RESEARCH BRIEF

Comparing Pharmacotherapy Instruction to the 2009 and 2016 ACCP Toolkit Recommendations

Ashley E. Woodruff, PharmD,[a] Nicole P. Albanese, PharmD,[a] William A. Prescott Jr, PharmD [a,b]

[a] University at Buffalo, School of Pharmacy and Pharmaceutical Sciences, Buffalo, New York
[b] Editorial Board Member, *American Journal of Pharmaceutical Education,* Arlington, Virginia

Objective. To compare pharmacotherapy instruction in Doctor of Pharmacy (PharmD) programs with the 2009 and 2016 American College of Clinical Pharmacy (ACCP) pharmacotherapy toolkits.

Methods. A survey was sent to representatives at US schools and colleges with PharmD programs. The survey consisted of questions pertaining to pharmacotherapy credit-hours, contact time spent for each therapeutic subject area, and pedagogical methods used. Data were analyzed using descriptive statistics.

Results. Representatives from 75 of 129 PharmD programs responded (response rate 58%). A median of 23 credit-hours were devoted to required pharmacotherapy. Infectious diseases and cardiology were taught with the most number of contact hours. Lecture was the most popular principal method of instruction delivery but the incorporation of case-based learning was also common.

Conclusion. Devoted curricular time to pharmacotherapy is adequate to provide coverage of tier 1 and 2 topics from the ACCP toolkit. PharmD programs should continue to review their pharmacotherapy coursework to adjust topic coverage as needed to incorporate active learning strategies whenever possible.

Keywords: pharmacotherapy, education, pharmacy, toolkit

INTRODUCTION

The American College of Clinical Pharmacy (ACCP) defines clinical pharmacy as the "area of pharmacy concerned with the science and practice of rational medication use."[1] ACCP also states that clinical pharmacists are "experts in the therapeutic use of medications."[1] The Accreditation Council for Pharmacy Education (ACPE) defines pharmacotherapy as "evidence-based clinical decision-making, therapeutic treatment planning, and medication therapy management strategy development for patients with specific diseases and conditions that complicate care and/or put patients at high risk for adverse events."[2] There is considerable overlap in the definitions of clinical pharmacy and pharmacotherapy.

Pharmacotherapy courses (also known as pharmacotherapeutics or therapeutics) are arguably the backbone of clinical pharmacy education. The 2016 ACPE Accreditation Standards mandate the inclusion of pharmacotherapy in the Doctor of Pharmacy (PharmD) curriculum but do not address the manner in which this material should be

taught. In an effort to ensure colleges and schools of pharmacy equip an "appropriately educated and skilled clinical pharmacy workforce," the ACCP Educational Affairs Committee published a pharmacotherapy toolkit in 2009.[3] This document outlined and prioritized pharmacotherapy topics that should be taught universally, providing pharmacy colleges and schools a resource for pharmacotherapy curricular development and revision. Their recommendations, which classified topics into three tiers, focused on both the breadth and depth of topic coverage. Tier I topics were identified as those that must be covered well, and tier II and III topics are those that could be covered if time allowed. Tier I topics were subclassified as tier IA (students should receive extensive instruction and training) and tier IB (students should be exposed to the topic). In 2016, the ACCP Educational Affairs Committee updated the toolkit and changed the focus of their recommendations to better mirror ACCP's current mission and vision: to promote pharmacists as collaborative, direct patient care providers.[4] The 2009 toolkit, which focused on topic coverage, was replaced with recommendations focused on practice competency level to better ensure that students would be prepared to enter patient care roles. The 2016 toolkit advocates that

Corresponding Author: Ashley E. Woodruff, University at Buffalo, School of Pharmacy and Pharmaceutical Sciences, 205 Kapoor Hall, Buffalo, NY 14203. Tel: 716-783-2736. Fax: 716-829-6093. E-mail: aew7@buffalo.edu

students should receive education and training on tier 1 and 2 topics: graduates should be prepared to provide collaborative, patient-centered care for tier 1 topics, but may require additional knowledge or skills after graduation, typically in the form of residency training, to provide collaborative, direct patient care for tier 2 topics. Tier 3 topics are those that are less likely to be taught in pharmacotherapy courses and graduates who practice in these areas are expected to acquire the knowledge and skills on their own to provide direct patient care. It should be noted however that neither the 2009 nor 2016 toolkit recommendations have been incorporated into ACPE Accreditation Standards.

