Inter-professional Education: Establishing a Collaborative Pharmacy-Medicine Research Education Certificate Program

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Abstract

Background: Interprofessional collaboration (IPC) is the cornerstone to successful patient care, outcomes and research endeavors. Yet, no study has investigated this premise as applied to research methodology amongst physicians in training. We proposed a formalized research education program to evaluate its validity. **Objective:** To determine whether IPC between the Departments of Medicine and the Pharmacy improves research methodology amongst trainees of the program. **Methods:** Through funding from the Nussbaum Grant, four weekly evidence-based medicine (EBM) research lectures were offered to internal medicine, pharmacy residents and medical students. A core element of statistical concepts, clinical trial design, abstract/manuscript development, and grant proposals were taught. Each session included active discussions within groups consisting of all disciplines to maximize inter-professional interaction. Efficacy of the concept was evaluated utilizing the Fresno test prior starting and at the end of the course. **Results:** A total of 72 participants were enrolled in the program since 2013: 28 medical/pharmacy residents, 38 medical students and 6 research fellows. Overall mean Fresno score increased from 89.7 ± 28.3 to 118.1 ± 31.0, ($p<0.001$). The improvement in the total score was consistent across all disciplines; medical students (27.2 ± 29.6; $p<0.001$), medical residents (35 ± 26; $p<0.001$), pharmacy residents (22.3 ± 20.8; $p=0.05$) as well as research fellows (15.3 ± 13.7; $p=0.041$).In contrast to initial performance differences between disciplines in the EBM naïve population ($p=0.004$), the participants performed comparably by the end of the course ($p=0.184$). **Conclusion:** An IPC research program at our institution significantly improved knowledge and skills related to research methodology, especially in EBM naïve trainees.

Keywords: Inter-professional education, Fresno test, Evidence-based Medicine

Introduction:

Evidence-based medicine (EBM) has been identified to improve decision making and optimize patient care.[1,2] Understanding the methods from which this evidence is garnered may be valuable to its successful implementation as well as fostering contributions to research by health care providers previously disinclined. Thus, developing a strong foundation and knowledge-base in research will promoteevaluation of medical advances in the care of those to whom we are committed. The Accreditation Council for Graduate Medical Education (ACGME) provides little guidance as to the research curriculum for physicians-in-training (residents).[3]Thus, it is left to the individual programs, its directors and coordinators to implement or prescribe any research training opportunities for the residents. Some curricula incorporate research commitments into their programs, while others only provide research opportunities or electives.

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In contrast, many pharmacy school curricula mandate courses on research methodology, clinical trial design and statistical evaluation. Regardless of which curriculum is adopted, understanding research is integral to both medical and pharmacy education. It is valuable for professional fulfillment as well as medical advances for those clinicians who choose to pursue some aspect of research. Interprofessional collaboration (IPC) is important to both medical education and clinical care and has been incorporated into numerous hospital accreditation models. The World Health Organization (WHO) defines interprofessional collaboration in education and practice as an "innovative strategy where students from two or more professions learn from and with each other". Interprofessional education has been referred to as "a necessary step to set the stage for a collaborative practice-ready health workforce" which is better prepared to respond to local health needs.[4] The Institute of Medicine also identifies the ability "to work in interdisciplinary teams, cooperate, collaborate, communicate and integrate care in teams to ensure that care is continuous and reliable".[5]

At Saint Barnabas Medical Center, a 599 bed academic community hospital with residencies in most medical disciplines, both pharmacy and internal medicine residents identified opportunities to improve knowledge in medical research and methodology. In recognition of this need, we proposed a formalized research education and certification program available to medical and pharmacy residents as well as medical students. The aim of our study was to determine if interprofessional collaboration on EBM concepts in research methodology results in improvements as assessed by the Fresno test. The Fresno Test is a validated education tool designed to assess the level at which participants practice EBM research skills.[5,6]

Methods

The primary objective of the study was to determine if multidisciplinary education on research methodology leads to improvements in student and resident application of research concepts.

