Pharmacy Education, 2013; 13 (1): 165 – 171

Literature searching skills of first and third professional year pharmacy students

MICHAEL P. KRAJEWSKI[1*], FRED DOLORESCO[1,2], MARK J. WROBEL[1], DEBORAH CHIARELLA[3], CORY E. FOMINAYA[4], PETER M. BRODY JR.[1], LINDA M. CATANZARO[1]

[1]*University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, New York 14214, USA.*

[2]*University at Buffalo School of Public Health and Health Professions, Buffalo, New York 14214, USA.*

[3]*University at Buffalo Health Sciences Library, Buffalo, New York 14214, USA.*

[4]*Ralph H. Johnson VA Medical Center, Charleston, South Carolina 29414, USA.*

Abstract

Background: Few studies have evaluated literature searching skills of pharmacy students and how these skills change as student's progress through school.

Aims: Determine if there is a difference in literature searching and search results evaluation skills between first and third professional year students.

Methods: Rubrics to assess search strategy and article quality evaluated a drug information assignment given to both classes of students. Scores were compared.

Results: A statistically significant difference in results evaluation skills (p=0.001) and no difference in quality of search skills (p=0.8) was found between first and third year students. Third year students scored higher in search evaluation.

Conclusion: With no difference in quality of literature searches between the two groups, and the superior performance of third year students in selection of appropriate results, improved clinical knowledge may be sufficient to overcome a suboptimal search strategy. Speed and efficiency may be the benefits of an improved search strategy and need further study.

Keywords: *drug information, database search skills, pharmacy students*

Introduction

Drug information skills are an important element of effective pharmacy practice. The ability to effectively search medical databases to locate supporting literature forms the foundation of evidence-based pharmacy practice. The didactic portion of pharmacy school has traditionally been the expected time for students to develop proficiency in drug information retrieval in preparation for performing drug information tasks during advanced pharmacy practice experiences (APPE) in the final professional (P4) year and when practicing as pharmacists. With the recent addition of introductory pharmacy practice experiences (IPPE) to the curriculum of ACPE-accredited programs, students are often required to use these skills much earlier in their pharmacy education.

A recent search of electronic citation databases was performed to identify studies related to drug information searching skills of students in professional health science programs. Studies were identified assessing search skills of students in medical, dental, nursing, and allied health students, but few studies of pharmacy student search behavior have been reported (Berner *et al*., 2002; Burrows & Tylman, 1999; Carlock, 2007; Dorsch *et al*., 2004; Gosling & Westbrook, 2004; Gruppen *et al*., 2005; Huuskonen & Vakkari, 2008; Lawrence & Levy, 2004; Mattheos *et al*., 2004; Schutt & Hightower, 2009; Scott *et al*., 2008; Shaneyfelt *et al*., 2006; Shelstad & Clevenger, 1994; Van Moorsel, 2005). No previous studies addressed how progress through pharmacy school affects pharmacy student search strategy skills.

Because of changes made to the curriculum related to expansion of experiential education, an opportunity for improvement in the education of students in the Doctor of Pharmacy (PharmD) program at the University at Buffalo State University of New York, School of Pharmacy and Pharmaceutical Sciences (UB SoPPS) was identified. Drug information retrieval and database searching is introduced in the first semester of the first professional (P1) year. Historically, these skills had not been formally assessed until completion of a formal drug information assignment in the last semester of the third professional (P3) year. With the institution of IPPEs, a majority of students in the P3 year will have completed at least one IPPE drug information assignment before the end of the fall semester. The assignment is intended to help develop the students' skills in drug information retrieval and evaluation in the pharmacy practice environment and prepare them for practicing at a more advanced level during P4 APPE rotations. With the incorporation of IPPE into the curriculum, students are now

*Correspondence: Michael Krajewski, *Senior Research Scientist, 345 Abbott Hall, Buffalo, New York 14214, USA. Tel:+00 1 716 8295228; Fax: +00 1 716 8290415. Email: mpk5@buffalo.edu*

ISSN 1447-2701 online

required to use a skill that has not been reinforced with formally evaluated assignments since introduction in the P1 year. There is currently no instrument in place to evaluate students' preparedness in drug information skills before completing their first IPPE drug information assignment. Before making significant changes to the curriculum it would be beneficial to assess how the gap in the current curriculum has impacted drug information searching and literature retrieval skills of P3 pharmacy students by comparing to those of P1 students.

A retrospective quality examination project was performed to address this gap. The objectives were to determine if a difference in search skills between P1 and P3 pharmacy students exists and to identify what impact search skills have on the articles found and selected to answer a drug information question. Results of this study help characterize the development of literature retrieval skills as students progress through the PharmD program.