There are now two published iterations of the pharmacotherapy toolkit providing guidance to pharmacy colleges and schools for pharmacotherapy curricular decision-making. There is a lack of data evaluating whether pharmacy colleges and schools are using this guidance or even have the capability to adhere to these recommendations within their curriculum framework. The authors of this brief sought to better characterize the current state of pharmacotherapeutic education by surveying pharmacy schools and colleges.

METHODS

Using the ACPE website, 129 candidate-status and accredited PharmD programs in the US and its territories were identified.[5] Programs having pre-candidate status during the 2013-2014 academic year and those located outside the US and its territories were excluded.

A survey instrument was designed to collect information about pharmacotherapy curricula at the identified PharmD programs. Demographic data for the responding programs that were not readily available on the American Association of Colleges of Pharmacy (AACP) or ACPE websites were requested from the programs. The primary objective of this study was to identify the credit hours assigned to required pharmacotherapy courses across pharmacy colleges and schools. Other pharmacotherapy curricula data that were collected included the number of faculty that teach within the pharmacotherapy courses, when these courses are introduced in the curriculum, time allotted per therapeutic section (eg, cardiovascular), and the pedagogical methods used. For each therapeutic section, respondents were asked to list the approximate number of in-class contact hours dedicated to that content. To assess pedagogical techniques, respondents were asked what types of instruction are used in the pharmacotherapy curriculum and what type was used most often. Definitions of instructional methods were provided from the MedBiquitous Standardized Vocabulary to reduce inter-respondent variability.[6]

An electronic hyperlink to the survey instrument was emailed to representatives from all identified PharmD programs. Representatives were identified through a Curriculum Special Interest Group email list purchased from AACP and an internally compiled list of pharmacy practice department chairs and associate deans of academic affairs. The survey instrument was initially distributed on November 10, 2014. Reminder emails were sent to institutions that had not yet responded on December 17, 2014 and January 28, 2015. The survey was closed on February 26, 2015. SurveyMonkey (Portland, OR) was used to collect survey responses.

Survey responses that included the number of credit hours devoted to the required pharmacotherapy sequence in the PharmD curriculum were considered useable. In situations when multiple completed surveys were received from the same program, a preferential order was assigned based on the respondents' academic position, with highest preference given to those deemed most likely to have the best understanding of the program's curriculum. The preferential order used to determine which responses would be used was: curriculum committee chair, pharmacy practice faculty, department chair, associate dean, and dean. The distribution of responses was determined using demographic data, geographic location, university affiliation (ie, part of an academic medical center or not) and type of institution (ie, public vs private). Geographic location was determined using the US Census Bureau.[7] In addition to response rate, representativeness of US pharmacy colleges and schools was confirmed by comparing demographic data of included institutions with the overall profile of US pharmacy colleges and schools.

When reporting credit hours, a multiplier of 2/3 was used to standardize semester credit hours for those programs that reported hours based on quarters. Respondents who provided credit hours less than or greater than one standard deviation from the median were manually verified by the investigators against published curriculum information on the institution's website. If the information provided by the respondent differed from published information on the institution's website, the credit hours from institution's website were used in the analysis.

Survey responses were analyzed using Microsoft Excel (Redmond, VA) and Prism software (Prism Software Corp., Irvine, CA). Descriptive statistics were reported, and data were analyzed using the Chi-square test or Mann-Whitney U test as appropriate. This study was deemed exempt by the University at Buffalo IRB.

