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Title of Project:

The Impact of University of Arizona College of Pharmacy Student Projects on Education, Professional Practice, and the Community: A Retrospective Review

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ABSTRACT

Specific Aims: To describe the impact University of Arizona College of Pharmacy (UA CoP) student projects have on education, professional practice, and the community.

Subjects: Quality improvement (QI) and senior research projects conducted by UA CoP students who completed their education in May 2020 were included in the review.

Methods: Project data were collected from posters, written reports, and slide presentations by independent reviewers using a data extraction form mapped to five Buxton and Hanney Payback Framework (PF) categories: (1) knowledge production; (2) benefits to future research; (3) benefits to policy and product development; (4) benefits to health and health systems; and (5) broader economic benefits. Descriptive and demographic data were also collected and summarized.

Main Results: A total of 104 student pharmacists from the UA CoP Phoenix and Tucson campuses participated in and completed 73 projects. Impact category observations included knowledge production (33%), benefits to future research (3%), and benefits to health and health systems (11%). Student projects covered various topics targeting a range of audiences. Eleven percent of projects implemented interventions demonstrating statistically significant results. Four percent of projects found secondary outcomes which may be of value for further research.

Conclusions: Projects conducted by UA CoP pharmacy students were associated with benefits to education, professional practice, and the broader community, demonstrating that student projects have benefits beyond the usual academic outcomes of poster presentations and publications. Further research is needed with continued refinement of existing frameworks to comprehensively assess the impact of pharmacy student research projects.

INTRODUCTION

Research is defined as the process of systematic inquiry by which a hypothesis is generated, data are collected, critical information is documented, and data are analyzed and interpreted in accordance with the appropriate methodology set by specific academic and professional disciplines.[1] The purpose of research is to expand human knowledge of the biological, physical, or social world beyond what is currently known.[1] Health research refers to a multidisciplinary field of scientific investigation aimed at testing ideas and answering questions that improve options to prevent and treat disease, as well as increase knowledge about human health. The integration of research and healthcare systems function as an integral part of healthcare organization structure and the standard of patient care worldwide.[2]

Health research has an invaluable impact on education, professional practice and the community. The translation and implementation of health research provides important information on disease risk factors and trends, and outcomes of public health and treatment interventions. In addition, the results of health research inform action for and the implications of healthcare quality, cost and use, and future research implementation. Utilizing the Buxton and Hanney Payback Framework (PF), researchers are able to collate data and qualitatively measure the impact of study outcomes.[3,4,5] The PF with modifications is the most widely used methodology for interpreting impact assessment.[6] The PF impact categories include knowledge production, benefits to future research, informing policy and product development, benefits to health and the health system, and broader economic benefits.

One of the many methods the University of Arizona College of Pharmacy (UA CoP) utilizes to develop pharmacist and scientist leaders in patient care, interprofessional practice, as well as patient- and population-oriented research is the incorporation of Quality Improvement (QI) and senior research projects in the curriculum. To date, the impact of pharmacy student projects on education, professional practice, and the community has not been investigated extensively. Furthermore, the purpose of this study is to describe the impact UA CoP student QI and senior research projects have had on education,

professional practice, and the community.

METHODS

Design: This was a retrospective, observational study describing the impact UA CoP student QI and senior research projects have had on education, professional practice, and the community.

Subjects: Pharmacy student projects were included in the study if they were completed by the UA CoP student cohort who completed their academic education in May 2020. Eligible pharmacy student projects must have been completed between August 2016 to May 2020, overseen by a preceptor or faculty member associated with the UA CoP, and have a written report or a poster created which includes the background, methods, results, and conclusions. This study did not involve data from human subjects, and therefore, did not require approval from the Institutional Review Board.

Measures: Pharmacy student research project data were collected from posters, written reports, and short slide presentations by three independent reviewers using an electronic data extraction form. The data extraction form was mapped to the Buxton and Hanney Payback Framework categories to summarize the responses entered (Appendix 1). [3,4,5,] The five impact categories measured were (1) knowledge production; (2) benefits to future research; (3) benefits to policy and product development; (4) benefits to health and health systems; and (5) broader economic benefits. Descriptive and demographic data were also collected by the three independent reviewers on the practice setting in which the project was conducted at, the number of student participants, the classification of the project, and if the project included an intervention with a measurable outcome. Any discrepancies in data entry were reconciled through discussion with the inclusion of faculty advisors.

Data Collection: Data extraction by the research team was conducted via independent reviews of posters, written reports, and short slide presentations using an electronic data extraction form. Poster presentation information and publication data were retrieved from searching publicly available literature

and information provided by faculty advisors.