The Fresno Test is the first standardized, objective measure of ability in EBM that requires learners to demonstrate knowledge and skill.[6] The test consists of 12 questions with a maximum total score of 212: seven short answer questions; two questions that require a series of mathematical calculations and three fill-in-the-blank questions. (Table 1) Fresno test assesses knowledge and understanding of EBM and identifies the participant's strengths and weaknesses and was used in pre- and post-intervention analysis to determine efficacy of the intervention. Initially created for internal medicine residents, the Fresno test has been expanded and validated in other areas such as physical therapy and occupational therapy programs. [5, 7]

Our study population consisted of residents from the Internal Medicine Residency Program at Saint Barnabas Medical Center, NJ, pharmacy residents from Saint Barnabas Medical Center, NJ, medical students from Saint George's University School of Medicine, Grenada and research fellows who were medical school graduates from Saint George's University School of Medicine, Grenada. The educational intervention was created and taught by two clinical pharmacists, with a combined total of over two decades of extensive research and teaching experience. Prior toinitiation, all course work was evaluated and approved by the Director and the Associate Director of the Internal Medicine Residency Program at the institution.

The intervention consisted of four sessions of two-hour lectures, given over a four-week period, each addressing several key aspects of evidence-based medical research. The lectures included: 1) Developing the research question;protection of human subjects; and abstract writing; 2) A review and update on clinical trial design; and statistical analysis; 3) Identification, writing and submission of grants; and essential components of manuscript development; 4) Successful strategies in composition and production of platform and poster presentations. Each lecture incorporated multiple small group discussion sessions requiring active participation: consisting of medical residents, medical students, pharmacy residents and research fellows to maximize interdisciplinary interaction.

All study participants were required to complete all four sessions in addition to the pre- and post-intervention 30 minute Fresno test. Statistical analysis utilized Paired t-test or Wilcoxon signed rank test depending on the normality, Chi-Square test for categorical variables and Analysis of variance for the comparison of two or more variables. Statistical significance was accepted at the level of $p<0.05$. No faculty or participant involved in the study reviewed the data or performed the statistical analysis. Instead, an uninvolved research fellow reviewed and scored all pre- and post-test results.

Along with the course, an anonymous survey was requested from all participants to determine their opinion on the quality of the program and self-perception of their research competency.

Result:

The research methodology course was offered four times between 2013 and 2015 and yielded a total of 72 participants including: 23 Internal Medicine residents, 38 Internal Medicine students (MS3/MS4), 5 Pharmacy residents and 6 research fellows. Among the 23 Internal Medicine residents, 10 were in post graduate year (PGY)-1 of training, 10 in PGY-2 and 3 residents in PGY-3. Overall, significant improvement of total Fresno test scores was observed after the 4-week EBM course. The overall mean Fresno test score increased from pre-program test score of 89.7 ±28.3 to post-program Fresno test score of 118.1 ±31.0, out of a possible 212. ($p<0.001$).The net increase in the total score was consistent across all disciplines; medical students (27.2±29.6; $p<0.001$), medical residents (35±26; $p<0.001$), pharmacy residents (22.3±20.8; $p=0.05$) as well as research fellows (15.3±13.7; $p=0.041$). When subcomponents of questions were analyzed, ten out of the twelve questions on the Fresno test demonstrated, statistically significant improvement in individual scores following our intervention. The exceptions being questions four and six, which test the topics of study design and internal validity respectively (Table 1).

When disciplines were compared, there were no net difference between participants from Internal Medicine and Pharmacy. However, taking in to account of the previous exposure to EBM, pharmacy and research fellows had higher baseline scores when compared with medical resident and students in the EBM naïve population ($p=0.004$). This observation is reflected from curriculum differences in their training. Interestingly, this difference was not observed by the end of the four-week EBM course. ($p=0.184$) This may suggest IPC education has greater benefit to EBM naïve participants. (Table 2) Similarly, the degree of the improvement in the performance of medicine residents were 35.0 points, medical students were 27.2 points, pharmacy residents were 22.3 points and research fellows were 15.3 points; all $p<0.05$. (Figure 1) However, no statistical difference was observed depending on the post graduate training period regardless of previous EBM exposure status. (Table 3)