RESULTS

Eighty-nine responses were received. Multiple responses were received from 14 PharmD programs. After duplicate criteria were applied, responses from 75 unique programs were included in the final sample set (response rate 58%). Representatives from US pharmacy colleges and schools were confirmed by comparing demographic

data of included institutions with the overall profile of US pharmacy colleges and schools. There was no statistically significant difference between the overall profile of US pharmacy colleges and schools and respondent programs regarding type of institution, geographic location and university affiliation. Demographic data are presented in Table 1. Each geographical region was represented in the sample population: the response rate from programs in the North region was 18/25 (72%), 29/50 in the South region (58%), 17/31 in the Midwest region (55%), 10/22 in the West region (45%) and other (Puerto Rico) was 100% (n=1/1).

The median credit hours devoted to required pharmacotherapy coursework in the PharmD curriculum of responding programs was 23 hours (IQR 17-30). There was no significant difference in the median credit hours offered by public and private institutions (24 vs 20, $p=.38$). The pharmacotherapy curriculum was most commonly initiated during the P2 year (65.3%). A smaller proportion of programs launched this curriculum during the P1 (28.0%) and P3 years (6.7%). Nearly all respondents indicated that more than 10 faculty members were involved in the teaching of their program's pharmacotherapy sequence (Table 1).

When evaluating therapeutic sections, infectious diseases, cardiology and hematology/oncology were taught most extensively, with a median of 36, 32 and 22.5 contact hours, respectively. Immunology, dermatology and men's health received the least coverage, with median contact hours of 5.5, 4 and 3, respectively (Table 2).

Greater than 50% of programs reported using a combination of case-based learning, large and small group discussion, independent learning, lecture, and team-based learning in their pharmacotherapy courses (Table 3). When asked which pedagogical technique was most utilized, lecture was most commonly cited (64%). However, a multimodal approach was common: 88% of programs reported using both lecture and case-based learning, while only 4% reported using lecture without case-based learning.

DISCUSSION

This survey found that respondent US PharmD programs devoted a median of 23 credit hours to required pharmacotherapy coursework, with the majority (65.3%) of programs initiating their required pharmacotherapy coursework in the P2 year. This indicates that programs include between 5 and 6 credit hours of pharmacotherapy content per semester (most commonly during the P2 and P3 years), or approximately one-quarter to one-third of required coursework within a 15-20 credit hour semester. This amount of coursework would seem reasonable, as pharmacotherapy is often the cornerstone course sequence of the PharmD program, encompassing a vast amount of

Table 1. Survey Respondent Demographics (n=75)

Title	n (%)
Pharmacy practice faculty	25 (33.3)
Assistant or associate dean	22 (29.3)
Chair of pharmacy practice	20 (26.7)
Curriculum committee chair	4 (5.3)
Pharmaceutical sciences faculty	2 (2.7)
Pharmacotherapy committee chair	1 (1.3)
Dean	1 (1.3)
Institution type	
Private	40 (53.3)
Public	35 (46.7)
Affiliation	
Part of comprehensive university	47 (62.7)
Part of an academic medical center	17 (22.7)
Standalone	11 (14.7)
Geographic Region	
North [a]	18 (24.0)
South [b]	29 (38.7)
Midwest [c]	17 (22.7)
West [d]	10 (13.3)
Other [e]	1 (1.3)
Class size	
≤50	0
51-100	37 (49.3)
101-150	23 (30.7)
151-200	9 (12.0)
>200	6 (8.0)
Number of faculty that teach within the pharmacotherapy sequence	
≤5	0
6-10	3 (4.0)
11-15	19 (25.3)
16-20	18 (24.0)
21-25	18 (24.0)
26-30	7 (9.3)
>30	10 (13.3)

[a]North: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont
[b]South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia
[c]Midwest: Indiana, Iowa, Illinois, Kansas, Michigan, Minnesota, Missouri, North Dakota, Nebraska, Ohio, South Dakota, Wisconsin
[d]West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming
[e]Puerto Rico