Data analysis: There were 73 pharmacy student research projects conducted by the UA CoP student cohort who completed their academic education in May 2020. All research projects met the inclusion criteria. Total and categoric-specific payback scores were collated, analyzed by calculating frequencies and percentages. Descriptive and demographic characteristics were also analyzed by calculating frequencies and percentages and summarized in Table 1.

RESULTS

A total of 104 student pharmacists from the UA CoP participated in groups from both the Phoenix and Tucson campuses to complete a combined total of 73 projects. There were 34 QI projects and 39 senior research projects (Table 1). Most projects were completed by groups of two to four students, while only six were conducted as individual projects. Forty-four (60%) of the student groups were composed of Tucson students, 11 (15%) groups were Phoenix students, and 6 (8%) of the groups were composed of students attending on both campuses. Preceptor supervision to project ratio ranged from one to nine preceptors per group.

Projects took place within many different pharmacy practice settings. QI project groups were paired with pharmacist preceptors currently working within the community to assess how they could improve quality at their project site. Similarly, senior research projects required a supervising preceptor, yet there were no limitations to the types of research projects completed nor sites for project origination. Eleven (15%) of projects were conducted in community pharmacies, 9 (12%) occurred at ambulatory care sites, and 20 (27%) originated at the UA CoP. Most projects occurred within hospitals, also known as health systems, for a total of 21 (29%). Additionally, 12 (16%) of studies were conducted at specialty care pharmacy sites including mail order pharmacies, compounding pharmacies, a medication management center, and the UA Tucson Poison Control Center.

Student projects covered a wide variety of classifications targeting a broad range of audiences, as summarized in Table 1. Patients were the primary audience targeted by 29 (40%) student projects followed by other audiences (e.g., providers, Pharmacy and Therapeutics Committee, QI/informatics committees) accounting for 28 (38%) studies. The greatest number of projects were classified as pharmacy services (n = 16 (22%)). Clinical care was the second highest area of study at 13 (18%) projects performed. Other types of projects included interdisciplinary communications, retrospective college of pharmacy cohort studies, faculty surveys on pharmacy education, inhaler device technique knowledge assessment, and an evaluation of cost-effectiveness and utilization. Only one study completed was laboratory-based.

Of note, 8 (11%) of student projects made interventions which reported statistically significant results. An additional 2 (3%) of projects found secondary outcomes which may be of value for further research. The first project included the implementation of a tool evaluating reported versus clinical penicillin allergies, and the second project evaluated the potential for decreased labor cost by purchasing pre-packaged, large volume bottles instead of small volume bottles (e.g., 1,000 tablets versus 100 tablets) to facilitate more efficient auto refills in a mail-order facility.

Table 2 summarizes the PF impact category results combining both QI and senior research projects (n = 73). Twelve student projects were presented at conferences, four projects led to peer-reviewed journal publications, and eight projects produced other products, such as toolkits, facilitation guides, or checklists, indicating the highest percentage of impact across all the PF categories occurred in knowledge production (n = 24 (33%)). Benefits to health and health systems had the second highest combined impact (n = 8 (11%)) with four projects resulting in service delivery QI, three increased effectiveness of services, and one produced gains in equity (e.g. better accessibility of services). The lowest positive impact result occurred in the category of benefits to future research with 2 (3%) projects producing institutional-level improvements to health information systems.

This study did not demonstrate impact in the remaining two PF categories, (1) informing policy

and product development and (2) broader economic benefits. Both categories had zero projects that produced results meeting the parameters.

DISCUSSION

To our knowledge, this is the first study utilizing the PF to assess the outcomes of student projects. The area of greatest impact was generated in the knowledge production category. UA CoP students are routinely encouraged by faculty and preceptors to expand their experience and to effectively communicate their knowledge through presentations and publications, therefore these findings are congruent with these practices and with a listed communication competency in the Center for Advancement of Pharmacy Education (CAPE) outcomes for professional pharmacy education programs.[7]

Pharmacy student project impact remains difficult to compare to other reports in literature due to the paucity of existing data. This study showed that the assessment of the impact of pharmacy student projects can be conducted using a modified version of the PF to capture outcomes data. Our findings are consistent with theoretical models of employing the PF for assessing impact in that similar results were found by Castor et al. [6] Through their utilization of an adapted PF questionnaire to assess implementation science impact, they described the type of payback achieved. Additionally, these authors note that following research evidence generation, the policy generation benefits typically occur after 1-3 years, and the true impact of the research evaluated goes beyond publication metrics and can be utilized by stakeholders from various levels of the health system.[6]