Participants also reported significantly improved confidence in all aspects of the survey questions compared to their baseline ($p<0.05$): formulating a research question, literature evaluation capacity, abstract writing, grant writing, statistical concepts, research methodology and poster presentation production. (Table 4)

Discussion:

There is wide variability in medical school and Internal Medicine residency education on the subjects of research and research methodology. However, pharmacy schools, under the directions of Accreditation Council for Pharmacy Education (ACPE), have more defined expectations for research and research methodology concepts within their curriculum. Our initiative in attempt to remedy this incongruence involved the education of medical students and medical residents in addition to pharmacy residents and research fellows by seasoned pharmacy faculty members at the institution. Overall, there is a lack of widespread use of appropriate tools to assess EBM ability, knowledge and skills among health care professionals and students. In addition, there are studies that suggest apoor correlation between self-perceived abilities in EBM skills and objective assessments of the same.[8, 9]Validated scoring tools are highly reliable in the assessment of such skills, especially "The Fresno Test of Evidence Based Medicine" which uses the objective grading rubric in scoring individual EBM knowledge and skill. [6]The Fresno Test has also been shown to have high inter-rater reliability.[6]

This research certification program was conducted to improve EBM skills and knowledge in our participants and Fresno Test was used to assess the effectiveness of the program. By design, our study required inter-professional collaboration between Departments of Medicine and Pharmacy thus promoting the well-recognized and important "collaborative practice-ready health workforce".[3]This program provided significant improvement in overall knowledge of EBM and improved self confidence in evidence-based practice while instilling the practice of interprofessional collaboration. These results were consistent across all disciplines regardless of the length of medical training received. Our structured eight-hour research certification program covered a wide variety of standard EBM skills involved in critical thinking, question forming, literature review and critique, statistical interpretations, writing and presentation of research activity as well as the application of results in clinical practice among other things. We applied the Fresno Test prior to starting and after completion of the program and found a significant improvement in the overall performances and most of the aforementioned skills in all groups of participants.

The standardized grading rubric used by the Fresno Test along with the use of a single scorer for the entire project ensured consistency in scoring the performances of all participants. Some of the limitations of the study were the relatively small sample size and lackof assessment of prior exposure to similar educational courses in research methodology and evidence based practices. Additionally, due to the nature of the course, participants may have been exposed to the Hawthorne effect in their self confidence survey. The benefit of this program to healthcare practice is an improvement in the medicine and pharmacy residents' research knowledge base as well as quantity and quality of research projects conducted. This program also helps to foster a collaborative work environment that may also translate to improving interprofessional teamworkwith respect to patient care.

Since the initiation of the program in February 2014, the department of medicine has increased its research submissions to meetings by over 50% and we have sustained national and local poster acceptances as well. Following the success of this research methodology course, we intend to to further expand the official offering of this program to all Internal Medicine, Pharmacy, and Surgery residents as well as all medical students at our institutionin the near future.

Conclusion:

An inter-professional collaborative research certification program initiative in our community teaching hospital significantly improved knowledge and skills related to research methodology in health care professionals. The use of a standardized and objective scoring system employed by a unifiedindependent scorer ensured consistency in demonstrating these results. We recommend that such inter-professional research certificate courses be usedin other practices to improve EBM skills and knowledge in all healthcare professionals.

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Table1. Fresno test question topics and mean overall performance

		Mean Fresno score		
Q	Topic	Pre-program	Post-program	p-value
1	Formulation of clinical question	9.6±1.6	10.5±1.4	<0.001
2	Source of evidence	13±4.4	14.7±4.5	0.010
3	Search strategy	8.2±4.6	12.6±6.1	<0.001
4	Study design	11.7±6.4	13±6.1	0.075
5	Relevance	6.5±5.6	9±6	0.002
6	Internal validity	10.9±7.5	11.6±7.1	0.449
7	Magnitude of effect	9.9±9.9	13.7±10.1	<0.001
8	Statistical of diagnosis	9.6±7.6	15±7.1	<0.001
9	Statistical of therapy	5.3±4.4	9.5±3.3	<0.001
10	Confidence Interval	1.9±2	2.7±1.9	0.002
11	Best study design diagnosis	0.8±1.6	2.3±2	<0.001
12	Best study design therapy	2.3±2	3.5±1.3	<0.001
	Total	89.7±28.3	118.1±31	<0.001

Table 2. Overall improvement in Fresno test by discipline.