Methods

A comparison of the two classes was initially planned as an internal quality examination for the purpose of making future changes to the UB SoPPS PharmD curriculum. After determining that the academic community may benefit from knowledge of the study results, Institutional Review Board (IRB) approval was sought for publication. The project was given exempt status by the University at Buffalo Social and Behavioral Sciences IRB. Data collection was conducted in the fall of 2009 with data analysis completed in July 2010. A convenience sample was derived that included all students registered in two courses during the fall 2009 semester at UB SoPPS. Students registered in Pharmaceutical Care I (PC1), a required course for P1 students, represented P1 students. Students registered in Introduction to Pharmacy Practice Experiences III (IPPE3), a required course for P3 students, represented P3 students.

These courses were chosen based on their placement within the curriculum and their relationship to drug information and literature searching instruction and evaluation. In the PC1 course, drug information databases and literature searching strategies are introduced. The class includes didactic instruction and laboratory application of drug information database searching skills. The IPPE3 course is the first course in which drug information search and evaluation skills are formally evaluated. Faculty involved in both courses had previously identified that P3 students in IPPE were expected to complete drug information assignments with a two-year gap since they last received instruction on drug information searching. The IPPE3 course coordinator invited faculty that provided instruction in PC1 to provide a refresher for the P3 class. The decision was made to assign the same drug information search question to the PC1 and IPPE3 classes. Both classes received database searching instruction in their first semester of pharmacy school and both classes had received instruction on the topic of the drug information question. The P1 class serves as a surrogate for first exposure to database searching education and the P3 class serves as a surrogate for students progressing two years after the first exposure to the first application of database searching and assessment without formal assessment.

Students were given the drug information question, "Should ACE-inhibitors or ARBs be used to treat African American patients with hypertension?" and asked to submit a document with a screen capture of their search strategy as well as article citations for the five most relevant titles they would choose to answer the question. The assignment did not require students to write a response to the question. One week was given to complete the assignment. No directions were given as to which database or search tool was to be used for the assignment. Students were instructed to work independently on the assignment and were informed as to the purpose of the assignment and that the grade on the assignment would not impact the grade in the class. Feedback was given by faculty to each of the classes at the start of the spring semester. For analysis, photocopies were made of each assignment submitted by students in both classes. Evaluation of the results was blinded. This was accomplished by removing all student and class information from the copies which were used for evaluation by the search strategy and title selection evaluators. Randomly assigned identification numbers were used to link the analysis to subject demography for data analysis.

Assignment Evaluation

Dual evaluation was used to minimize bias and errors. Similar techniques have been used in systematic reviews (Buscemi *et al*., 2006). Rater scores were compared for a possible correlation to assess the rubrics ability to create consistent results. Score discrepancies were resolved by the raters prior to evaluation of the endpoints of the study. Two individuals, a pharmacy student with a Masters of Library Science and the librarian liaison to UB SoPPS, each individually evaluated the search strategies using a rubric (Appendix A) that was adapted from a previous study (Carlock, 2007). Article title selection evaluation was completed by the same pharmacy student and a faculty member. No previously published rubrics were identified that specifically met the criteria for evaluating title selections, therefore, a new tool (Appendix B) was developed. This tool was designed to assess the relevance of the article citation in addressing the drug information question. Only titles were considered for assessment, as the PC1 class had not yet received instruction on article evaluation.

For the database search strategy evaluation, terms were considered to be searched as subject headings if the database automatically mapped the search term to a subject heading or if a subject heading term was searched but not as a subject heading. Points for subject heading search were not awarded if the database did not allow searching by subject heading or some kind of controlled vocabulary. Students that used the "find similar articles" tool were excluded if the original search from which the "find similar" article was not included.

Similar rules were applied for the results evaluation process. The full citation submitted by the student was considered in the results evaluation. This included article title and journal title, but not the article abstract. As hypertension can be associated with multiple related disease states, a list of disease states considered acceptable for the disease state category of the rubric was created. For the preferred and acceptable article criteria of the rubric, the faculty rater determined the list of preferred and acceptable articles. Classification was not based on the conclusions of the author but rather on study

