycemic control.
Table 3: The average baseline and 6 month follow-up of blood pressure and weight.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>6 Months*</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight (pounds)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>212</td>
<td>213</td>
<td>+1</td>
</tr>
<tr>
<td>Intervention</td>
<td>212</td>
<td>211</td>
<td>-1</td>
</tr>
<tr>
<td><strong>Blood Pressure (mmHg)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>139</td>
<td>138</td>
<td>-1</td>
</tr>
<tr>
<td>Intervention</td>
<td>137</td>
<td>135</td>
<td>-2</td>
</tr>
<tr>
<td>Diastolic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>80</td>
<td>81</td>
<td>+1</td>
</tr>
<tr>
<td>Intervention</td>
<td>80</td>
<td>79</td>
<td>-1</td>
</tr>
</tbody>
</table>

No statistically significance based on t-test.

Limitations of the study include small sample size, self-selected population, and short duration. In addition, the study did not track the patients’ follow-up appointments with physicians or healthcare providers during the 6 months. These factors may have influence on the results of the study.

**Conclusion:** Patients that attended the interdisciplinary DSME program show a reduction in their A1c values at 3 or 6 months. Interdisciplinary DSME programs have a positive effect on patient outcomes; however, several barriers exist when treating the underserved population.

**References:**
Section: Short Communications

Can cinacalcet (Sensipar®) be crushed and administered via a feeding tube?

Lauren Johnson, Pharm.D. Candidate 2017  
Bernie R. Olin, Pharm.D.  
Associate Clinical Professor and Director, Drug Information  
Auburn University, Harrison School of Pharmacy  
Date Submitted: February 24, 2017; Accepted April 30, 2017

**Question:** Can cinacalcet (Sensipar®) be crushed and administered via a feeding tube? If so, are there any available compounding formulations to consider?

**Background:** An adult patient in acute/chronic renal failure with hyperparathyroidism needs cinacalcet. The patient has a nasogastric tube currently, but will receive a percutaneous endoscopic gastrostomy tube for long-term nutrition and medication administration. Everything the caller found indicates that cinacalcet must be swallowed whole, but does not explain why. The patient is being treated at this time with miacalcin injectable, but this is a very costly regimen that is not the primary treatment for her condition.

**Response:** Literature searches via Facts and Comparisons eAnswers, Pubmed, International Pharmaceutical Abstracts, and Google Scholar were performed that contained terms such as cinacalcet, crush, administration, dissolve, and nasogastric tube. Cinacalcet (Sensipar®) should be taken whole and not be broken or divided. After speaking with a pharmacist at the pharmaceutical company Amgen, they confirmed the wording in the package insert, as it has not been studied. It is a film coated tablet, but is not enteric coated or sustained release. (Personal communication: Medical information specialist, Amgen, 1-800-772-6436, September 20, 2016). However, there is a case report of a 2-year boy who had a gastrosomy tube in which cinacalcet was given successfully. They instructed the parents to crush a 30 mg tablet and mix it with 10 mL of water and give 5 mL of the solution to give a dose of 15 mg and to discard the remaining mixture. The patient’s serum parathyroid and calcium levels were able to be brought back to within goal range.

In another study involving 7 pediatric patients with chronic kidney disease (CKD) and secondary hyperparathyroidism, 30 mg tablets were ground, diluted with lactose monohydrate, and re-pressed into tablets containing 2.5 mg, 5 mg, and 7.5 mg of cinacalcet in order for the patient to receive 0.25 mg/kg. This study also showed that cinacalcet effectively reduced serum concentrations of parathyroid, calcium, and phosphorus.

**Conclusion:** The manufacturer has no data on the topic, but confirmed that the tablet was film-coated with no other properties that would be disrupted by crushing. However, based on several cases, it appears that cinacalcet can be crushed and given via a percutaneous endoscopic gastrostomy tube.

**References:**
Question: What is the role of Vitamin D to ameliorate myopathy due to statin therapy?

Background: A general question from a practitioner who was looking for the evidence that supported the use of vitamin D for statin-induced myopathy.

Response: A primary literature search was performed using Pubmed, Google Scholar, and the Cochran Library. The search terms included vitamin D, myopathy, myalgia, statins, cholecalciferol, ergocalciferol, statin intolerance, and myalgia. In addition, pharmacology texts were utilized for background information and medication-related questions, as well as individual drug databases.

The HMG-CoA (3-hydroxy-3-methylglutaryl-coenzyme A) reductase inhibitors (commonly known as statins), are competitive, structural equivalents of HMG-CoA reductase that are most effective at reducing low-density lipoproteins (LDL) by increasing high-affinity LDL receptors, resulting in increased LDL clearance from the blood. The statins within this class include lovastatin, atorvastatin, fluvasatin, pravastatin, simvastatin, rosvastatin, and pitavastatin. Statins have side effects which include arthralgia, diarrhea, headache, insomnia, and importantly, myalgia. Statin-induced myalgia is reported in approximately 27% of patients and is a common reason for discontinuing statin therapy. Metabolism of statins occur by different cytochromes such as CYP3A4 (simvastatin, atorvastatin, lovastatin) and CYP2C9 (fluvasatin). Pitavastatin is marginally metabolized by CYP2C9 and CYP2C8 while pravastatin and rosuvastatin are not primarily metabolized by cytochrome. The American College of Cardiology/American Heart Association (ACC/AHA) Guideline of the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults (2014), recommends that during statin therapy, if mild to moderate muscle pain symptoms occur, the patient should be evaluated for other conditions that might increase the risk for muscle symptoms such as reduced vitamin D levels.

