The Utility of Early Experiential Programs In Developing Pharmaceutical Care Practices In the Community Pharmacy Setting: Do Pharmacy Students Make a Difference?

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In 1996, The American Association of Colleges of Pharmacy Commission to Implement Change In Pharmaceutical Education endorsed pharmaceutical care as the main mission of pharmacy practice.[1] With a significant increase in the number of medication errors in recent years, it is necessary to have medication experts, such as pharmacists and the pharmacy students who train under them, in the community pharmacy setting recognize and intervene in problematic drug regimens.

It is well documented that pharmacists are viable resources for clinical interventions in the inpatient setting and ambulatory or outpatient setting. When properly utilized, pharmacists are able to improve pharmaceutical care while simultaneously helping to reduce overall healthcare costs. Several studies demonstrating the effectiveness of pharmacists in performing clinical interventions and improving patient outcome while decreasing overall healthcare costs exist. Haig and Kiser[2] discovered that pharmacist inclusion on medical teams on hospitals wards led to decreases in hospital costs, medication charges, and hospital length of stay. Leape et al.[3] found that when clinical pharmacists were allowed to participate on physician rounds in an intensive care unit, adverse drug events were decreased by 66%. Further, it was found that an overwhelming 99% of pharmacists' medication recommendations were accepted by participating physicians. Lastly, Gandhi et al.[4] determined that pharmacy services led to a total of 4,151 intervention recommendations in the coronary care unit of the University of Massachusetts Memorial Health Care Hospital. Physicians accepted 99% of the intervention recommendations over a segment of time that included two intervention periods. It was determined that over these two intervention periods, direct drug costs for the coronary care unit decreased by $192,681 and total drug costs decreased by $372,384.

As can be deduced from the above studies, most of the information concerning the utility of pharmacists in providing clinical medication interventions relates to the inpatient setting. A significant challenge facing the profession of pharmacy is to demonstrate that pharmacists and pharmacy students can positively impact health outcomes by performing clinical interventions in the community pharmacy or ambulatory care setting. Singhal et al.[5] echoed this sentiment when he stated, "the application and value of pharmaceutical services in ambulatory care settings is not well confirmed. It is important that pharmaceutical services be implemented and evaluated in ambulatory care settings to further establish the value of community and ambulatory care pharmacists to the healthcare system, healthcare providers, and society".

Unfortunately, many pharmacists and pharmaceutical organizations have been unable to move from the transitional phase to the patient care phase in pharmaceutical care development. The status quo approach of many pharmacists and professional pharmaceutical organizations has resulted in the inability to incorporate new clinical roles and responsibilities and allow them to penetrate into and become an integral part of the practice of pharmacy. This study utilizes third-year Doctor of Pharmacy students to document the need for clinical pharmaceutical services in the community pharmacy setting

Pharmaceutical Care

Hepler and Strand[6] became visionaries in the development of the modern idea of pharmaceutical care in the late 1960s. With the foundation of the modern practice of pharmacy and the inception of the revolutionary idea of patient-specific pharmaceutical care, it became apparent that pharmacist attitudes and roles must greatly change. Hepler and Strand defined pharmaceutical care as, "the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life. These outcomes are (1) cure of a

disease, (2) elimination or reduction of a patient's symptomatology, (3) arresting or slowing of a disease process, or (4) preventing a disease or symptomatology". Only now have pharmacists begun to realize the incredible opportunity they have in satisfying the needs of patients while restructuring their profession in the process.

Greater emphasis on pharmaceutical care is needed in response to several recent revelations regarding the American healthcare system and the practice of pharmacy. First, recent statistics have shown that the number of medication related deaths have increased sharply over the past several years. Philips et al.[7] discovered that between 1983 and 1993, annual outpatient deaths due to medication errors rose from 172 to 1,459. Further, adverse drug events are believed to have claimed 106,000 American lives in 1994.[8] This would translate into 4.6% (106,000 of 2,286,000) of all deaths during 1994 being caused by adverse drug events (mathematically, this would make adverse drug events potentially the 4th leading cause of death in America). Similarly, Prince et al.[9], found that 2.9% (293 out of 10,184) of all patients visiting the emergency department of a 517-bed tertiary care institution were victims of drug-induced illnesses or adverse drug events. The most common reasons for these visits were overdose with drugs of abuse, noncompliance with prescribed medications, and adverse drug events.

In this article, adverse drug events are defined as, "any noxious, unintended, and undesired effect of a drug, which occurs at doses used in humans for prophylaxis, diagnosis, or therapy."[10] This definition excludes therapeutic failures and intentional misuse of a drug in abuse or poisoning, but does include errors in administration.

The fundamental goals, processes, and relationships of pharmaceutical care exist regardless of practice setting.[9] Another reason for increased interest in furthering pharmaceutical care in the outpatient or ambulatory care setting is to attempt to reduce overall healthcare costs

related to adverse drug events and suboptimal pharmaceutical care received by patients. The tremendous costs associated with the before-mentioned medication problems have been widely documented in the inpatient hospital setting. Schneider et al.[11], determined that between 1992 and 1994, estimated costs related to adverse drug events and medication errors was $1,497,148 annually in a university-affiliated hospital. Similarly, Bates et al.[12], found that at Brigham and Women's Hospital and Massachusetts General Hospitals in Boston, Massachusetts, preventable adverse drug events caused an additional $2.8 million ($4,685 per adverse drug event) in costs. Overall, adverse drug events were associated with an added cost of care of $5.6 million ($2,595 per adverse drug event) to each hospital.

