

COMMUNITY PHARMACY FOUNDATION

FINAL REPORT

PROJECT TITLE:

**MINIMIZING RISK AND MAXIMIZING OUTCOMES IN GERIATRIC PATIENTS THROUGH
INTEGRATED CLINICAL PHARMACY SERVICES IN AN
INNOVATIVE MODEL OF COMMUNITY PRACTICE**

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MINIMIZING RISK AND MAXIMIZING OUTCOMES IN GERIATRIC PATIENTS THROUGH INTEGRATED CLINICAL PHARMACY SERVICES IN AN INNOVATIVE MODEL OF COMMUNITY PRACTICE

ABSTRACT

Background: The VascuScript Pharmacy, Inc. was established in 2009 with the mission to integrate clinical pharmacy services into the standard business practices of a brick and mortar community pharmacy. Geriatric patients are amongst the highest risk group of patients to be impacted by poor adherence and inappropriate medication use. The objective of this study is to determine if an innovative model of delivering medication management services to geriatric patients through a community-based pharmacy practice model can be sustained to increase adherence, reduce medication problems, and increase health literacy and quality of life.

Methods: Community pharmacists visited patients ≥ 65 years of age with ≥ 5 prescription medications, in their home, to assess medication adherence, knowledge of indication and appropriate use of each medication, the presence of Beer's Criteria medications, health literacy (REALM-SF), and health-related quality of life (CDC HRQOL-4). Patients were included in the study for a period of one-year and filled all their medications at the VascuScript Pharmacy. Medication adherence was determined from the mean possession ratio calculated from pharmacy claims records and expressed as an adherence percentage. Each patient received a structured 15-30 minute medication management consultation by phone on a monthly basis. In-home visits and additional phone consultations were provided on an as needed basis. Financial viability of the geriatric care program was determined by establishing the number of patients required to cover the salary of the community pharmacist.

Results: 20 patients were enrolled in a one-year period. The adherence rate was $91.0 \pm 9.7\%$ and ranged from 73% to 100%. 80% of patients demonstrated an adherence rate $\geq 80\%$. On average, patients were aware of the indication of an additional 1.0 ± 3.2 medications (non-significant) and tended to increase the number of medications taken appropriately ($+1.2 \pm 1.8$; $p=0.052$). Beer's Criteria medications were not altered. The total number of medication-related problems were significantly reduced (-3.2 ± 2.9 ; $p=0.011$). Systolic blood pressure (-9.0 ± 3.4 mmHg; $p=0.004$) and diastolic blood pressure (-3.6 ± 3.7 ; $p=0.092$) tended to be reduced. Hemoglobin A_{1c} reduced $0.6 \pm 1.3\%$, but was not statistically significant. Pharmacists and their interns spent an additional 5.7 ± 1.9 hours per patient per year beyond standard dispensing functions. Net profit from the geriatric care program (net income – pharmacist cost) was \$22,907. 50 and 100 patients would be required to justify a pharmacist at 0.5 FTE and 1.0 FTE, respectively.

Conclusions: Geriatric patients enrolled in the innovative community pharmacy practice model had an adherence rate $>90\%$, reduced the number of medication-related problems, and tended to improve their knowledge and use of the medication regimen. The delivery of community pharmacist-based in-home and ongoing telephonic medication management consults to the geriatric patient appears to be a sustainable and potentially revenue generating endeavor for the community pharmacy.

1. BACKGROUND

The National Priorities Partnership, a collaborative of 28 major national organizations involved in all aspects of health care, designated safety as one of the six national priorities for the U.S. health care system (2008). This designation calls for a culture of safety targeted at driving the incidence of health care induced harm, disability, and death toward zero.[1] Often requiring multiple medications to manage multiple disease states, geriatric patients are amongst those at the highest risk of complication from inappropriate medication use. Pharmacists are one of the most accessible health care practitioners and in an opportune position to positively impact patient safety and clinical outcomes.

It has been demonstrated that patients can improve their safety through informed choice, safe medication use, and complication reporting.[2] This includes not only the potential problems that occur from prescription medication use but also issues that may arise through the improper use of over-the-counter medications. The willingness of a patient to take on safety action is known to be complicated by an unwillingness to behave in a manner that might challenge a physician's judgment or actions.[3] Community pharmacists are in the unique position to provide perspective on the physician's recommendation and act as an advocate to facilitate necessary change. Through supportive and repeated interaction with their community pharmacist patients can develop assertiveness toward their own health care, an increased frequency and quality of interaction with their physician, and thus a minimized risk of harm and maximized opportunity to optimize clinical outcomes.