design. Preferred articles were large, randomized, double-blind studies, systematic reviews, or consensus statements of an organization that studies hypertension in blacks (Norris *et al*., 2006; Julius *et al*., 2004; Bakris *et al*., 2005; Wright Jr. *et al*., 2002; Douglas *et al.*, 2003; Wright Jr. *et al*., 2005; Brewster *et al*., 2004). Acceptable articles were not inferior to preferred articles in terms of content but study design was not as rigorous (Papademetriou *et al*., 2004; Fenves & Ram, 2002; Saunders & Gavin 3rd, 2003; Cohn *et al*., 2004; Douglas, 2005; McGill & Reilly, 2001; Mokwe *et al*., 2004; Moran *et al*., 2007; Ferdinand & Saunders, 2006; Appel *et al.*, 2008; Ferdinand & Armani, 2007; Wright *et al*., 2007; Weir *et al*., 2005; Bakris *et al*., 2002; Prisant *et al*., 2008; Maciejewski *et al*., 2006; Weir & Saunders, 1998; Flack & Sica, 2005; Arora *et al*., 2003; Flack *et al*., 2000; Weir *et al*., 2001).

Appropriateness to the drug information question was also considered when selecting these titles. This may have been a different level of evaluation of articles than what was performed by students on the assignments. By not forcing students to use a specific search tool it was expected that some students may submit results that were not from academic journals. These submissions were evaluated in the same manner as academic articles. The maximum obtainable score on the search rubric was 18. Despite theoretically having 25 available points on the title selection rubric, the scoring system had a functional maximum score of 22.

Statistical Analysis

The primary endpoint of this study is the difference in composite score of the search strategy between P1 and P3 students. The secondary endpoint is the difference in composite score of the title selection between the two groups. By examining the difference in search and article selection scores between these two groups, a determination may be made as to whether students continue to develop database search skills while progressing through pharmacy school or remain at their baseline level from their first professional year.

The Mann-Whitney-U test was used to compare the difference in database search scores and title selection scores between the two groups. A minimum difference of two points between the median scores of the two classes was defined as significant because this point difference would result in a change of a full letter grade (*e.g*. from an A- to a B-) had the activity been a graded assignment. Spearman's Rank-Order Correlation was performed to determine interdependence between database search scores and article selection scores, with an *r* of 0.7 or greater considered a strong correlation. (Sheshkin, 2007)

A power calculation was performed based on the parameters of the search strategy comparison to determine if the available sample size would be appropriate. The SAS (SAS Institute Inc., Cary, NC) macro UNIFYPOW was used to determine the power of the available sample size of 237 with an estimated dropout rate of 6% (O' Brien, 1998). Based on an a of 0.05, a minimum significant difference of two, and maximum standard deviation of 20%, the study would have power of at least 90%.

Results

After evaluation by both raters, initial scores were compared for inter-rater reliability (Figures 1 & 2). Each of the rater comparisons exhibited a strong correlation between scores ($r2 = 0.96$ for search score rater comparison and $r2 = 0.89$ for title score rater comparison). Following this comparison, raters reviewed results and determined a single consensus score for each submission to be used for further statistical analysis.

Figure 1: Search Rater Score Comparison

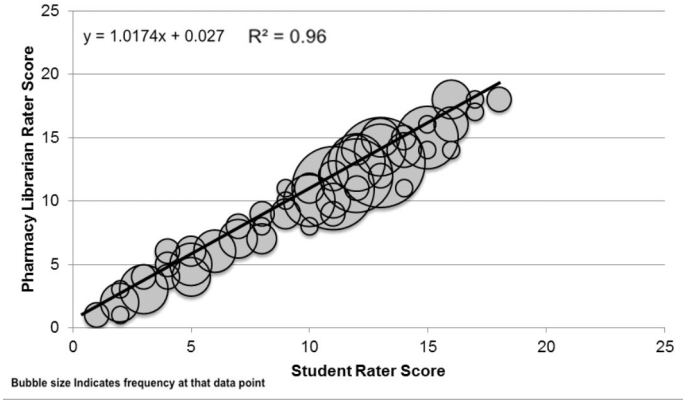
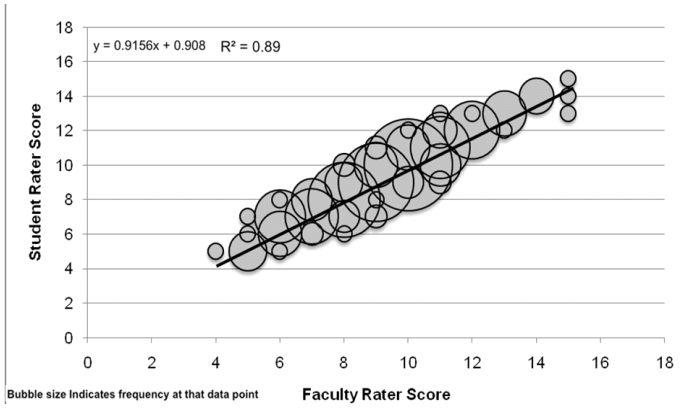