Determining the costs related to medication problems in the outpatient setting has proven to be much more difficult. Recently, however, great strides have occurred in the determination of the costs of drug-related morbidity and mortality. Johnson and Bootman[8] determined that in 1994, drug-related morbidity and mortality constituted a cost of $76.6 billion ($30.1 to $136.8 billion) in the ambulatory care setting to the United States healthcare system. Interestingly, the largest component of this cost was the need for hospitalizations due to medication-related adverse events. It is difficult to separate costs related to inpatient and outpatient medication administration because they are intimately related; one may lead to the other and vice versa.

Methods

Study Design

This multicenter, three-phase study evaluated the ability of Doctor of Pharmacy students in the community pharmacy or ambulatory care setting at performing and documenting clinical interventions. A secondary purpose of the questionnaires was to show that there was a great need for clinical pharmacy interventions in the ambulatory or community pharmacy setting. A

total of 204 Pharmacy 743 / 744 questionnaires (see appendix) administered by second year Doctor of Pharmacy students were evaluated for five different disease states including asthma (n = 50); congestive heart failure (n = 21); diabetes (n = 48); hyperlipidemia (n = 42); and peptic ulcer disease (n = 43).

Phase I

The first phase of the study began the third week of August 2000 and ended the third week of November 2000. This phase was conducted in 20 chain pharmacies in the greater Albuquerque metropolitan area. Doctor of Pharmacy students participating in University-required Pharmacy 743 / 744 Experiential classes administered the disease state surveys to Walgreens patients filling prescriptions for medications related to the treatment of asthma, congestive heart failure, diabetes, hyperlipidemia, and peptic ulcer disease. However, patients receiving prescriptions for the first time were excluded from the study. The surveys were administered under the direct supervision of a licensed pharmacist. In addition to the surveys, patient information data forms were completed by the students, which included all the medications that the patients were taking (prescription, over-the-counter, and herbal) at the time of the survey interview.

Phase II

Researchers collected surveys and patient information data forms from all participating pharmacies from the third week of November 2000 through the third week of December 2000. To ensure the protection of the individual patient's identity and privacy, researchers verified that patients' names (along with all other uniquely identifying information) had been removed from all patient surveys before retrieval from the pharmacy sites. Researchers then made three

identical photocopies for each disease state questionnaire to provide to a clinical pharmacist panel for evaluation.

Phase III

The final stage of the study began the second week of January 2001 and ended the first week of March 2001. During this time, a panel of clinical pharmacist practitioners was formed for the purposes of evaluating each patient medication questionnaire. The panel consisted exclusively of pharmacist practitioners registered to practice pharmacy in the State of New Mexico with special training in asthma, congestive heart failure, diabetes, hyperlipidemia, and / or peptic ulcer disease. Each disease state questionnaire was evaluated by three separate pharmacy clinicians utilizing a Clinician-Completed Likert Scale (see appendix) to determine if a clinical intervention was appropriate for each patient's pharmacological therapy due to potential suboptimal or undesirable therapeutic outcome, drug interaction, or adverse drug events.

Results

Table 1 presents Spearman rank order correlations across all disease states. The lower triangle presents correlations for nominal and metric variables while the upper triangle of the table presents correlations of nominal variable and nominalized metric variables. Correlations in the upper and lower triangles are consistent. Due to the unique nature of the data, nominalization was required for some of the statistical analysis performed below.

Table 2 presents the descriptive statistics across all disease states. Means and standard deviations are for metric data, while medians and modes are for nominal data. Table 3 presents descriptive statistics by disease state. Differences among disease states in Table 3 were evaluated with MANOVA (multivariate analysis of variance). Multivariate F value or Wilks' Lambda was 0.171. For metric variables, all questions asked of the clinical pharmacist panel on

the Clinician-Completed Likert Scale were significantly differently except “minor adverse drug reaction present” ($p = 0.057$). The MANOVA analysis also allowed us to understand the amount of variance in dependent variable explained by disease state. For example, the adjusted R^2 for suboptimal therapy shows that 46% of rater’s judgements can be explained. For prone to significant drug interactions, minor adverse drug reaction present, significant adverse drug reaction present, clinical intervention needed, and requires disease state education / counseling, the corresponding R^2 values are 34%, 2.6%, 40.4%, 17.8%, and 4.7%.

Table 4 presents least significant differences post-hoc analyses of metric variables among disease states. Patients with diabetes appear to be the most likely to have suboptimal therapy, be prone to significant drug interactions, and require disease state education / counseling. Patients with peptic ulcer disease, however, appear to have a lower chance of receiving suboptimal therapy.

Table 5 presents the significant results of two logistic regressions. Logistic regressions were performed to examine the multivariate effects of predictor variables on suboptimal therapy and the need for clinical interventions across disease states. Disease states themselves were non-significant, with the presence of suboptimal therapy and the judged utility of education/counseling accounting for differences in the need for clinical intervention. Prone to drug interactions, minor adverse drug events, and significant adverse drug events were non-significant. Logistic regression of suboptimal therapy on metric predictors was also performed. Only requires disease state education / counseling was a significant ($p = .001$) predictor with odds of 5.93, the confidence interval does not contain zero.

Table 6 presents crosstabulations of needs for pharmaceutical care by disease state. Note the overwhelming number of patients across all disease states who required some type of disease

state education and / or counseling. Overall, raters judged 94% (182 out of 193) of patients to need disease state education and / or counseling. All patients in the diabetes and congestive heart failure disease state classifications were found to have suboptimal therapies. In contrast, most patients with peptic ulcer disease were receiving optimal therapy. Across all disease states, 68% (126 out of 185) of patients had suboptimal therapies. Lastly, 88% (173 out of 197) of patients surveyed required a clinical intervention.