This study presents evidence of assessing the impact of pharmacy student projects beyond knowledge production, benefits to future research, informing policy and product development, benefit to health and health systems, and broader economic benefits. This study demonstrates that pharmacy students at UA CoP engaged in the eight key curricular competencies of research as identified by the American College of Clinical Pharmacy (ACCP), such as identifying relevant research problems, generating

a hypothesis, creating a study design, developing a study protocol and/or submitting an application to the institutional review board, utilizing the appropriate statistical tests to analyze data, interpreting and applying the findings of research to pharmacy practice, and effectively communicating the outcomes with professionals through publication and presentations.[8]

Further research is needed with continued refinement of existing frameworks to comprehensively assess the impact of pharmacy student research projects on education, pharmacy practice, and the community. The modified PF allowed the researchers of this study to extract impact category data from multiple sources to qualify cumulative outcomes of student projects. Therefore, it is recommended by the researchers that the framework may be utilized to capture outcomes data with modifications for the circumstances of the respective study parameters.

It is important to acknowledge that this study has limitations. First, the study represented the impact of pharmacy student QI and senior research projects from a single cohort; thus, the impact of the projects cannot be compared to others. Second, certain assumptions had to be made regarding the accuracy of the data represented in the posters, written reports, and short slide presentations. Third, the definitions of the impact categories considered were compromised on, and the qualitative measures used to determine impact may not have been comprehensive enough to encompass the outcomes found in the pharmacy student QI and senior research projects. Finally, this study assessing pharmacy student project impact occurred at a time that may have been too early for most of the research to make an impact.

CONCLUSIONS

Utilizing a modified PF to extract data in this study enabled the researchers qualitatively describe the impact of UA CoP pharmacy student QI and senior research projects on education, professional practice, and to the broader community. Projects conducted by UA CoP pharmacy students were associated with benefits to education, professional practice, and the broader community, demonstrating

that student projects have benefits beyond the usual academic outcomes of poster presentations and publications. Further research is needed with continued refinement of existing frameworks to comprehensively assess the impact of pharmacy student research projects.

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Table 1.

Sample Description (n = 73 projects)

Pharmacy Practice Site Location	**n (%)***
Tucson	44 (60)
Phoenix	11 (15)
Tucson and Phoenix	6 (8)
Other	12 (16)
Pharmacy Practice Setting	
Community	11 (15)
Ambulatory Care	9 (12)
Health and Hospital Systems	21 (29)
College of Pharmacy	20 (27)
Other	12 (16)
Number of Preceptors per group	
1	42 (58)
2	18 (25)
3	9 (12)
≥4	6 (8)
Unable to determine	1 (1)
Number of Student Participants per group	
1	6 (8)
2	15 (21)
3	45 (63)
4	6 (8)
≥5	1 (1)
Project Classification	
Pharmacy Surveys and Education	7 (10)
Student Surveys and Education	6 (8)
Patient Surveys and Education	8 (11)
Clinical Care	13 (18)
Literature or Media Based	6 (8)
Pharmacy Services	16 (22)
Laboratory Based Studies	1 (1)
Retrospective Chart Reviews	9 (12)
Other	7 (10)
Target Audience	
Educators	1 (1)
Patients	29 (40)
Pharmacists	6 (8)
Pharmacy Technicians	2 (3)
Students	6 (8)
Other	28 (38)
Multiple	1 (1)
Intervention with Statistically Significant Outcome	
Yes	8 (11)
No	63 (86)
Other	2 (3)
Class Project Type	
Quality Improvement	34 (47)
Senior Research Project	39 (53)

*Percent may not equal 100% due to rounding

Table 2.

Payback Framework (PF) Impact Categories (n = 73 projects)

	n (%) *
Knowledge production	*24 (33)*
Conference presentations	12 (16)
Peer-reviewed journal publications	4 (6)
Other products (e.g., toolkits or facilitation guides)	8 (11)
Benefits to future research	*2 (3)*
Institutional-level capacity building (improvements to health information systems)	2 (3)
Qualifications gained or expected to be gained by project members	0 (0)
Led to generation of subsequent research activities by team members	0 (0)
Contributed to research by others	0 (0)
Informing policy and product development	
Expected to influence policy/decision-making at the local, national, international level	0 (0)
Expected to lead to the development of institutional policies/guidelines that would change the behavior of medical professionals, health care managers, and/or health service users/the wider public	0 (0)
Benefits to health and health system	*8 (11)*
Quality improvements in service delivery	4 (6)
Increased effectiveness of services	3 (4)
Gains in equity (e.g., better accessibility of services)	1 (1)
Broader economic benefits	*0 (0)*
Benefits derived from a healthy workforce	0 (0)
Cost reduction in service delivery	0 (0)

*Percent may not equal 100% due to rounding

APPENDICES

Data Collection Form

Electronic Version: https://forms.gle/sbk3QbJ9nhDVKs2A8