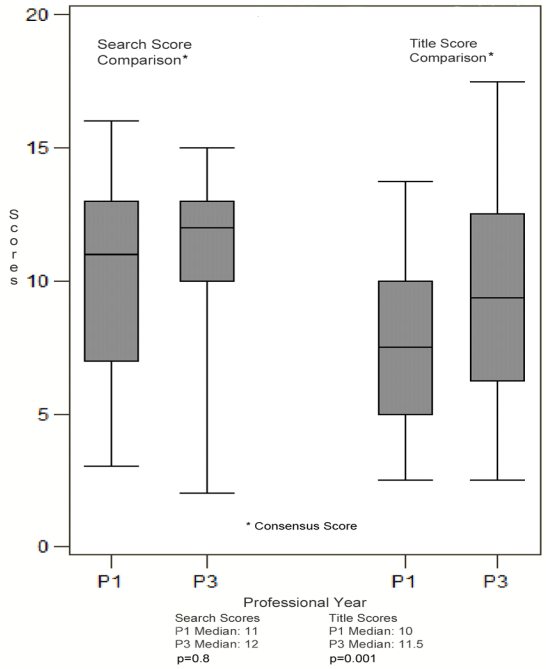
Figure 2: Title Rater Score Comparison



A total of 232 assignments from a total class population of 237 students were evaluated for inclusion in the analysis. Four students did not submit an assignment and one student was removed because of involvement in the study.

Figure 3 depicts results of the comparison of search scores and title scores between the two classes. For the search strategy analysis, 224 (96.6% of the population) assignments were evaluable, with 118 assignments (52.7%) from the P1 class and 106 assignments (47.3%) from the P3 class. Six assignments were removed because students failed to submit a screenshot from which a search strategy could be discerned and two were omitted from the analysis due to the use of the "find similar articles" tool. Of the eight removed assignments, 5 were from the P1 class and three were from the P3 class. Comparison of search scores indicated no difference in the mean sum of the ranks between the two classes (P1 median 11 vs. P3 median 12, p=0.8). Five of the 224 evaluable assignments (2.2%) received the maximum possible score (18) for this assessment.

Figure 3: Results Comparison by Class



A total of 231 assignments (99.6% of the population) were evaluable for the article title selection analysis, including 123 (53.2%) P1 assignments and 108 (46.8%) P3 assignments. One assignment was removed because the student failed to include a citation list of their article selections. The mean sum of the ranks was significantly higher for the P3 class compared to the P1 class (P3 median 11.5 vs. P1 median 10, p=0.001). No students attained the maximum possible score (22) for this assessment.

A total of 223 assignments (96.1% of the population) were included in analysis of the correlation of search score and title score, 118 assignments (52.9%) for the P1 class and 105 (47.1%) for the P3 class. Seven assignments were removed because the assignments lacked either a search or title score. The Spearman correlation coefficient for comparison of search and title scores was -0.026 for the P3 class and 0.097 for the P1 class. The correlation coefficient for both classes combined was 0.039 and this comparison is represented in Figure 4 and 5. These results indicated no meaningful correlation between quality of search strategy score and title evaluation score in either class.

Figure 4 Title Vs Search Consensus Score Correlation

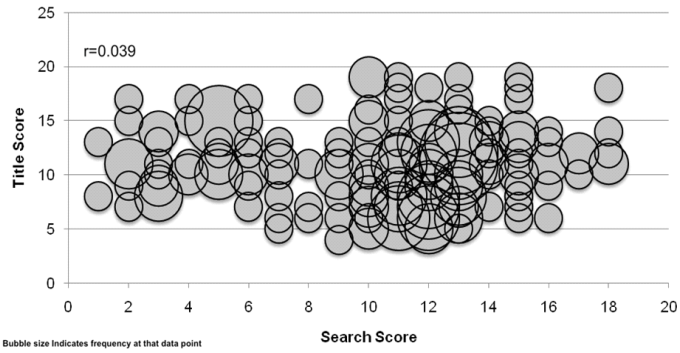
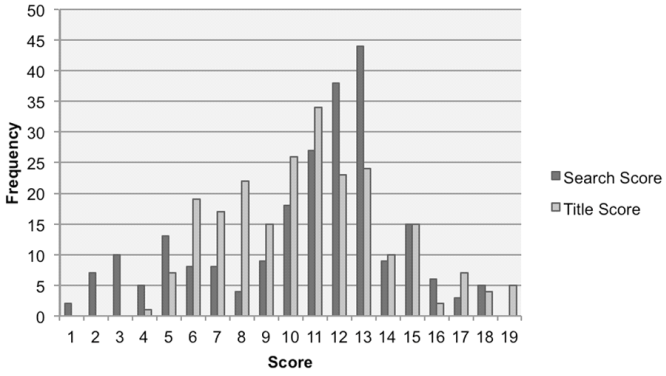