Table 2. Devoted Pharmacotherapy Contact Hours Per Therapeutic Subject Area

Therapeutic Subject Area	Contact Hours, Median (IQR)
Infectious Diseases	36 (29-60)
Cardiovascular	32 (22.5-48)
Hematology/oncology	22.5 (12-32)
Endocrinology	18 (10-27)
Psychiatry	17.25 (12-25)
Nephrology/Fluids/Electrolytes	15 (10-27)
Gastroenterology	14 (9-24)
Neurology	13 (10-20)
Respiratory	12 (8-18)
Women's Health	10 (6.75-16.25)
Critical Care	10 (4-15)
Musculoskeletal	9 (5-12)
Nutrition	6 (3-10.25)
Geriatrics	6 (3-10)
Pediatrics	6 (2.5-12)
Immunology	5.5 (3-10)
Dermatology	4 (2-9)
Men's Health	3 (2-5)

material. Additionally, the North American Pharmacist Licensure Examination (NAPLEX) focuses on pharmacotherapy and health outcomes emphasizing the need for a significant portion of the PharmD curriculum to be focused on these topics.[8]

The 2009 pharmacotherapy toolkit included a total of 161 topics, 100 of which were designated tier I topics, those that ACCP recommends schools/colleges cover universally.[3] In contrast, the 2016 toolkit includes a total of 276 topics, a 70% increase from the 2009 version; however, the number of tier 1 topics was reduced 13% from 100 in 2009 to 87 in 2016.[4] Assuming the 23 credit

Table 3. Pedagogical Techniques Used to Teach Pharmacotherapy

Technique[a]	n (%)
Case-based instruction/learning	52 (91)
Lecture	52 (91)
Discussion, large group (>12 students)	39 (68)
Discussion, small group (≤12 students)	35 (61)
Independent learning	35 (61)
Team-based learning	32 (56)
Problem-based learning	28 (47)
Self-directed learning	26 (46)
Simulation	25 (44)
Journal club	24 (42)
Laboratory	24 (42)
Workshop	5 (9)

[a]MedBiquitous Curriculum Inventory Working Group Standardized Vocabulary Subcommittee.[6]

hours that pharmacy schools and colleges dedicate to required pharmacotherapy coursework is distributed evenly across the P2 and P3 years (assuming a 15-week semester), PharmD programs are spending roughly 345 in-class contact hours teaching pharmacotherapy topics. The 2016 toolkit advocates quality over quantity and cautions against a bulimic learning strategy where students are given large amounts of material without opportunities to apply that information to develop skills required for patient care. PharmD programs should prioritize tier 1 topics but should also allocate time to teach tier 2 topics. To accomplish this, PharmD programs could cover tier 1 topics with 2.5 hours of contact time (on average), which could facilitate use of both didactic and active learning strategies (eg, 1.5 hours of lecture and 1 hour of active learning). Given the total of 345 contact hours (cited above), 127.5 hours would remain for coverage of the 133 tier 2 topics, which would allow for just under an hour per topic. It may be difficult to use active learning strategies to teach these topics given the limited amount of contact time, but incorporation of active learning techniques should be encouraged whenever possible.

The way in which pharmacotherapy is taught is crucial to facilitate graduates' practice readiness. This study revealed that 64% of programs use lecture most often to teach pharmacotherapeutics. When asked about other instructional methods used, 91% of programs reported using case-based instruction in their pharmacotherapy courses, the extent of which was not elicited. There are much published data indicating the benefits of case-based learning and other active learning pedagogies (over lecture), especially when used for higher levels of learning and assessment, as is commonly the case in pharmacotherapy courses.[9-13] The sheer number of topics that can be covered within pharmacotherapy courses may require the use of lecture for efficiency, but the recommendations from the 2016 toolkit should be recognized as an opportunity to review pedagogical approaches used to incorporate more application based, clinically oriented activities.