Discussion

There is an immense need for clinical intervention services in the community pharmacy setting. Philips et al.[7] discovered that between 1983 and 1993, annual outpatient deaths due to medication errors rose from 172 to 1,459. Additionally, adverse drug events are believed to have claimed 106,000 American lives in 1994.[8] Likewise, Prince et al.[9], found that 2.9% (293 out of 10,184) of all patients visiting the emergency department of a 517-bed tertiary care institution were victims of drug-induced illnesses or adverse drug events. The most common reasons for these visits were overdose with drugs of abuse, noncompliance with prescribed medications, and adverse drug events.

In addition to being a highly accessible source of information for patients, pharmacists and pharmacy students also have the necessary knowledge to recognize medication errors, significant drug interactions, and adverse drug reactions, and initiate changes in medication regimens that can improve quality of life and be life saving.

Our clinician review panel believed that the surveyed patients required disease state education and / or counseling, had suboptimal therapies, and needed clinical interventions.

The results presented in table 5 appear to support the need, related to these disease states, for clinical interventions by community pharmacists to resolve suboptimal therapy related to

suboptimal levels of patient education and counseling. This study supports the education emphasis of community-based pharmacy disease state management programs. Patient responses were interpreted by raters as indicating a lack of understanding of their disease. For example, patients may have stated that they knew about HbA1C, but when asked for a treatment goal they stated it in terms of their glucose level instead of the HbA1C. By not basing a treatment goal on HbA1C, raters may have indicated the need for patient education and judge these patients as receiving suboptimal therapy. The results of this study generally support a model in which the effects of educational deficiencies on the need for clinical interventions are mediated by rater judgments of suboptimal therapy. Additional studies should be designed to support statistical path analysis or structural equation modeling of these relationships.

The most astonishing results of this study were presented in table 6. Ninety-four percent of all patients required disease state education and / or counseling. Sixty-eight percent of patients were receiving suboptimal therapy and 88% of patients needed a clinical intervention.

However, for peptic ulcer disease and hyperlipidemia, raters determined that only 12% and 56% of patients surveyed respectively had suboptimal therapy compared to the overwhelming findings of 68% across all disease states. An anomaly has arisen out of these findings. Is important to note that although raters determined only 12% (5 out of 41) of peptic ulcer disease patients had suboptimal therapies, 83% (35 out of 42) required some type of clinical intervention. Even though it would appear these findings fly in the face of logic, several viable reasons for their practicality do exist and will be covered in greater detail in the discussion section of this paper. First, treatment of hyperlipidemia and peptic ulcer disease is usually accomplished with a relatively simple one or two drug medication regimen. Asthma, congestive heart failure, and diabetes, however, are often treated with much more complicated, multiple

drug regimens. By comparing simple to complicated drug regimens, it is feasible to presume that it is much more likely that raters would label the latter as suboptimal. It is much more difficult to treat some disease states than others and consequently the related drug regimens may be deemed suboptimal. Secondly, compliance could also have an impact on patient's medical therapy and whether raters view it as suboptimal or not. It is much less difficult to be compliant with simple drug regimens and therefore may lead raters to falsely assess it as not suboptimal.

Table 6 also leads us to believe that diabetes was the most troublesome disease state encountered. Raters determined that 98% (47 out of 48) of diabetes patients required disease state education and / or counseling. In addition, every diabetes patient surveyed was found to have suboptimal therapy and to need a clinical intervention.

As pharmacists rush to define their place and responsibilities in today's healthcare system, the only constant in the pharmacy profession is change. The accepted role of pharmacists in every practice setting is changing. The traditional role of the dispensing pharmacist is quickly giving way to accommodate one in which the pharmacist manages the patient's total medication profile and is able to dispense, counsel, and recommend or prescribe a patient's medication therapy.

The health care needs of Americans have changed in recent years and will continue to change exponentially over time. In order to ensure their continued need and authenticate their reputation as medication specialists, practicing pharmacists, instructors in pharmaceutical sciences, and students of pharmacy must be willing to undertake the challenge of accepting greater roles in the improvement of patient pharmaceutical care and its associated clinical and patient-related responsibilities.

In the twentieth century, the maturation of the profession of pharmacy occurred in three distinct phases. These phases included traditional, transitional, and patient-care related.[6] In the traditional role, pharmacists' responsibilities included procuring, preparing, and evaluating drug products. The transitional phase brought the disappearance of the pharmacist's apothecary role and the pursuit of professional identity and acceptance. The last and most important of these phases was the development of patient care. During this phase of development, pharmacists have been called upon to increase their clinical roles and therefore the overall scope of their responsibilities.

Pharmacy students and their instructors are mired in the problem of moving from a strictly medication dispensing role to the role of a clinical medication specialist. It is imperative for the continued growth and maturation of the pharmacy profession that pharmacists, pharmacy students, and pharmaceutical sciences instructors attempt to be proactive in establishing the pharmacy practitioner's ability to make clinically significant medication interventions in all settings.

Limitations

First, demand bias may have led some patients to answer survey questions inaccurately. This may be to please the surveyor or obscure the fact that they are noncompliant with their medication usage. Along with this, there is no way to ascertain whether patients truly knew what they were being asked in regard to the way they take their medications. Medical jargon and questions that utilize generic versus brand medication names could confuse the patient being surveyed. Second, some important information such as patient age, weight, and sex were missing from some of the questionnaires. It is not known if this had a significant effect on the way the raters answered the questions on the Clinician-Completed Likert Scale.