Figure 5: Frequency of Search and Title Consensus Scores



Discussion

This study shows a lack of improvement in pharmacy student search skills over time in the absence of reinforcement with formally evaluated assignments to assess drug information skills. The search assignment used for this study or a drug information paper are examples of potential reinforcement. Very few students attained the maximum score for each rubric, indicating that (a) there is room for improvement of these scores and (b) the reason a difference between the two groups was not detected was not due to a ceiling effect. This study provides an opportunity to understand the potential benefit of reinforcing and assessing drug information skills throughout the PharmD curriculum.

With no difference in search strategy score, a possible explanation for the higher article selection scores by the P3 class may be the greater clinical knowledge gained between the P1 and the P3 years. The impact of clinical knowledge also offers a plausible explanation for why the search and results comparison did not result in a significant positive correlation. A student taking the time to evaluate articles for appropriateness from a long results list could have found the same articles as a student performing a higher quality search with a shorter results list.

Further studies are needed to capture the efficiency with which students retrieve articles. The amount of time students spent conducting the searches was not captured with the assignment. The lack of strong correlation between high search score and high results score may call into question the need to teach database searching skills. Evaluating the time required to find quality articles may be a better measure to show the importance of quality search skills.

Limitations

The nature of this study has inherent limitations. The ideal method by which to study the progression of the P1 pharmacy students would be to test the students again during their P3 year instead of the current P3 students as a surrogate. This was not feasible due to the timeframe of the impending changes that the school is planning to implement in the curriculum. Without directly observing students during the assignment, there was no way to limit the possibility of students working together on the assignment or assess the amount of time students spent on the assignment. This may

make reproducibility of this study challenging but is indicative of student practices. In-class work, with direct student observation may be beneficial in limiting student cooperation.

The rubrics used for search strategy and title evaluation have not been tested for external validity. Further confirmation of the reproducibility of results from these rubrics and validation is needed. A more in-depth evaluation of literature evaluation skills would also be beneficial. Students were not asked to submit article abstracts, article database records, or the full text of the article. This was a limitation of the article selection evaluation but was beyond the scope of the assignment.

Conclusion

The provision of drug information will continue to be an important part of the pharmacists' professional duties in most if not all practice settings. Healthcare practitioners will continue to seek pharmacists' assistance when more complicated drug information questions arise. As the results of this study have shown, pharmacy students do not necessarily improve their search skills as they progress through pharmacy school. UB SoPPS has moved the drug information course to earlier in the didactic curriculum and, as a result of this study, has also begun implementing measures to reinforce and evaluate drug information skills earlier in the IPPE curriculum. The P1 class will continue to be assessed on database search skills. Retention of skills will be measured as will the effectiveness of training methods. Further study evaluating the efficiency of student search strategies is planned.

References

Appel, L.J., Wright Jr, J.T., Greene, T., Kusek, J.W., Lewis, J.B., Wang, X., Lipkowitz, M.S., Norris, K.C., Bakris, G.L., Rahman, M., Contreras, G., Rostand, S.G., Kopple, J.D., Gabbai, F.B., Schulman, G.I., Gassman, J.J., Charleston, J. & Agodoa, L.Y. (2008) Long-term effects of renin-angiotensin system-blocking therapy and a low blood pressure goal on progression of hypertensive chronic kidney disease in African Americans. *Archives of Internal Medicine,* **168,** 832-839.

Arora, R., Clark, L. & Taylor, M. (2003) Treatment of high-risk African American patients: left ventricular dysfunction, heart failure, renal disease, and postmyocardial infarction. *Journal of Clinical Hypertension (Greenwich, Conn.),* **5,** 26-31.

Bakris, G.L., Ferdinand, K.C., Douglas, J.G. & Sowers, J.R. (2002) Optimal treatment of hypertension in African Americans: Reaching and maintaining target blood pressure goals. *Postgraduate Medicine,* **112,** 73-84.