There exists evidence that integrating pharmacists directly into the medical practice can improve patient outcomes.[4-8] More generalizable to the larger pharmacy community, the Asheville Projects and Diabetes Ten City Challenge have shown that clinical pharmacy service programs can be effectively integrated into the community practice setting to sustain improvements in clinical and economic outcomes.[9-12] Historical review indicates that in older patients, 50.1 adverse drug events occur per 1,000 patient years, of which 27.5% are preventable.[13] Although not commonly reported in the community pharmacy setting, pharmacists have repeatedly demonstrated their efficiency in reducing the occurrence of medication-related problems in older patients and have a clear responsibility to these patients in their community.[14-16] This final report provides methodology and outcomes data for an innovative geriatric care program delivered by Community Pharmacists.

2. PRIMARY AND SECONDARY RESEARCH OBJECTIVES

The VasuScript Pharmacy, Inc. was established in August 2009 with the mission to integrate clinical pharmacy services into the standard business practices of a brick and mortar community pharmacy. Since its inception, VasuScript Pharmacy, Inc. has developed clinical relationships with hospitals, outpatient clinics, physician medical groups, independent physician practices, surgical practices, mobile practitioner groups, and health plans to facilitate clinical referrals and expanded avenues of prescription growth.

The present project had the following primary and secondary objectives:

Primary Clinical Objective: To determine if a community pharmacy-based pharmacy service program in geriatric patients can maintain a medication adherence rate $\geq 80\%$, increase knowledge of the regimen, and reduce the number of medication-related problems.

Primary Economic Objective: To determine the number of patients required to validate a part-time or full-time pharmacist to perform the required clinical functions of the geriatric clinical pharmacy service.

Secondary Clinical Outcomes: To determine if a community pharmacy-based pharmacy service program in geriatric patients can improve common metabolic parameters (weight, blood pressure, cholesterol, and glucose), health literacy (REALM-SF), and Quality of Life (evidenced by the CDC HRQOL healthy days).

Care Process Outcomes: To determine the number of hours of pharmacist time required to perform necessary functions of the geriatric clinical pharmacy service. To determine the number of referring practices that would recommend patients for entry into the geriatric clinical pharmacy service.

3. STUDY DESIGN AND METHODS

3.1 Study Design

Prospective, longitudinal, single cohort study.

3.2 Setting

The VascuScript Pharmacy is located in Buffalo, NY. The business model design as a mobile community pharmacy allowed pharmacists to see patients in their home throughout Western New York. Patients enrolled in the program ranged from 1 to 40 miles from the physical location of the pharmacy.

3.3 Statement of Institutional Review Board Approval

The research protocol was approved by the University at Buffalo Health Sciences Institutional Review Board on April 11th, 2011.

3.4 Enrollment and Study Duration

Patients were permitted to be enrolled for a period of 1-year following Institutional Review Board Approval. The initial enrollment period target of 6-months was extended to 1-year to support further patient enrollment. Patients were identified and referred to the VascuScript Pharmacy from 14 medical practices. These included one primary care physician group, one mobile practitioner group, and 12 independent practicing physicians. Patients were explained the program by the physician and directed to schedule an in-home visit with the VascuScript Pharmacy. The pharmacists contacted patients to schedule a meeting date for the initial visit.

3.5 Inclusion and Exclusion Criteria

Inclusion criteria for entry into the geriatric clinical pharmacy service program were as follows:

- Age ≥ 65 years of age[†]
- ≥ 5 chronic medications

Exclusion criteria to the geriatric clinical pharmacy service program are as follows:

- Unable or unwilling to use the VascuScript Pharmacy, Inc.

[†] The age requirement was reduced to ≥ 55 years of age 8 months into the study. No patients were < 65 years.

3.6 Description of Patient Interactions

The schedule of patient interactions is presented in Figure 1. The initial visit was considered the index date for the 1-year study period. The following activities were performed at the initial and follow-up intervals:

Visit #1 (in-home): The patient acknowledged explanation of all clinical and study procedures and signed informed consent. At start of the visit, the pharmacist administered the REALM-SF to establish a baseline of health literacy and requested the patient complete the CDC HRQOL-4 healthy days module. The pharmacist reviewed all available demographic, medical history, anthropometric, laboratory, and medication-related information. The medication regimen was reviewed for Beer's criteria medications and medication-related problems which were categorized as patient-related (adherence), prescriber-related (expired indication, therapeutic duplication, inappropriate dose, off-label use, under-treatment, inconvenience), or medication-related (contraindication, drug-drug interaction, drug treatment of an adverse event). Clinical and study data were documented in the case report form and recommendations sent to the physician by the pharmacist.