Conclusion

Findings of this study led this research group to conclude that there is a great need for improvements in pharmaceutical care services in community pharmacy settings. Pharmacists and pharmacy students possess the knowledge necessary to begin modification of suboptimal medication therapy, recognition of significant drug interactions and adverse drug reactions, and improvement in patients' overall health outcomes. Pharmacists and pharmacy students also have the ability to recognize and circumvent potentially life-threatening medication errors, drug interactions, and adverse drug events. In this study, raters determined that 94% of patients needed disease state education and / or counseling and found that every diabetes and congestive heart failure patient surveyed was deemed to have suboptimal therapy. Further, raters found that across all disease states, 88% of patients required a clinical intervention. This data shows that there is an incredible need for clinical intervention services in the community pharmacy setting and an even greater opportunity for pharmacists and pharmacy students to satisfy it.

Students involved in Doctor of Pharmacy programs are traditionally an under-utilized clinical resource in the community pharmacy setting. With the expansion of patient care responsibilities and exponential growth in pharmaceutical information encountered by clinical pharmacists, it is imperative that students of pharmacy are exposed to clinical scenarios early in their training. We conclude that Doctor of Pharmacy students are viable resources for identifying, documenting, and initiating clinical interventions in community pharmacy settings.

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Table 1

Correlations Across All Disease States

		1	2	3	4	5	6	7	8	9	10	11	12	13
		Nominalized Variables												
1	Suboptimal Therapy	1.00	.23**	.27***	.12	.57***	.29***	-.65***	-.22**	.13*	.33***	-.02	-.35***	.14*
2	Prone to Significant Drug Interactions	.19**	1.00	.01	.19**	.13*	.05	-.12	-.10	.02	.03	.01	-.20**	.10
3	Minor ADR Present	.16**	.19**	1.00	.19**	.14*	.12	-.16**	-.00	-.07	.04	.03	-.07	.10
4	Significant ADR Present	-.12*	.44***	.51***	1.00	.06	.04	.08	-.06	-.14**	.04	.10	-.22**	.04
5	Clinical Intervention Needed	.69***	.30***	.25***	.16**	1.00	.40***	-.35***	-.12*	-.20***	-.08	-.24***	-.21**	-.08
6	Requires Disease State Education / Counseling	.39***	.13*	.02	-.02	.33***	1.00	-.14*	-.08	-.13*	.16**	-.10	-.09	.06
7	Add Medication	-.73***	-.15**	-.11	.11	-.54***	-.19**	1.00	-.07	-.13*	-.15**	-.06	.10	-.10
8	Increase Dosage	-.11	.00	-.03	.04	-.08	-.03	-.07	1.00	-.05	-.07	-.03	.16**	.02
9	Discontinue Medication	.06	.08	-.02	-.03	-.17**	.04	-.13*	-.05	1.00	.06	.04	-.05	.17**
10	Decrease Dosage	.26***	.00	-.05	-.19**	-.01	.16**	-.15**	-.07	.06	1.00	.19**	-.12*	.19**
11	Lifestyle Modification	-.03	-.16**	-.10	-.24***	-.15**	-.30***	-.06	-.03	.04	.19**	1.00	.04	.14*
12	Monitoring Required	-.27***	-.17**	-.02	.01	-.21**	-.29***	.10	.16**	-.05	-.12*	.04	1.00	-.12*
13	Additional Diagnostics Required	.12*	.06	-.04	-.20**	-.05	.12*	-.10	.02	.17**	.19**	.14*	-.12*	1.00
		Metric and Nominal Variables												

Note: Spearman rank order correlations, n = 204, * p = .10; **p = .05; ***p = .001

Table 2

Descriptive Statistics Across All Disease States

	N	Mean	Std. Deviation	Median	Mode
Suboptimal Therapy	185	3.45	.89	1.68[a]	2.00[b]
Prone to Significant Drug Interactions	179	2.40	.74	1.16[a]	1.00[b]
Minor ADR Present	198	2.17	.85	1.18[a]	1.00[b]
Significant ADR Present	200	1.74	.53	1.03[a]	1.00[b]
Clinical Intervention Needed	197	3.86	.68	1.88[a]	2.00[b]
Requires Disease State Education / Counseling	193	3.99	.59	1.94[a]	2.00[b]
Add Medication	203			1.55	2.00[c]
Increase Dosage	202			1.91	2.00[c]
Discontinue Medication	203			1.77	2.00[c]
Decrease Dosage	204			1.96	2.00[c]
Lifestyle Modification	203			1.72	2.00[c]
Monitoring Required	200			1.77	2.00[c]
Additional Diagnostics Required	204			1.96	2.00[c]

Note: [a]Nominalized metric variables, [b]1=No & 2=Yes, [c]1=Yes & 2=No.

Table 3

Descriptive Statistics By Disease State

		Mean	Std. Deviation	Mode
Asthma	Suboptimal Therapy	3.60	.87	2.00
	Prone to Significant Drug Interaction	1.73	.67	1.00
	Minor ADR Present	2.08	1.32	1.00
	Significant ADR Present	1.15	.49	1.00
	Clinical Intervention Needed	3.72	.78	2.00
Congestive Heart Failure	Suboptimal Therapy	4.09	.62	2.00
	Prone to Significant Drug Interaction	3.10	.84	2.00
	Minor ADR Present	2.10	.64	1.00
	Significant ADR Present	1.92	.43	1.00
	Clinical Intervention Needed	4.37	.52	2.00
Diabetes	Suboptimal Therapy	4.17	.45	2.00
	Prone to Significant Drug Interaction	2.74	.52	1.00
	Minor ADR Present	2.49	.68	1.00
	Significant ADR Present	1.89	.38	1.00
	Clinical Intervention Needed	4.20	.42	2.00
Hyperlipidemia	Suboptimal Therapy	3.04	.62	2.00
	Prone to Significant Drug Interaction	2.54	.63	1.00
	Minor ADR Present	2.04	.66	1.00