		Med Resident		Med Student		Pharmacy		Research Fellow		Overall		p-value
		N	Mean±SD	N	Mean±SD	N	Mean±SD	N	Mean±SD	N	Mean±SD	
Pre-program Fresno score	EBM naïve	15	65.7±25.38	34	86.6±18.43	5	108.5±49.01	3	74.5±13	57	82.4±26.24	0.004
	EBM experienced	8	115.7±12.4	4	128.5±14.85	0	n/a	3	108.3±22.31	15	117.6±15.8	0.229
	Overall	23	83.1±32.42	38	91±22.15	5	108.5±49.01	6	91.4±24.7	72	89.7±28.28	0.316
Post-program Fresno score	EBM naïve	15	104.4±19.7	34	116.7±31.01	5	130.8±56.12	3	89.5±23.07	57	113.3±31.52	0.184
	EBM experienced	8	143.7±14.5	4	131.1±26.96	0	n/a	3	124±27.78	15	136.4±21.03	0.349
	Overall	23	118.1±26.07	38	118.2±30.61	5	130.8±56.12	6	106.8±29.64	72	118.1±30.99	0.658
Overall improvement	EBM naïve	15	38.7±29.25	34	30±27.76	5	22.3±20.81	3	15±19.05	57	30.9±27.36	0.44
	EBM experienced	8	28±18.24	4	2.6±37.62	0	n/a	3	15.7±10.37	15	18.8±24.7	0.252
	Overall	23	35±26.03	38	27.2±29.58	5	22.3±20.81	6	15.3±13.72	72	28.3±27.12	0.386

EBM: Evidence-based medicine; SD: standard deviation, n/a: not available

Table 3. Overall improvement in Fresno test by training year in medicine residents.

		PGY-1		PGY-2		PGY-3		Total		p-value
		N	Mean±SD	N	Mean±SD	N	Mean±SD	N	Mean±SD	
Pre-program Fresno score	EBM naïve	6	66.9±26.69	7	60.2±26.63	2	81.3±22.27	15	65.7±25.38	0.614
	EBM experienced	4	114±12.56	3	118.5±16.8	1	114±0	8	115.7±12.4	0.914
	Overall	10	85.8±32.24	10	77.7±36.45	3	92.2±24.61	23	83.1±32.42	0.766
Post-program Fresno score	EBM naïve	6	97.8±18.94	7	114.4±18.01	2	89.5±16.97	15	104.4±19.7	0.166
	EBM experienced	4	140.8±14.33	3	141.3±15.01	1	162.5±0	8	143.7±14.5	0.447
	Overall	10	115±27.58	10	122.5±20.88	3	113.8±43.82	23	118.1±26.07	0.793
Overall improvement	EBM naïve	6	30.8±19.52	7	54.1±27.81	2	8.3±39.24	15	38.7±29.25	0.094
	EBM experienced	4	26.8±11.65	3	22.8±26.6	1	48.5±0	8	28±18.24	0.542
	Overall	10	29.2±16.17	10	44.8±30.03	3	21.7±36.2	23	35±26.03	0.272

EBM: Evidence-based medicine; SD: standard deviation, n/a: not available

Table4. Survey question topics and participant rating.

Q	Survey topic area	Mean Survey score		p-value
		Pre-program	Post-program	
1	formulate research question	3.1±1	4.2±0.7	0.001
2	Literature evaluation	3±0.8	4.3±0.6	<0.001
3	Abstract writing	2.8±0.9	4±0.8	<0.001
4	Grant writing	1.6±0.8	3.8±0.9	<0.001
5	Statistical concept	2.9±1	4.3±0.5	<0.001
6	Research methodology	3±0.9	4.1±0.7	<0.001
7	Poster presentation production	3±1	4.4±0.6	<0.001