When evaluating contact hours per therapeutic section, infectious diseases, cardiology and hematology/oncology were covered most extensively at respondent programs with median contact hours of 36, 32 and 22.5 respectively. Coverage of infectious diseases and cardiology is consistent with the 2016 toolkit recommendations, wherein infectious diseases and cardiology sections have the most tier 1 and total topics. However, although there are 24 hematology/oncology topics included in the 2016 toolkit, only two are categorized as tier 1, both of which are hematology topics. It should be noted that the Hematology/Oncology Pharmacy Association (HOPA) published an "Alternative Viewpoint"

advocating inclusion of seven oncologic topics into the tier 1 class.[14] Immunology, dermatology and men's health received the least coverage according to the respondents with median contact hours of 5.5, 4 and 3 respectively. It is not surprising that men's health received the fewest contact hours from the survey respondents as the 2009 toolkit listed only two topics under this category: benign prostatic hyperplasia and erectile dysfunction. Both topics were moved into the urologic disorders subject area in the 2016 toolkit, given a tier 1 classification, while the men's health subject area was removed. The 2009 toolkit mentioned dermatologic disorders as a topic under the miscellaneous subject area, which is vague in terms of specific dermatologic conditions needing coverage. In 2016, dermatology was made into a subject area with seven specific topics listed, two of which are listed as tier 1 topics. There are four topics that comprise the immunology subject area in the 2016 toolkit, and only one is listed as tier 1. Given the minimal amount of tier 1 topics in these subject areas, it is reasonable that they might have fewer contact hours devoted to them.

In addition to the new dermatology therapeutic subject area, other notable changes between the 2009 and 2016 toolkit include incorporation of a toxicology disorders section that has 17 total topics, four of which are tier 1. This is in stark contrast to the 2009 toolkit that only mentions coverage of alcohol withdrawal and toxicology under critical care and accidental ingestions under pediatrics. Ear, nose and throat disorders were also added as a therapeutic subject area in the 2016 toolkit. Within it, there are seven topics listed and six of them are listed as tier 1. Each of these topics are new to the toolkit but most of them might fit into the self-care or nonprescription genre (eg, rhinorrhea, cerumen impaction, cough) and therefore may already be covered in other courses in the PharmD curriculum. Ophthalmic disorders were also added as a therapeutic subject area in the 2016 toolkit with three tier I topics and six topics overall. Lastly, there was a shift in the pediatrics section in 2016 where many topics that had previously been tier II or III in 2009 were moved to tier 1. This is likely reflective of the need to attain practice readiness in PharmD graduates, as mentioned in the 2016 ACPE Accreditation Standards for the entry level PharmD degree and endorsed in the 2016 toolkit, which must include all patient populations, not just adults. AACP, ACCP, and the Pediatric Pharmacy Advocacy Group (PPAG) are drafting a joint statement on pediatric pharmacy education that will complement the 2016 ACCP toolkit.

It seems pharmacy colleges and schools are devoting an adequate amount of curricula time to pharmacotherapeutic material. Based on the survey results and the changes between the 2009 and 2016 toolkit, it is reasonable for pharmacy colleges and schools to use these data to closely examine their pharmacotherapy course material and the way in which that material is taught at their institutions. A therapeutic subject area like hematology/oncology can require advanced post-graduate training and board certification to attain practice readiness. For subject areas such as this, it might be reasonable to reduce content to ensure coverage of any non-covered tier 1 topics in other therapeutic subject areas (if they exist). The reduction in recommended tier 1 topics in the 2016 toolkit should also serve as an opportunity for programs to evaluate pedagogical approaches used in these courses to incorporate more active learning strategies.

This study is not without its limitations, the first of which is the survey response rate of 58%. Although survey methodologies were used to increase the response rate, a multi-modal approach may have been beneficial. Because the response rate did not meet 60%, there is a risk of non-response bias; however, respondents' institutional demographic data were similar to the overall composition of US pharmacy colleges and schools.[15] There were no statistically significant differences when comparing the sample population to the composition of US pharmacy colleges and schools regarding institution type, geographical location and university affiliation. As such the authors feel that the survey data is representative of US colleges and schools of pharmacy despite the suboptimal survey response. Additional use of specific definitions (eg, contact hours and academic medical center) could have been provided in the survey to strengthen the data validity. Also, respondents were not asked if they used an integrated, modularized or systems-based approach in their curriculum that could have made delineation of specific credit hours devoted to pharmacotherapy difficult. The largest limitation is the timing of our survey, which occurred just prior to the publication of the 2016 toolkit. The survey was created using many of the 2009 toolkit subject areas and topics that made interpretation of these data more difficult when changes were published in 2016. This did, however, present a unique opportunity to compare the two versions, something that was not explicitly done previously.

CONCLUSION

There was a notable shift in the 2016 ACCP Pharmacotherapy toolkit toward practice competency over individual topic coverage. From this survey data, the time devoted to required pharmacotherapy curricula appears sufficient to enable PharmD programs to use ACCP's guidance by providing considerable coverage of tier 1, and to a lesser extent, tier 2 topics. However, continuous review of the time devoted to the various therapeutic subject areas should take place with incorporation of active-learning strategies, particularly for tier 1 topics.

REFERENCES

1. American College of Clinical Pharmacy. The definition of clinical pharmacy. *Pharmacotherapy.* 2008;28(6):816-817.

2. Accreditation Council for Pharmacy Education. Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree. Standards 2016. https://www.acpe-accredit.org/pdf/Standards2016FINAL.pdf. Accessed February 2, 2015.

3. American College of Clinical Pharmacy. 2009 ACCP Pharmacotherapy Toolkit. Pharmacotherapy Didactic Curriculum Toolkit 2009. http://www.accp.com/docs/positions/misc/pharmacotherapytoolkit.pdf. Accessed June 12, 2014.

4. American College of Clinical Pharmacy: Swinghammer TL, Crannage AJ, Boyce EG, et al. 2016 ACCP Pharmacotherapy Didactic Curriculum Toolkit. www.accp.com/docs/positions/misc/Toolkit_final.pdf. Accessed July 1, 2017.

5. Accreditation Council for Pharmacy Education. Preaccredited and accredited professional programs of colleges and schools of pharmacy. https://www.acpe-accredit.org/deans/schools.asp. Accessed June 12, 2014.

6. MedBiquitous Curriculum Inventory Working Group Standardized Vocabulary Subcommittee. Curriculum inventory standardized instructional and assessment methods and resource types (September 2012 version) Washington, DC, Association of American Medical Colleges; 2012. http://medbiq.org/curriculum/vocabularies.pdf. Accessed February 2, 2015.

7. US Census Bureau. Census regions and divisions of the United States. https://www.census.gov/geo/reference/gtc/gtc_census_divreg.html. Accessed July 2, 2014.

8. NAPLEX passing rates for 2014-2016 graduates. https://nabp.pharmacy/wp-content/uploads/2017/02/2016-NAPLEX-Pass-Rates.pdf. Accessed January 10, 2018

9. Dupuis RE, Persky AM. Use of case-based learning in a clinical pharmacokinetics course. *Am J Pharm Educ*. 2008;72(2):Article 29.

10. Garrison DR, Kanuka H. Blended learning: uncovering its transformative potential in higher education. *Internet High Educ*. 2004;7(2):95-105.

11. Pereira JA, Pleguezuelos E, Merí A, Molina-Ros A, Molina-Tomás MC, Masdeu C. Effectiveness of using blended learning strategies for teaching and learning human anatomy. *Med Educ*. 2007;41(2):189-195.

12. Deslauriers L, Schelew E, Wieman C. Improved learning in a large-enrollment physics class. *Science*. 2011;332(6031):862-864.

13. Brown SD, Pond BB, Creekmore KA. A case-based toxicology elective course to enhance student learning in pharmacotherapy. *Am J Pharm Educ*. 2011;75(6):Article 118.

14. Nightingale G, Saunders IM, Comeau JM, et al. Hematology/Oncology Pharmacy Association Entry-level Competencies Task Force Response Statement to the 2016 American College of Clinical Pharmacy Pharmacotherapy Didactic Curriculum Toolkit. *Pharmacotherapy.* 2017;37(5):e30-e31.

15. Fincham JE. Response rates and responsiveness for surveys, standards, and the Journal. *Am J Pharm Educ*. 2008;72(2):Article 43.