	Significant ADR Present	1.88	.51	1.00
	Clinical Intervention Needed	3.48	.63	2.00
Peptic Ulcer Disease	Suboptimal Therapy	2.57	.59	1.00
	Prone to Significant Drug Interaction	2.32	.41	1.00
	Minor ADR Present	2.09	.34	1.00
	Significant ADR Present	2.02	.11	1.00
	Clinical Intervention Needed	3.79	.63	2.00

Table 4

MANOVA Post-Hoc Analyses of Differences in Metric Variables Among Disease States

Variable of Interest	Disease State (I)	Disease State (J)	Contrast Estimate (I-J)	Std. Error	P	95% Confidence Interval	
						Lower Bound	Upper Bound
Suboptimal Therapy	Asthma	Congestive Heart Failure	-.49	.17	.01	-.82	-.15
		Diabetes	-.57	.13	.00	-.83	-.31
		Hyperlipidemia	.56	.14	.00	.30	.83
		Peptic Ulcer Disease	1.03	.14	.00	.77	1.30
	Congestive Heart Failure	Diabetes	-.08	.17	.63	-.42	.25
		Hyperlipidemia	1.05	.17	.00	.70	1.40
		Peptic Ulcer Disease	1.52	.17	.00	1.18	1.86
	Diabetes	Hyperlipidemia	1.13	.14	.00	.86	1.40
		Peptic Ulcer Disease	1.60	.14	.00	1.33	1.87
	Hyperlipidemia	Peptic Ulcer Disease	.47	.14	.00	.19	.75
Prone to Significant Drug Interactions	Asthma	Congestive Heart Failure	-1.37	.16	.00	-1.68	-1.06
		Diabetes	-1.00	.12	.00	-1.25	-.77
		Hyperlipidemia	-.81	.13	.00	-1.06	-.56
		Peptic Ulcer Disease	-.59	.13	.00	-.83	-.34
	Congestive Heart Failure	Diabetes	.36	.16	.02	.05	.67
		Hyperlipidemia	.56	.16	.00	.24	.88
		Peptic Ulcer Disease	.79	.16	.00	.47	1.10
	Diabetes	Hyperlipidemia	.20	.13	.12	-.05	.45
		Peptic Ulcer Disease	.42	.13	.00	.173	.67
	Hyperlipidemia	Peptic Ulcer Disease	.23	.13	.09	-.03	.48

Minor ADR Present	Asthma	Congestive Heart Failure	-.02	.22	.94	-.44	.41
		Diabetes	-.41	.17	.01	-.75	-.0898
		Hyperlipidemia	.04	.17	.82	-.30	.38
		Peptic Ulcer Disease	-.01	.17	.94	-.35	.32
	Congestive Heart Failure	Diabetes	-.40	.22	.07	-.83	.03
		Hyperlipidemia	.06	.22	.80	-.38	.49
		Peptic Ulcer Disease	.00	.22	.99	-.44	.44
	Diabetes	Hyperlipidemia	.45	.18	.01	.10	.80
		Peptic Ulcer Disease	.40	.18	.02	.05	.75
	Hyperlipidemia	Peptic Ulcer Disease	-.05	.18	.77	-.41	.30
Significant ADR Present	Asthma	Congestive Heart Failure	-.77	.11	.00	-.98	-.56
		Diabetes	-.75	.08	.00	-.91	-.58
		Hyperlipidemia	-.73	.09	.00	-.90	-.57
		Peptic Ulcer Disease	-.88	.09	.00	-1.04	-.71
	Congestive Heart Failure	Diabetes	.03	.11	.79	-.18	.24
		Hyperlipidemia	.04	.11	.72	-.18	.26
		Peptic Ulcer Disease	-.10	.11	.35	-.31	.11
	Diabetes	Hyperlipidemia	.01	.09	.90	-.16	.18
		Peptic Ulcer Disease	-.13	.09	.13	-.30	.04
	Hyperlipidemia	Peptic Ulcer Disease	-.14	.09	.11	-.32	.03
Clinical Intervention Needed	Asthma	Congestive Heart Failure	-.65	.16	.00	-.96	-.33
		Diabetes	-.48	.12	.00	-.73	-.24
		Hyperlipidemia	.24	.19	.06	-.01	.50
		Peptic Ulcer Disease	-.07	.13	.58	-.32	.18
	Congestive Heart Failure	Diabetes	.16	.16	.31	-.16	.48
		Hyperlipidemia	.89	.16	.00	.56	1.21
		Peptic Ulcer Disease	.57	.16	.00	.25	.90

	Diabetes	Hyperlipidemia	.73	.13	.00	.47	.98
		Peptic Ulcer Disease	.41	.13	.00	.15	.67
	Hyperlipidemia	Peptic Ulcer Disease	-.31	.13	.02	-.58	-.05
Requires Disease State Education / Counseling	Asthma	Congestive Heart Failure	-.06	.15	.70	-.35	.24
		Diabetes	-.19	.12	.11	-.41	.04
		Hyperlipidemia	-.04	.12	.76	-.28	.20
		Peptic Ulcer Disease	.26	.12	.03	.02	.50
	Congestive Heart Failure	Diabetes	-.13	.15	.39	-.43	.17
		Hyperlipidemia	.02	.15	.90	-.29	.33
		Peptic Ulcer Disease	.32	.15	.04	.01	.62
	Diabetes	Hyperlipidemia	.15	.12	.22	-.09	.39
		Peptic Ulcer Disease	.45	.12	.00	.21	.69
	Hyperlipidemia	Peptic Ulcer Disease	.30	.13	.02	.05	.55

Note: Post-Hoc test = Least Significant Difference, Asthma n = 50, Congestive Heart Failure n = 21, Diabetes n = 48, Hyperlipidemia n = 42, Ulcer disease n = 43, ADR = Adverse Drug Reaction.