Bakris, G.L., Smith, D.H., Giles, T.D., White, W.B., Davidai, G. & Weber, M.A. (2005) Comparative antihypertensive efficacy of angiotensin receptor blocker-based treatment in African-American and white patients. *Journal of clinical hypertension (Greenwich, Conn.),* **7,** 587-595; quiz 596-597.

Berner, E.S., McGowan, J.J., Hardin, M., Spooner, A., Raszka, W. & Beckow, R.L. (2002) A model for assessing information retrieval skills of medical students. *Academic Medicine,* **77**, 547-551.

Brewster, L.M., Van Montfrans, G.A. & Kleijnen, J. (2004) Systematic review: Antihypertensive drug therapy in black patients. *Annals of Internal Medicine,* **141,** 614-627.

Burrows, S.C. & Tylman, V. (1999) Evaluating medical student searches of MEDLINE for evidence-based information: process and application of results. *Bulletin of the Medical Library Association*, **87**, 471-476.

Buscemi, N., Hartling, L., Vandermeer, B., Tjosvold, L. & Klassen, T.P. (2006) Single data extraction generated more errors than double data extraction in systematic reviews. *Journal of Clinical Epidemiology,* **59,** 697-703.

Carlock, D., Anderson, J. (2007) Teaching and Assessing the Database Searching Skills of Student Nurses. *Nurse Educator,* **32,** 5.

Cohn, J.N., Julius, S., Neutel, J., Wwber, M., Turlapaty, P., Shen, Y., Dong, V., Batchelor, A., Guo, W. & Lagast, H. (2004) Clinical experience with perindopril in African-American hypertensive patients: A large United States community trial. *American Journal of Hypertension,* **17,** 134-138.

Dorsch, J. L., Aiyer, M.K. & Meyer, L.E. (2004) Impact of an evidence-based medicine curriculum on medical students' attitudes and skills. *Journal of the Medical Library Association,* **92,** 397-406.

DOUGLAS, J. G. 2005. Clinical guidelines for the treatment of hypertension in African Americans. *American Journal of Cardiovascular Drugs,* 5**,** 1-6.

Douglas, J.G., Bakris, G.L., Epstein, M., Ferdinand, K.C., Ferrario, C., Flack, J.M., Jamerson, K.A., Jones, W.E., Haywood, J., Maxey, R., Ofili, E.O., Saunders, E., Schiffrin, E.L., Sica, D.A., Sowers, J.R. & Vidt, D.G. (2003) Management of high blood pressure in African Americans: Consensus statement of the hypertension in African Americans Working Group of the International Society on Hypertension in blacks. *Archives of Internal Medicine,* **163,** 525-541.

Fenves, A. & Ram, C.V. (2002) Are angiotensin converting enzyme inhibitors and angiotensin receptor blockers becoming the treatment of choice in African-Americans? *Current hypertension reports,* **4,** 286-289.

Ferdinand, K.C. & Armani, A.M. (2007) The management of hypertension in African Americans. *Critical Pathways in Cardiology,* **6,** 67-71.

Ferdinand, K.C. & Saunders, E. (2006) Hypertension-related morbidity and mortality in African Americans--why we need to do better. *Journal of clinical hypertension (Greenwich, Conn.),* **8,** 21-30.

Flack, J.M., Mensah, G.A. & Ferrario, C.M. (2000) Using angiotensin converting enzyme inhibitors in African-American hypertensives: A new approach to treating hypertension and preventing target-organ damage. *Current Medical Research and Opinion,* **16,** 66-79.

Flack, J.M. & Sica, D.A. (2005) Therapeutic considerations in the African-American patient with hypertension: considerations with calcium channel blocker therapy. *Journal of clinical hypertension (Greenwich, Conn.),* **7,** 9-14.

Gosling, A.S. & Westbrook, J.I. (2004) Allied health professionals use of online evidence: a survey of 790 staff working in the Australian public hospital system. *International Journal of Medical Informatics,* **73**, 391-401.

Gruppen, L.D., Rana, G.K. & Arndt, T.S. (2005) A controlled comparison study of the efficacy of training medical students in evidence-based medicine literature searching skills. *Academic Medicine: Journal Of The Association Of American Medical Colleges,* **80,** 940-944.

Huuskonen, S. & Vakkari, P. (2008) Students' search process and outcome in Medline in writing an essay for a class on evidence-based medicine. *Journal of Documentation,* **64,** 287-303.