Vitamin D2 (ergocalciferol) is a fat-soluble vitamin responsible for maintaining an appropriate calcium and phosphate balance and is required for normal bone growth and mineralization. Ergocalciferol is inactive until hepatically metabolized into its active metabolite, 25-hydroxyvitamin D (calcifediol). The labeled indication of ergocalciferol includes vitamin D deficiency and deficiency prophylaxis. Low vitamin D levels, without statin interference, can cause reduced muscle function, myalgia, and myositis. Levels <10 ng/mL can create severe muscle weakness and pain. Vitamin D metabolism includes induction of CYP3A4 and CYP2C9, and in conjunction with statins can help reduce statin-induced muscle toxicity by increasing metabolism of statins. Vitamin D can help improve muscle strength through interaction at a highly specific nuclear receptor in muscle tissue. Skeletal muscle contains vitamin D receptors that help with maturation of Type II muscle fibers. Muscle contractility and myogenesis is an important function of vitamin D, and this role is fulfilled by transportation of calcium into the sarcoplasmic reticulum, which is necessary for sarcomeric muscular contraction.

A recent study (2015) of vitamin D supplementation in statin-intolerant patients with myopathy showed that statin-induced myalgia in vitamin D deficient patients can be resolved by vitamin D supplementation. The study investigated 146 patients (74 men, 72 women) intolerant to > two statins due to myopathy, myositis, or myonecrosis, with concurrent low serum vitamin D levels (<32 ng/mL). The intervention included supplementation of oral ergocalciferol (50,000-100,000 units/week) with follow-up at six, 12, and 24 months. After normalization of serum vitamin D levels, statins were re-challenged, resulting in decreases in LDL levels and majority (>88%) of previously statin-intolerant patients free from myalgia, myositis, myopathy, and/or myonecrosis. The study concluded that statin-intolerance due to myalgia,
myositis, myopathy, or myonecrosis, in addition to low serum vitamin D levels, can be resolved by vitamin D supplementation (50,000-100,000 units/week) in most cases after six weeks of supplementation.

A recent meta-analysis (2015) aimed to demonstrate the role of serum vitamin D levels in statin-associated myalgia. The meta-analysis included seven studies with 2420 statin-treated patients divided into subgroups with or without myalgia. Plasma vitamin D levels were lower within the symptomatic subgroup (28.4 ± 13.80 ng/mL) compared to the asymptomatic subgroup (34.86 ± 11.63 ng/mL). One of the seven studies by Ahmed et al., showed that low serum concentrations of calcifediol (<20 ng/mL) are associated with myalgia and reduced muscle function. Lee et al., demonstrated the association of statin-associated myalgia, by reintroducing statin therapy in a subgroup of patients after repletion of vitamin D levels. This study included 11 patients with statin-associated myalgia, of which eight were vitamin D insufficient (<24.02 ng/mL) and three with severely deficient vitamin D levels (<12.02 ng/mL). After discontinuation of the statin and restitution of vitamin D, improvement in myalgia was attained during a three-month observation period. After three months, six patients agreed to rechallenge the same previous statin therapy and were able to achieve titrations above their original doses. The results of this study imply a correlation between vitamin D deficiency and statin-induced myalgia. The meta-analysis suggested a correlation between low plasma vitamin D levels and myalgia in patients on statin therapy, and that vitamin D supplementation can be a beneficial option for statin-induced myalgia patients.

In a retrospective review of data from the National Health and Nutrition Examination Survey (NHANES), an ongoing, cross-sectional survey Morioka et al., investigated whether vitamin D status was correlated with statin use and musculoskeletal pain. After data selection, 5907 participants from 2001 to 2004 were used in the analysis. Vitamin D status correlated to having a serum calcifediol value above or below 15 ng/mL. The study found no significant association between statin use and musculoskeletal pain when the calcifediol value is >15 ng/mL. The study concluded that in adults >40 years old with a calcifediol level <15 ng/mL, statin users reported musculoskeletal pains twice as much as non-statin users. This strengthened the hypothesis that vitamin D deficiency, <15 ng/mL, can increase the odds of experiencing muscle pains associated with statins.

**Conclusion:** In patients taking statins and experiencing muscle pain, low serum vitamin D should be considered. Raising the serum vitamin D levels may help with statin-induced myalgia. Mechanisms may include its ability to bind on vitamin D receptors on skeletal muscle and help with maturation of Type II muscle fibers. Also, vitamin D can induce cytochromes 3A4 and 2C9, and therefore may reduce the toxic effects of statins by increasing their metabolism. Vitamin D supplementation may benefit vitamin D deficient (levels <32 ng/mL) patients exhibiting muscle pain from statins. A recommendation then is to take oral ergocalciferol 50,000-100,000 units/week for a minimum of six weeks to decrease or resolve myalgia associated with statin use. This data supports the ACC/AHA recommendation to consider vitamin D deficiency as a risk factor for statin-induced myalgia.