Table 5

Logistic Regression for Suboptimal Therapy and Clinical Intervention Needed

Dependent Variable	Predictor Variable	B	Significance	Odds	Lower Confidence Interval	Upper Confidence Interval
Clinical Intervention Needed	Question 1	3.44	.000	31.27	5.66	172.69
	Question 6	1.59	.013	4.92	1.41	17.25
Suboptimal Therapy	Question 6	1.78	.001	5.93	2.00	17.62

Note: Asthma n = 50, Congestive Heart Failure n = 21, Diabetes n = 48, Hyperlipidemia n = 42, Peptic Ulcer disease n = 43.

Table 6

Crosstabulations of Needs for Pharmaceutical Care by Disease State

	Requires Disease State Education / Counseling		Suboptimal Therapy		Clinical Intervention Needed	
	No	Yes	No	Yes	No	Yes
Asthma	0	47	10	38	7	40
Congestive Heart Failure	0	19	0	19	0	21
Diabetes	1	46	0	47	0	48
Hyperlipidemia	3	37	13	17	10	29
Peptic Ulcer Disease	7	33	36	5	7	35
Across All Disease States	11	182	59	126	24	173
Percentage Across All Disease States		94%		68%		88%

Note: Asthma n = 50, Congestive Heart Failure n = 21, Diabetes n = 48, Hyperlipidemia n = 42, Peptic Ulcer disease n = 43.

Patient Name: _____ Prescriber Name: _____
Patient Phone #: _____ Prescriber Phone #: _____
Date Rx Reviewed: _____/____/_____

Asthma Medication Questionnaire

Drugs That This Questionnaire May Be Used With:

Note: These are merely examples; other asthma medications may be reviewed.

1. **Albuterol (Proventil, Ventolin)**
2. **Salmeterol (Serevent, Serevent Diskus)**
3. **Methylxanthines:**
   a. Theophylline.
   b. Aminophylline.
4. **Aerosol Corticosteroids:**
   a. Beclomethasone (Beclovent, Vanceril).
   b. Dexamethasone (Decadron).
   c. Triamcinolone (Azmacort).
   d. Fluticasone (Flovent).

Patient History:

Asthma Medication(s)	Strength	Last Refill	Complications

C.O.P. Student Name: _____ Patient Age: _____
Drug Allergies: _____
_____
_____

Concurrent Medications (Including *Prescription*, *OTC*, and *Herbal*)

Medication	Strength	Last Refill	Complications

? *If more, please use back of paper…*

Medication Questions (Questions to Ask Patients)…

1. What did your Dr. tell you that you were taking this medication for?
   _____
   (Ask the patient if they have been instructed that they have Asthma or Chronic Obstructive Pulmonary Disease).

2. How often are you using your albuterol (rescue inhaler)? _____

3. Are you experiencing any side effects from your asthma medication?
   - ❑ Yes, please explain: _____
     (Students, please rewrite any side effect information in the patient history section above).
   - ❑ No

3. Do you wake up in the middle of the night coughing and / or wheezing?
   - ❑ Yes, how often _____
   - ❑ No

Note: If patient has COPD, skip to question 9.

4. Do you know what triggers / causes your asthma attacks? ? Yes, _____ ? No

5. Has anyone ever told you about the things that trigger asthma? ? Yes ? No

6. Do you know what happens to your lungs when you have an attack? ? Yes ? No

7. Do you monitor your asthma with a peak flow meter?
   - ❑ Yes, how often _____
   - ❑ No

8. Do you know what to do when you are having an attack?
   - ❑ Yes, please explain_____
   - ❑ No

9. Have you ever been instructed / taught proper inhaler technique?
   (how to use your inhaler correctly) ? Yes ? No

Conclusion: Thank the patient for answering questions pertaining to their medication.

Reviewed Jointly By Preceptor and Student:

_____ _____
Preceptor's Signature Date

_____ _____
Student's Signature Date

Patient Name: _____ Prescriber Name: _____
Patient Phone #: _____ Prescriber Phone #: _____
Date Rx Reviewed: _____/_____/_____

Congestive Heart Failure Medication Questionnaire

Note: Patients should be identified as CHF patients if they are receiving digoxin and furosemide (this may be an overestimate).

Patient History:

Digoxin & Furosemide	Strength	Last Refill	Complications

C.O.P. Student Name: _____ Patient Age: _____
Drug Allergies: _____
_____
_____

Concurrent Medications (Including *Prescription, OTC,* and *Herbal*)

Medication	Strength	Last Refill	Complications

? *If more, please use back of paper…*

Medication Questions (Questions to Ask Patients)…

1. Have you been told by your Dr. that you have heart failure or that your heart doesn't pump as well as it used to? Yes (If Yes, Go to #5) No

2. Are you taking digoxin or lanoxin for an irregular heart rhythm (atrial fibrillation)?
   Yes No If no, why are they taking digoxin?_____

3. Are they having any side effects with digoxin? Yes, describe_____
   _____ No

4. Thank them for their time and ask if they have any questions regarding their medications.

5. Have you been told by your Dr. to follow a low salt or sodium diet? Yes
   No

6. If yes, do you follow your diet? Yes No

7. Do you exercise? Yes No

If Yes, how often?