Julius, S., Alderman, M.H., Beevers, G., Dahlof, B., Devereux, R.B., Douglas, J.G., Edelman, J.M., Harris, K.E., Kjeldsen, S.E., Nesbitt, S., Randall, O.S. & Wright Jr., J.T. (2004) Cardiovascular risk reduction in hypertensive black patients with left ventricular hypertrophy: The life study. *Journal of the American College of Cardiology,* **43,** 1047-1055.

Lawrence, J.C. & Levy, L.S. (2004) Comparing the self-described searching knowledge of first-year medical and dental students before and after a MEDLINE class. *Medical Reference Services Quarterly,* **23,** 73-81.

Maciejewski, S., Mohiuddin, S.M., Packard, K.A., Mooss, A.N., Reyes, A.P., Aryana, A. & Hilleman, D.E. (2006) Randomized, double-blind, crossover comparison of amlodipine and valsartan in African-Americans with hypertension using 24-hour ambulatory blood pressure monitoring. *Pharmacotherapy,* **26,** 889-895.

Mattheos, N., Nattestad, A., Falk-Nilsson, E. & Attstrom, R. (2004) original article The interactive examination: assessing students' self-assessment ability. *Medical Education,* **38,** 378-389.

McGill, J.B. & Reilly, P.A. (2001) Combination treatment with telmisartan and hydrochlorothiazide in black patients with mild to moderate hypertension. *Clinical Cardiology,* **24,** 66-72.

Mokwe, E., Ohmit, S.E., Nasser, S.A., Shafi, T., Saunders, E., Crook, E., Dudley, A. & Flack, J.M. (2004) Determinants of blood pressure response to quinapril in black and white hypertensive patients: The quinapril titration interval management evaluation trial. *Hypertension,* **43,** 1202-1207.

Moran, A., Simon, J.A., Shiboski, S., Pickering, T.G., Waters, D., Rotter, J.I., Lyon, C., Nickerson, D., Yang, H., Saad, M., Hsueh, W. & Krauss, R.M. (2007) Differential Effects of Ramipril on Ambulatory Blood Pressure in African Americans and Caucasians. *American Journal of Hypertension,* **20,** 884-891.

Norris, K., Bourgoigne, J., Gassman, J., Hebert, L., Middleton, J., Phillips, R.A., Randall, O., Rostand, S., Sherer, S., Toto, R.D., Wright Jr., J.T., Wang, X., Greene, T., Appel, L.J. & Lewis, J. (2006) Cardiovascular Outcomes in the African American Study of Kidney Disease and Hypertension (AASK) Trial. *American Journal of Kidney Diseases,* **48,** 739-751.

O' Brien, R.G. (1998) A Tour of UnifyPow: A SAS Macro for Sample-Size Analysis. In *Proceedings of the 23rd SAS Users Group International Conference*, *1998*. Cary NC: SAS Institute.

Papademetriou, V., Narayan, P. & Kokkinos, P. (2004) Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers in African-American patients with hypertension. *Journal of clinical hypertension (Greenwich, Conn.),* **6,** 310-314.

Prisant, L.M., Thomas, K.L., Lewis, E.F., Huang, Z., Francis, G.S., Weaver, W.D., Pfeffer, M.A., McMurray, J.J.V., Califf, R.M. & Velazquez, E.J. (2008) Racial Analysis of Patients With Myocardial Infarction Complicated by Heart Failure and/or Left Ventricular Dysfunction Treated With Valsartan, Captopril, or Both. *Journal of the American College of Cardiology,* **51,** 1865-1871.

Saunders, E. & Gavin 3rd, J.R. (2003) Blockade of the renin-angiotensin system in African Americans with hypertension and cardiovascular disease. *Journal of clinical hypertension (Greenwich, Conn.),* **5,** 12-17.

Schutt, M.A. & Hightower, B. (2009) Enhancing RN-to-BSN students' information literacy skills through the use of instructional technology. *Journal of Nursing Education,* **48,** 101-105.

Scott, S.D., Gilmour, J. & Fielden, J. (2008) Nursing students and internet health information. *Nurse Education Today,* **28,** 993-1001.

Shaneyfelt, T., Baum, K.D., Bell, D., Feldstein, D., Houston, T.K., Kaatz, S., Whelan, C. & Green, M. (2006) Instruments for evaluating education in evidence-based practice: a systematic review. *JAMA: The Journal Of The American Medical Association,* **296,** 1116-1127.

Shelstad, K.R. & Clevenger, F.W. (1994) On-line search strategies of third year medical students: perception vs fact. *The Journal Of Surgical Research,* **56,** 338-344.

SheshkinN, D.J. (2007) Handbook of Parametric and Nonparametric Statistics. 4th ed. New York: Chapman & Hall.