**References:**


Role of vitamin D in asthma?

Alexandria Flowers, Pharm.D. Candidate 2017  
Bernie R. Olin, Pharm.D.  
Associate Clinical Professor and Director, Drug Information  
Auburn University, Harrison School of Pharmacy  
Date Submitted: February 24, 2017; Accepted April 12, 2017

Question: What evidence exists concerning the efficacy of vitamin D used to treat and/or prevent asthma?

Background: Due to the increasing need for inhalers in school children, a school nurse would like to know if there are other ways to treat asthma. A radio program recently mentioned that vitamin D can be utilized in asthma treatment and prevention, and they would like to know more about the efficacy of using vitamin D for asthma.

Response: In addition to using Pharmacotherapy texts, literature searches through PubMed and International Pharmaceutical Abstracts were performed that used terms such as vitamin D, asthma, treatment, prevention, efficacy that resulted in numerous relevant articles.

In a case-controlled study of 1,340 school-aged children (687 asthmatic and 653 controls) from communities of extreme poverty in Columbia were studied to determine if there is a relationship between vitamin D levels and IgE levels. Vitamin D levels were found to be naturally higher in the control group (61.9 ng/mL) versus the case group (53 ng/mL); however, total IgE levels were found to be higher in the case group when compared to the control group (0.27 and 0.22 respectively). The relationship between vitamin D and asthma symptoms has yet to be defined, but vitamin D is thought to influence specific IgE responses. IgE is an immunoglobulin antibody that is increased in those with asthma experiencing asthmatic symptoms.

In another case-controlled animal trial, using one-day old rat pups, vitamin D was administered via nebulizer at three different doses (1,25D, 25D, or the diluent) daily for 14 days. When compared to the controls, those nebulized with 25D and 1,25D had enhanced lung maturation as evidenced by increased expression markers of alveolar epithelial, mesenchymal, and endothelial differentiation, surfactant phospholipid synthesis, and lung morphology without any significant increases in serum 25D and calcium levels. Even though this study shows some positive outcomes of using vitamin D for lung maturation, the study was done on young rats that are not diagnosed with asthma, nor is it made clear whether the rats had a vitamin D deficiency, so it is hard to relate that back to the human asthmatic population.

In a meta-analysis of 435 children and 658 adults, investigators evaluated the use of vitamin D versus placebos efficacy in preventing and/or treating acute asthma exacerbations. The authors concluded that vitamin D is likely to offer protection against severe asthma attacks. People given vitamin D experienced fewer asthma attacks (decreased severity) requiring oral corticosteroids reducing the average number of attacks annually from 0.44 to 0.28. It also decreased the number of patients requiring hospitalizations (decreased frequency) due to acute asthma symptoms/attacks from 6% of patients down to 3% of patients. Doses (ranging from 500 IU daily to 100,000 IU) evaluated did not correlate with any adverse effects. Vitamin D did not offer any benefits on lung-function or day-to-day asthma

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symptoms. Those with frequent severe asthma attacks were underrepresented in the analysis, so further trials will need to be conducted focusing more on this population before definitive clinical recommendations can be made.4

Vitamin D is not included in the asthma guidelines, Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma.5 However, they were last published in 2007, so they should be updated in the near future and perhaps vitamin D will be mentioned.

Conclusion: Vitamin D supplementation may have some beneficial effects in terms of severity and frequency of asthma attacks by decreasing the number of patients requiring oral corticosteroids and reducing hospitalizations caused by severe asthma attacks. No dose or serum levels have been determined for this patient population and, research is still unclear as to whether supplemental vitamin D will only help those with a vitamin D deficiency or patients with asthma. The effects of vitamin D have not yet shown to treat acute asthma exacerbations in any studies conducted. As a whole, further studies should be conducted before patients are given any official advice on the use of vitamin D in the treatment/prevention of asthma.

References:

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

The 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 include 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:

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).
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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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Short descriptions of controversies or clinical pearls related to pharmacy practice. In addition, authors may submit patient cases with a review section about the problem and solution. (maximum 500 words)

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Email:kwbenner@samford.edu

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Clinical Team Leader, Department of Pharmacy
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Allison Meyer Helmer, PharmD, BCACP
Assistant Clinical Professor of Pharmacy Practice
Auburn University Harrison School of Pharmacy
Email:amm0085@auburn.edu

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Assistant Clinical Professor of Pharmacy Practice
Auburn University Harrison School of Pharmacy
Email:kmh0003@auburn.edu

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Associate Clinical Professor of Pharmacy Practice
Auburn University Harrison School of Pharmacy
Email:watsokm@auburn.edu

Nathan Pinner, PharmD, BCPS
Associate Clinical Professor of Pharmacy Practice
Auburn University Harrison School of Pharmacy
Email:nap0003@auburn.edu

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