- ❑ Every day.
- ❑ > 3 times per week.
- ❑ Once a week.
- ❑ Rarely.

If No, Did your Dr. advise you to exercise regularly? Yes No

8. Do you ever experience shortness of breath? Yes No

- ❑ When walking < 1 block
- ❑ When walking between 1 to 2 blocks
- ❑ When walking around the house
- ❑ When getting dressed o taking a shower
- ❑ When sitting or resting

9. Do you wake up at night feeling short of breath? Yes No

If Yes, how often?

- ❑ Every Night.
- ❑ < 4 times per week.
- ❑ Once a month.
- ❑ Rarely.

Conclusion: Thank the patient for answering questions pertaining to their medication.

Reviewed Jointly By Preceptor and Student:

_____ _____

Preceptor's Signature Date

_____ _____

Student's Signature Date

Patient Name: _____ Prescriber Name: _____
Patient Phone #: _____ Prescriber Phone #: _____
Date Rx Reviewed: _____/_____/_____

Diabetes Medication Questionnaire

Drugs That This Questionnaire May Be Used With:

Note: These are merely examples; other diabetes medications may be reviewed.

1. Insulin (Humilin).
2. Sulfonylureas:
   a. Glimepride (Amaryl).
   b. Glyburide (Diabeta, Micronase, Glynase).
   c. Glipizide (Glucotrol, Glucotrol XL).
3. Biguanides:
   a. Metformin.
4. Thiazolidinedione Derivatives:
   a. Rosiglitazone (Avandia).
   b. Pioglitazone.

Patient History:

Diabetes Medication	Strength	Last Refill	Complications

C.O.P. Student Name: _____ Patient Age: _____
Drug Allergies: _____
_____
_____

Concurrent Medications (Including *Prescription, OTC,* and *Herbal*)

Medication	Strength	Last Refill	Complications

? *If more, please use back of paper…*

Medication Questions (Questions to Ask Patients)…

1. Do you know the symptoms of high or low blood sugar?
   _____Yes _____No
2. Are you experiencing episodes of low blood sugar?
   _____Yes, how often _____No
3. Have you been told about the complications associated with diabetes?
   (such as kidney, eye, heart and circulation problems)
   _____Yes _____No
4. Do you self-monitor your blood sugar? (have a machine to check your blood sugar levels)
   _____Yes _____No

5. How often do you check your blood sugar levels?

- ❑ Rarely.
- ❑ Once a day.
- ❑ Twice daily.
- ❑ Three times daily.
- ❑ Greater than three times daily.

6. What was your most recent blood sugar level?

_____< 140
_____< 200
_____Between 120 and 140
_____> 200
_____Don't remember

7. Do you know what your "goal" or "target" for your blood sugar level should be?

- ❑ Yes, (what is it?) _____
- ❑ No.

8. Do you know what a hemoglobin A1C level is?

_____Yes _____No

9. Do you know what your goal should be?

_____Yes, (What is it?_____) _____No

10. Do you know what your last value was?

_____Yes, (What was it?_____) _____No

11. Do you follow a specific diet plan for your diabetes?

_____Yes _____No

12. Have you ever received dietary education?

_____Yes _____No

13. Have you received education about diabetes?

_____Yes _____No

14. do you exercise (aerobic) on a regular basis (at least 3 times a week)?

_____Yes _____No

15. Have you ever been told to exercise?

_____Yes _____No

16. Are you taking any non-traditional therapies for your diabetes? (herbs, teas, supplements, acupuncture)

_____Yes _____No

Conclusion: Thank the patient for answering questions pertaining to their medication.

Reviewed Jointly By Preceptor and Student:

_____ _____
Preceptor's Signature Date

_____ _____
Student's Signature Date

Patient Name: _____ Prescriber Name: _____
Patient Phone #: _____ Prescriber Phone #: _____
Date Rx Reviewed: _____/_____/_____

HYPERLIPIDEMIA Medication Questionnaire

Drugs That This Questionnaire May Be Used With:

Note: These are merely examples; other hyperlipidemia medications may be reviewed.

- Atorvastatin (Lipitor).
- Fluvastatin (Lescol).
- Lovastatin (Mevacor).
- Pravastatin (Pravachol).
- Simvastatin (Zocor).
- Cholestyramine (Questran, Questran Light).
- Colestipol (Colestid).
- Niacin (Niaspan).
- Nicotinic Acid.

Patient History:

Hyperlipidemia Medication	Strength	Last Refill	Complications

C.O.P. Student Name: _____ Patient Age: _____
Drug Allergies: _____
_____

Concurrent Medications (Including *Prescription*, *OTC*, and *Herbal*)

Medication	Strength	Last Refill	Complications

? *If more, please use back of paper…*

Medication Questions (Questions to Ask Patients)…

1. What did your Dr. tell you were taking this medication for?
   Please Explain: _____
   _____
2. Have you been told you have heart disease (such as had a heart attack, stroke, coronary bypass surgery, or have chest pain)? ? Yes ? No
3. Do you have diabetes? ? Yes ? No
4. When was the most recent time you have had your cholesterol checked?
   - ❑ 1 month ago
   - ❑ 1-3 months ago
   - ❑ 3-6 months ago
   - ❑ Not sure
   - ❑ 6-12 months ago
   - ❑ 12 months

5. What was your most recent total cholesterol level?

- ❑ < 200
- ❑ Between 200 and 240
- ❑ 240
- ❑ Don't know number, but Dr. told them it was high
- ❑ Don't know the number