Visit# 2-6 and 8-12 (telephonic): The pharmacist reviewed all medications and changes in clinical status with the patient through a scheduled and structured 15-30 minute phone consultation. Beers criteria and medication related problems were specifically reviewed for resolution and documented in the case report form. As determined appropriate by the pharmacist, information and recommendations were communicated to the physician for approval. Medications were reviewed and provided to the patient intermittently between formal visits as a standard business practice.

Visit #13 (in-home): At the start of the visit, the pharmacist re-administered the REALM-SF and had the patient complete the CDC HRQOL-4 healthy days module. In addition, the patient completed a short survey assessing their perception of benefit from the program, willingness to continue participation in the care model as a free program, willingness to participate in the care model for an added cost, and the amount of money they would be willing to pay for the service. The pharmacist gathered and reviewed all available demographic, medical history, anthropometric, laboratory, and medication-related problems.

3.7 Payment for Clinical Pharmacy Services

The standard business practices of the VascuScript Pharmacy are to provide free of charge prescription delivery, telephonic consults, and in-home consults for all patrons. The patient was explained that the geriatric clinical pharmacy service was a research protocol and that funding was desirable from the patient. The initial rate proposed for patients enrolled in the study was \$48/year. The patients were confused by the charge considering other patrons of the pharmacy would not pay a fee. Ethically, pharmacists were not comfortable with multiple standards for patients within the pharmacy. In order to adequately address the value of the service, the addition of a short survey was made for the final study visit that assessed the patient's perception of benefit from the program, willingness to continue participation in the care model as a free program, willingness to participate in the care model for an added cost, and the amount of money they would be willing to pay for the service.

3.8 Health Outcomes Assessments

Medication Adherence: The adherence to chronic medications was assessed by the mean possession ratio, a ratio of the day supply of medications to the actual time the medication supply lasted. Therefore, a ratio of <1 (expressed as a percentage) would be suggestive that a patient is not fully adherent to the medication regimen. The mean possession ratio was calculated from the records of the community pharmacy from the point at which the patient enrolled in the program (index date, first date filling a medication at the community pharmacy) through final follow-up.

Beer's Criteria Medications: Beer's Criteria medications are a list of alphabetically sorted potentially inappropriate medications in older adults [17]. The list can be used as a quick reference tool for pharmacists or other health care practitioners to identify or avoid the use of potentially high-risk medications in older patients. The number of Beer's criteria medications was assessed at baseline and for reduction through final follow-up.

Medication-related Problems: Medication-related problems were reviewed in three categories [16]:

- (a) Patient-related: non-adherence
- (b) Prescriber-related: expired indication, therapeutic duplication, inappropriate dose, off-label use, under-treatment, inconvenience
- (c) Medication-related: contraindication, drug-drug interaction, drug treatment of an adverse event.

Knowledge of the Medication Regimen: Knowledge of the medication regimen was assessed through:

- (a) Patient interview to determine the number of medications the patient is aware of indication
- (b) Patient interview to determine the number of medications the patient is taking as intended

Health Literacy: Health literacy was assessed by the REALM-SF score. The score is based on patient's ability to read aloud as many words as possible from a provided list: menopause, antibiotics, exercise, jaundice, rectal, anemia, and behavior. The patient scores 1 (one) point for each word they were able to read. The patient is allowed to say "blank", or if it takes more than 5 seconds on a word, the resultant score is 0 (zero). A total point score is recorded.

Health-related Quality of Life: Health-related Quality of Life (HRQOL) was assessed by having the patient complete the CDC HRQOL Healthy Days Core Module-4 (CDC HRQOL-4):

- (a) General health perception: scaled assessment (excellent, very good, good, fair, poor)
- (b) Number of days in the past 30-days not in good physical health
- (c) Number of days in the past 30-days not in good mental health
- (d) Number of days in the past 30-days that usual activities were limited due to poor health

Care Process: The assessment of the care process included the hour requirements for community pharmacist and pharmacist interns completing their academic training at the community pharmacy.

3.9 Economic Model for Financial Sustainability

In addition to improving the health and well being of geriatric patients through medication management services delivered by the community pharmacist, the primary economic objective was to determine the financial sustainability of delivering the care services. The following economic model was constructed to determine the number of patients required to justify a part-time (0.5 FTE) or full-time pharmacist (1.0 FTE):

Equation 1:

$\frac{\text{Annual Pharmacist Salary}}{\text{Net Income (per patient)}} = \text{Number of Patients Required}$
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Model Assumptions:

- Annual Full-time Pharmacist Salary = \$112,611.20 (Western New York estimate)
- Annual Part-time Pharmacist Salary = \$56,305.60 (Western New York estimate)
- Total Revenue (estimate) = Number of Prescriptions Filled x Revenue per prescription (\$75)
- Gross Profit (estimate) = Total Revenue x Margin (20%)
- Net Income (estimate) = