Research-related Curriculum and its Applications in US College of Pharmacy Programs

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ABSTRACT

Specific Aims: To quantify the number of PharmD programs that require completion of a research project. To describe the types of research being undertaken within PharmD programs. To compare current responses with those obtained in the last survey (2007).

Methods: Collaborative effort including students and faculty at three pharmacy programs (AZ, FL and MI). Cross-sectional analysis utilizing the survey (with modifications) developed in 2007. Peer review of questions (face-validity); format included dichotomous response, multiple-choice, and open response. Qualtrics® survey distributed via email to Academic Affairs (or comparative) Dean at AACP affiliate institutions. Descriptive analyses; duplicate responses combined when possible. Project was deemed exempt by IRB.

Main Results: Seventy-four programs responded (54% response rate). A total of 22 (30%) programs have a required student research project compared to 25% in 2007. Project requirements were similar among the programs requiring a project: proposal (95%), IRB application (90%), collect and analyze data (77%), prepare a written report (86%), and present findings (82%). The most common methods of collecting data were surveys (91%) and chart reviews (86%). Research related coursework was similar between programs except for research methods courses, which were 36% among programs requiring a research project, and 14% among those not requiring a project.

Conclusions: The number of programs requiring student research appears to have increased since 2007. Based on the survey data, students could expect to have similar

research experiences in any of the colleges requiring a research project. Most colleges provide coursework related to research.

Research-related Curriculum and its Applications in US College of Pharmacy Program

INTRODUCTION

This study was conducted to determine the importance of research based projects as part of the PharmD curriculum with accredited pharmacy programs within the United States.

It is critical for current pharmacists to have the skills to be able to read and analyze current literature. As new information comes out in studies pharmacists need to be able to evaluate the content and be able to relay to information to colleagues and patients. To improve the health of patients, pharmacist require the capability to take new information that is gained and incorporate it into the healthcare of patients. It is valuable for current students to be given the education that allows them the knowledge to be able to read and understand science literature.

Other research studies have been conducted on the importance of literature review and research methods taught in the PharmD program. Past studies have shown that less than 50% of the PharmD programs in the United States have research based projects (Murphy, 1997).

The University of Arizona College of Pharmacy since 1988, has required students to complete research projects that are evaluated before graduation. The primary intent of the research project is to educate pharmacy students the soon to be pharmacists in the

problem solving process that is a fundamental skill every healthcare professional needs. The University of Arizona College of Pharmacy does requires the students to do a formal presentation of the project, this will give the students the necessary skills of public speaking and presenting a topic that they are well versed on.

The purpose of this study was to quantify the number of PharmD programs in the United States that require completion of a research project, to describe the types of research being undertaken within PharmD programs and to compare current responses with those obtained in the last survey (2007).

METHODS

Design This cross sectional descriptive study will use data obtained from an online survey.

Subjects The subjects in this study will be associated with each PharmD program within the United States. The survey will be sent to an academic affairs dean of that PharmD program through a list created of all College of Pharmacies. There are 138 PharmD programs in the United States. This project was approved by the University IRB committee.

Measures Data were collected from a questionnaire adapted from the Murphy study in 2007. Responses from questionnaire will apply as dependent variables. Descriptive variables will include size of school, location and public vs private for all accredited colleges of pharmacy in the United States. We will also look at the school systems and see if they are quarter or semester, or if the research-related coursework offered is required, elective or both.

Data collection A list from the American Association of the College of Pharmacy will be used to identify participants. The selected persons will include the Deans' and department heads of academic affairs at the college of pharmacy, which will be emailed a cover letter that

will explain the project, a link to the online survey through Qualtrics, when the survey is due and the confidentiality of the data. Procedure will include sending to one person, if no response then follow up email, and if no response finally a phone call. If no response, repeat to a second associate of that college of pharmacy.

Data analysis Data were analyzed by calculating summary statistics. Comparisons between colleges with required projects to colleges without required projects were made using a Chi Square test. The a priori alpha level is 0.05

RESULTS

A total of 74 colleges returned the questionnaire for a 54% response rate. A total of 22 colleges (30%) stated that their curriculum included a required research project. As shown in Table 1, the types of research related courses offered were generally similar between the colleges that required a student research project and those who did not. Both types of colleges offered statistics, literature evaluation, or a combination course. Colleges that required a student research project were more likely to have a separate course in research design (36%) than colleges not requiring a student research project (13%; $p = 0.025$). Both types of colleges offered electives related to research but colleges requiring research projects were more likely to offer other courses (e.g. writing, meta-analysis) than colleges not requiring research projects.

Of colleges offering only elective student research programs, 33% reported that less than 10% of students participated, 34% reported that 10 to 50% of students participated in research, while two programs reported that more than 50% participated. Twenty-five percent could not estimate how many students participated.

When all colleges responded to a question of whether allocations of faculty time and support for student research projects was adequate, 63% responded that allocations were adequate or more than adequate. Allocations were considered inadequate by 26% while 12% reported that they were pursuing additional allocations.

Most colleges offering some type student research (58%), graded student research using letter grades, about a third (34%) used pass/fail, and 7% indicated that student research was not graded. In addition, the maximum number of students allowed to work together as a group varied widely among the colleges. Twelve colleges (18%) indicated that students must work independently. Another 14 (21%) limited student groups to two or three while 16 (22%) had no limits on group size. The remaining programs allowed from four to six students per group.

Mandatory Student Research Projects

As shown in Table 2, project requirements among colleges with mandatory student research projects were similar. At least 90% of mandatory programs required a proposal and an IRB application. Somewhat fewer programs required students to prepare a written report (86%) and present a poster (82%). Collecting and analyzing data was required by the fewest programs (77%). There was some variability in the proposal review process. Half the programs (50%) had the project advisor review the proposals and 27% had the course coordinator review them. Only one program had a second faculty member review proposals while three programs (14%) had two faculty members review the proposal.

The most common methods of collecting data were surveys (91%), and chart reviews (86%) while 82% used some type of clinical measure (e.g. HA1c, blood

pressure). Retrieval of data from a database and systematic review methods were used somewhat less (77% & 64% respectively). The least used method was direct observation (41%). Nine programs (41%) indicated that they had some restrictions on the types of projects that students could conduct. These restrictions included that the projects must be related to pharmacy and generate new data, that the project was approved by the Institutional Review Board (IRB), that the student body cannot be used for survey research, and the projects cannot involve radioactive substances.

While most colleges (89%) indicated that internal college faculty could serve as project mentor/advisor, 35% indicated that external pharmacy faculty (e.g. non-salaried preceptors) could serve and 30% that non-pharmacy faculty at the college or university could serve as advisors.

When asked if colleges had removed the requirement for student conducted research in the past 10 years, seven colleges (9%) responded yes. When asked which factors contributed to any change in the student research program, the top ranked reason cited was that student research projects were not of sufficient quality to address desired learning outcomes (average rank = 4.4 [SD=1.5] of 6 choices) and the least cited reason was increasing class size (average rank = 1.6[SD=1.1]). Reasons such 'Students were opposed to the projects', 'faculty were opposed to the projects' and 'Insufficient administrative support' were ranked 3.2 (SD=1.2), 3.6 (SD=0.8), and 3.8 (SD = 1.1), respectively. One college reported that they had changed the student research project from elective to mandatory.

<u>Research curriculum compared from 2007 to 2019</u>

When the findings of this study were compared to a similar study conducted in 2007, the proportion of pharmacy colleges having a required student research project was similar. In this study, 22 of 74 (30%) required a student research project, in the 2007 study, 20 colleges (25%; $p = 0.374$) required a project. However, in this study, it appeared that students were more likely to participate in elective research. In the 2007 study, 78% of elective research programs were estimated to involve less than 10% of students while in this study, only 33% of elective research programs reported student participation as less than 10%. It also appears that more colleges (9%) may have discontinued student research programs between 2007 and 2019 than was reported in 2007 (3%). With respect to offering coursework supporting research, 37% of all programs in this study offered combination courses that included statistics, research design, and/or literature evaluation in addition to the programs that had a required research methods course (20%), required statistics courses (39%), and required literature evaluation (51%). In 2007, all course work was reported as separate courses. Literature evaluation was required by 94%, statistics by 71%, and research methods by 53%. Finally, large class sizes was the lowest ranked reason for discontinuing student research projects in this study but was the primary reason identified in the 2007 study as a reason for not requiring projects.

DISCUSSION

Summary of Important Findings

The coursework topics used in required and not required research projects had similar use in PharmD curriculum with statistics, literature evaluation and any course with a combination of topics. As required research projects were less likely to include

electives into their coursework by half the percent (18% v 35%), it was not statistically significant. Research methods was the only concrete topic that proved it was integrated more in required than non-required projects on a statistically significant basis.

The most common project requirements included were proposal and IRB application for mandatory projects, while collecting and analyzing data were least common. It seems that IRB applications are becoming more necessary for research projects, as only one more additional project needed a proposal (91% v 95%). It may be best to always get IRB approval for future research projects if this trend continues to avoid any unnecessary obstacles down the road. Collecting and analyzing data may be the least because retrospective studies may be utilized more often with limited project time frames. The most common form of data collection was surveys for mandatory projects, while the least was direct observation of activities. It is understandable why surveys are used more commonly as there is usually a limited amount of time for data collection with student research projects. Surveys make data collection more convenient to get more data points to analyze quicker. Direct observation on the other is more timely, which may not lead to an adequate amount of data collection to come to a conclusion.

Comparison to 2007 Study

There were a few differences noted when making a comparison to the 2007 study. There was a higher percent of required student projects in this study, but it was not by a statistically significant amount. When compared to the 2007 study though, students in PharmD programs substantially utilized elective research programs more often. It should also be noted that programs in this study offered more combination coursework when compared to 2007.

Limitations

There were a couple limitations to overcome during the process of survey distribution. As our group was able to get a list of US accredited PharmD programs, we were not able to get a list of individuals appointed Assistant/Associate Dean for Academic Affairs, who we would be sending the survey to. It was difficult to find a person appointed such as for several PharmD programs and would have to select individuals with different, but similar titles including Director of Assessment/Curriculum. This might have lead to incorrect individuals being contacted, but it was always mentioned through email and phone that the survey should be forwarded to anyone they thought would be better suited to complete the survey. The other survey limitation was being able to get responses for the survey. Two emails explaining the survey with it attached at the bottom had been sent out over 7 weeks. During that time we only had a 19% (26/137) response rate, and when an additional email was sent after then the response was only 26% (35/137). After the lack of responses, a call script was compiled and all PharmD programs that had not yet replied were called at least once, possibly up to three times over a 3-week span. This was a great intervention as it had more than doubled our response rate to 54% (74/137). A 54% response rate would be difficult to make a broad conclusion on how research is offered in PharmD programs though, as no response was heard from slightly less than half.

CONCLUSIONS

The proportion of colleges of pharmacy that offer student research experiences appears to have modestly increased in the last 10 years. However, perhaps the biggest change from the previous study was the growth in the proportion of students who

complete elective research projects. The content of required research programs was quite consistent across programs and most colleges provided coursework related to research regardless of whether or not a research project is required of students.

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Table 1: Comparison of Types of Additional Research Related Courses Offered by Related to Research for Colleges with and without that do and do not have a Required Research Project

Coursework Topic	Required Research Project, N = 22	Research Project Not Required, N = 52	P-Value
Statistics (N, %)	10 (45%)	19 (37%)	0.472
Literature Evaluation	12 (55%)	26 (50%)	0.720
Research Methods	8 (36%)	7 (13%)	0.025
Combination	10 (45%)	19 (37%)	0.472

Electives	**4 (18%)**	**18 (35%)**	**0.157**
Other	**13 (59%)**	**6 (12%)**	**<0.001**

Table 2: Characteristics of Mandatory Student Research Projects (N = 22)

Characteristic	Number	Percent
Project Requirements		
Proposal	**21**	**95%**
Submit IRB application	**20**	**91%**
Collect and analyze data	**17**	**77%**
Prepare a written report	**19**	**86%**
Present findings (e.g. poster)	**18**	**82%**
Project Review Process		
Proposal not required	**1**	**5%**
Reviewed by project advisor	**11**	**50%**
Reviewed by course coordinator	**6**	**27%**
Reviewed by second faculty member	**1**	**5%**
Reviewed by at least 2 faculty members	**3**	**14%**
Types of Data Collection Methods Used		

Chart reviews	10	45%
Surveys	20	91%
Systematic review	14	64%
Clinical measures (e.g. blood pressure, glucose measures)	18	82%
Direct observation of activities (e.g. patients, clinicians)	9	41%
Data retrieval from a database	17	77%
Bench laboratory procedures	16	73%
Other	3	14%

Collaborative Survey Test (USF, UM, UA)
Start of Block: Default Question Block
Q1 Please provide the name of your college/school of pharmacy

_____

For the purposes of this survey, student conducted research is being defined generally as "posing research questions and devising methods to obtain suitable solutions, with or without actual data collection and analysis." Review papers on therapeutic or other topics should NOT be considered student conducted research, nor should simple service as an assistant to a faculty member on one of their projects.
Q2 Does your college/school have a required or elective student conducted a research project during the professional curriculum? Check all that apply (if both required and elective ONLY complete question 3)

☐ **No (1)**

☐ **Yes - Students must conduct research for a required stand-alone course or as part of another required course. (2)**

☐ **Yes - Students mayconduct research for electivecredit in a specific course (other than independent study). (3)**

☐ **Yes - Students mayconduct research for electivecredit as *independent study.* (4)**

Skip To: Q15 If Does your college/school have a required or elective student conducted a research project during... = No

Q3 What are the differences between the required and elective research projects?

_____

Q4 If your college/school offers only elective opportunities for student conducted research and not a required project, estimate the percent of students who will have completed a project by graduation. If your college/school requires a project, skip to the next question.

O **(1)**

O **10% to 50% (2)**

O **>50% (3)**

O **Can't estimate (4)**

Q5 Which of the following are requirements for your college/school's student conducted research projects? Please check all that apply.

☐ **Develop a written proposal for the project (1)**

☐ **Prepare and submit a human or animal subjects review board submission (when applicable) (2)**

☐ **Collect data (3)**

☐ **Analyze data (4)**

☐ **Prepare a written report (5)**

☐ **Present/defend findings at the college level or beyond (e.g., poster or platform presentation) (6)**

☐ **Other (please describe): (7)**

_____

Q6 How are the projects graded? (Check one)

O **pass/fail (1)**

O **letter grade (2)**

O **not graded (3)**

Q7 Who may serve as an advisor/project mentor for the student research project? Check all that apply.

☐ **Not applicable – students are not required to have an advisor/project mentor (1)**

☐ **Internal college of pharmacy faculty (2)**

☐ **External college of pharmacy faculty (e.g., non salaried preceptors) (3)**

☐ **Non-college of pharmacy faculty at your university (4)**

☐ **Other (please describe): (5)**

_____

Q8 Describe the amount of available faculty support to students engaging in research projects.

O **The school/college allocates more than adequate faculty time and support to students engaging in research projects. (1)**

O **The school/college allocates adequate faculty time and support to students engaging in research projects. (2)**

O **The school/college is working on getting adequate faculty time and support to students engaging in research projects. (3)**

O **The school/college doesn't specifically allocate faculty time and support to students engaging in research projects. Students and faculty members need to make individualized plans for faculty time and support. (4)**

Q9 Do your students use advisors other than an internal college of pharmacy faculty for their required projects? Check one.

O **Yes; please enter the percentage (%) of students that use external Advisors (1)** _____

O **No (2)**

Q10 Which statement best describes the review process for project proposals prior to the students being allowed to initiate a project? NOTE: exclude human/animal subjects committee review). Check one only.

O **Not applicable – a proposal is not required for the student conducted project. (1)**

O **The project advisor reviews the project proposal. (2)**

O **A course coordinator (or equivalent) reviews the project proposal in addition to the advisor. (3)**

O **An individual member of the faculty reviews the project proposal in addition to the advisor. (4)**

O **A faculty committee (at least two reviewers) reviews the proposal in addition to the advisor. (5)**

O **Other (please describe): (6)**

_____

Q11 What is the maximum number that is allowed to work on a single project (i.e., do you allow collaborative projects to count toward fulfilling the requirement)? Check one only.

O **Not applicable – each student must work on their own (1)**

O **Please enter the maximum number of students allowed to work on a single project: (2)** _____

O **Other (please describe): (3)**

_____

Q12 What financial support is given for the projects? Check all that apply.

☐ **Poster making supplies/printing are provided to all students (1)**

☐ **A specific budget is available for students to apply for research funds (2)**

☐ **Faculty advisors financially support projects at their discretion (3)**

☐ **No specific financial support is provided (4)**

☐ **Electronic, Stipend, Faculty (5)**

☐ **Other (please describe): (6)**

_____

Q13 What type of data collection methods do students at your college/school use to conduct their studies? Check all that apply.

☐ **Chart reviews (either electronic or paper) (1)**

☐ **Surveys (2)**

☐ **Systematic reviews (e.g., a meta-analysis) (3)**

☐ **Clinical measures (e.g., blood pressure collected as part of the study) (4)**

☐ **Interviews (5)**

☐ **Direct observation of activities (e.g., patients/clinicians) (6)**

☐ **Data retrieved from a database (7)**

☐ **Bench laboratory procedures (8)**

☐ **Other (please describe): (9)**

_____

Q14 Do you have any stated restrictions on the type of research ordata collection methods that may be used by the students?

O **No (1)**

O **Yes (please explain): (2)**

_____

Q15 Are there any proposed changes in the status of research project requirements at your college/school?

O **No (1)**

O **Don't know (2)**

O **Yes (please explain): (3)**

_____

Q16 Did your college/school cancel the requirement or elective opportunity for a research project in the last 10 years?

☐ **Yes – and the project requirementwas canceled completely (1)**

☐ **Yes – and the project electivewas canceled completely (2)**

☐ **Yes – but the requirement was made an elective instead (3)**

☐ **No – and the project elective was a requirement instead (4)**

☐ **If your school did cancel/change the research project, please explain why: (5) _____**

Q17 What, in your opinion, were the reasons the requirement was dropped or changed? Rank the following choices from most important to least important.

_____ Increasing class size made it too difficult to provide adequate advising (1)
_____ Students were opposed to the projects (2)
_____ Faculty were opposed to the projects (3)
_____ Insufficient administrative support (4)
_____ Projects weren't of sufficient quality to create desired learning outcomes (5)
_____ Other (please explain): (6)

Q18 Please select from the following which best reflects your opinion of students in entry-level Doctor of Pharmacy programs conducting required or elective research projects.

☐ **Strongly disagree (1)**

☐ **Disagree (2)**

☐ **Neutral (3)**

☐ **Agree (4)**

☐ **Strongly agree (5)**

☐ **Please tell us why you feel this way (Optional) (6)**

_____

Q19 Please indicate the type of academic calendar used at your college/school of pharmacy? (Please check one)

O **Semester (1)**

O **Quarter (2)**

O **Other (please describe): (3)**

_____

Q20 Please provide us with the coursework required by your school that applies to research – related areas. Example courses include but are not limited to: PrePharm (i.e. Statistics) Graduate: Research Methods – (e.g., appropriate study approaches to answer questions, proposal writing, collecting and analyzing data, writing the report, presenting findings Statistics Drug Information/Literature Evaluation Grant Writing

O **Provide the number of course units (i.e. credit hours). This can be a rough estimate. Don't count independent study activities in your responses! (6)** _____

O **If you would like to provide additional comments on research-related coursework or the value of requiring research projects in the education of Pharm.D. students, please do so in the space below. (7)**

_____

Q21 Please provide your contact information (i.e. Name, Phone number, Email) ***Optional***

_____

_____

_____
___
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End of Block: Default Question Block