6. Do you know the difference between "bad" and "good" cholesterol ? Yes ? No

7. What was your most recent LDL or "bad" cholesterol level?

- ❑ < 100
- ❑ Between 100 and 130
- ❑ 130
- ❑ Don't know the number, but Dr. told them it was high or elevated
- ❑ Don't know the number

8. Do you know what your "goal" or "target" level is for your **total cholesterol (TC)**?

? Yes What is it? _____(i.e., ? < 160 ? < 200 ? < 240)

? No Has your Dr. ever told you? ? Yes ? No

9. Do you know what your "goal" or "target" level is for your **LDL** or "bad" cholesterol?

? Yes What is it? _____(i.e., ? < 100 ? < 130 ? < 160)

? No Has your Dr. ever told you? ? Yes ? No

10. Do you follow a low-fat diet to lower your cholesterol? ? Yes ? No

11. Have you ever received education or been told what a low fat diet is? ? Yes ? No

12. Do you exercise (aerobic) on a regular basis (at least 3 x per week)? ? Yes ? No

13. Have you ever received education or been told to exercise? ? Yes ? No

14. Do you take any over-the-counter medication? Herbal medication? Homeopathic medication? ? Yes ? No

If Yes, please list and explain: _____

15. Have you experienced any adverse events or side effects from your cholesterol medication? ? Yes ? No
    If Yes, please describe: _____
16. Are you satisfied with the medical treatment that you receive for your cholesterol? ? Yes ? No
    If No, please explain: _____
17. Would you be interested in a cholesterol education and management program if it was provided by _____Pharmacy? ? Yes ? No

Conclusion: Thank the patient for answering questions pertaining to their medication.

Reviewed Jointly By Preceptor and Student:

_____ _____
Preceptor's Signature Date

_____ _____
Student's Signature Date

Patient Name: _____ Prescriber Name: _____
Patient Phone #: _____ Prescriber Phone #: _____
Date Rx Reviewed: _____/_____/_____

.....

Peptic Ulcer Disease / Reflux Disease Medication Questionnaire

Drugs That This Questionnaire May Be Used With:

Note: These are merely examples; other medications may be reviewed.

- Omeprazole (Prilosec)
- Lansoprazole (Prevacid)
- Ranitidine (Zantac)
- Famotidine (Pepcid)
- Cimetidine (Tagamet)
- Nizatidine (Axid)

Patient History:

Peptic Ulcer / Reflux Disease Medication	Strength	Last Refill	Complications

C.O.P. Student Name: _____ Patient Age: _____
Drug Allergies: _____
_____
_____

Concurrent Medications (Including *Prescription*, *OTC*, and *Herbal*)

Medication	Strength	Last Refill	Complications

? *If more, please use back of paper…*

Medication Questions (Questions to Ask Patients)…

1. What did your Dr. tell you that you were taking this medication for?
   Please Explain: _____
2. How long have you been taking this medication? _____

3. Have you had any problems or side effects from this medication?
   ? Yes ? No
   If Yes, Please Explain: _____
   _____

4. How has your ulcer pain / heartburn pain been since beginning your medication?
   _____

5. Have you needed to take any over the counter medication for your ulcer / heartburn pain since beginning this new medicine?
   ? Yes ? No
   If Yes, Please Explain: _____
   _____
   (What was taken, how much, how often, does it relieve the pain?)

Note: If patient is being treated for GERD, please proceed to #6

Note: If patient is being treated for an Ulcer, please proceed to #9

6. Do you smoke? ? Yes ? No

7. Were you ever told about foods to avoid, eating smaller meals, or avoiding nighttime meals and snacks? ? Yes ? No

8. If you don't take your medicine, do you get heartburn / reflux symptoms?
   ? Yes ? No

Please proceed to question #11

9. Have you ever been tested for H. Pylori, the bacteria responsible for most ulcers?
   ? Yes ? No
   If Yes, were you treated for the bacteria and how long ago?
10. If you don't take your medication, do you get ulcer symptoms?

11. Have you taken any medicines such as aspirin, ibuprofen (Advil, Nuprin), naprosyn, or ketoprofen (Orudis) since beginning this new medication?
    ? Yes ? No
    If Yes, Please Explain: _____
    _____

Conclusion: Thank the patient for answering questions pertaining to their medication.

Reviewed Jointly By Preceptor and Student:

_____ _____
Preceptor's Signature Date

_____ _____
Student's Signature Date

Patient Information Data Form

Date: _____

Patient #: _____

Current Medication:

1._____

2._____

3._____

4._____

5._____

6._____

7._____

8._____

9._____

10._____

11._____

12._____

13._____

14._____

15._____

Clinician-Completed Likert Scale

Patient #: _____

Please use the following scale to indicate the extent to which you disagree or agree with each item.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	**The patient is not receiving optimal pharmacological therapy.**	①	②	③	④	⑤
2.	**The patient's current pharmacological therapy is prone to clinically significant drug interactions. (drug-drug, drug-disease, drug-food)**	①	②	③	④	⑤
3.	**The patient's current pharmacological therapy is prone to adverse drug events.**	①	②	③	④	⑤
4.	**The patient appears to have had a minor adverse drug event.**	①	②	③	④	⑤
5.	**The patient appears to have had a significant adverse drug event.**	①	②	③	④	⑤

Check all that may apply:

Medication added	?
Dosage increased	?
Medication discontinued	?
Dosage decreased	?
Lifestyle modification	?
Monitoring	?
Additional diagnostics	?

6.	**The patient requires additional disease state education/counseling.**	①	②	③	④	⑤