Van Moorsel, G. (2005) Library-sponsored instruction improves core informatics competencies among allied health students: a research-based case study. *Journal Of Allied Health,* **34,** 145-152.

Weir, M.R., Ferdinand, K.C., Flack, J.M., Jamerson, K.A., Daley, W. & Zelenkofske, S. (2005) A noninferiority comparison of valsartan/hydrochlorothiazide combination versus amlodipine in black hypertensives. *Hypertension,* **46,** 508-513.

Weir, M.R. & Saunders, E. (1998) Renin status does not predict the anti-hypertensive response to angiotensin-converting enzyme inhibition in African-Americans. *Journal of Human Hypertension,* **12,** 189-194.

Weir, M.R., Smith, D.H.G., Neutel, J.M. & Bedigian, M.P. (2001) Valsartan alone or with a diuretic or ace inhibitor as treatment for African American hypertensives: Relation to salt intake. *American Journal of Hypertension,* **14,** 665-671.

Wright Jr., J.T., Bakris, G., Greene, T., Agodoa, L.Y., Appel, L.J., Charleston, J., Cheek, D., Douglas-Baltimore, J.G., Gassman, J., Glassock, R., Hebert, L., Jamerson, K., Lewis, J., Phillips, R.A., Toto, R.D., Middleton, J.P. & Rostand, S.G. (2002) Effect of blood pressure lowering and antihypertensive drug class on progression of hypertensive kidney disease: Results from the AASK trial. *Journal of the American Medical Association,* **288,** 2421-2431.

Wright Jr., J.T., Dunn, J.K., Cutler, J.A., Davis, B.R., Cushman, W.C., Ford, C.E., Haywood, L.J., Leenen, F.H.H., Margolis, K.L., Papademetriou, V., Probstfield, J.L., Whelton, P.K. & Habib, G.B. (2005) Outcomes in hypertensive black and nonblack patients treated with chlorthalidone, amlodipine, and lisinopril. *Journal of the American Medical Association,* **293,** 1595-1608.

Wright, J.T., Jamerson, K.A. & Ferdinand, K.C. (2007) The management of hypertension in the African American patient. *Journal of clinical hypertension (Greenwich, Conn.),* **9,** 468-475.

Appendix A

Database Search Evaluation Rubric

Task	Not Used (0)	Poor (1)	Fair (2)	Good (3)
Subject Heading Search	No subject headings used, keyword search only	Subject headings used but most search terms are keyword (Less than 50% of terms are subject headings)	Almost all search terms used are subject headings.	All search terms are subject headings except when no mapping to subject heading is available
Relevancy of Search Terms	No concepts addressed, no relevance to topic	Some but not all concepts addressed	All concepts addressed – not all subject headings	All concepts addressed. Searched using subject headings
Subject Heading Selection	Subject heading selection is not appropriate to topic being searched	Subject headings selected but only some are related to topic (Less than 50% of terms are appropriate)	Almost all subject headings are appropriate to topic	All subject headings are appropriate to topic
Use of Boolean Terms	Search terms not combined with Boolean terms	Search terms combined with Boolean terms but used inappropriately	Search terms combined with Boolean terms but not always appropriately	All search terms combined using Boolean terms appropriately.
Use of Limits	No limits are used	Only limited to full text or English language or both	Limits used but incorrectly	Limits used and used correctly
Search Tool Selection	Internet search engine, Consumer health website	Google Scholar Scirus	Library multi -search tool or subscription database without controlled vocabulary (ie Mesh, Emtree terms)	Library subscription databases with controlled vocabulary or pubmed was used
* Rubric adapted from Carlock (2007)				

Appendix B

Article Selection Evaluation Rubric (based on article citation)

Criteria	Includes appropriate drug(s)/ therapies	Includes appropriate populations	Includes appropriate disease(s)/ condition(s) or related disease(s)/ conditions(s)	Acceptable (appears on list of acceptable articles chosen by faculty expert)	Preferred (appears on list of preferred articles chosen by faculty expert)
For each article selected evaluate each criteria and score 1 point if criteria is met, 0 points if criteria is not met. Articles appearing in the preferred list also count as articles in the acceptable list.					
Acceptable related disease states: Cardiac Patients Cardiovascular Disease Cardiovascular Risk Chronic Kidney Disease Diabetes Diabetic Nephropathy End Stage Renal Disease Heart Failure Hypertension (Blood Pressure) Hypertensive Kidney Disease Kidney Disease Left Ventricular Dysfunction Low Renin Hypertension Lower Extremity Arterial Disease Renal Failure					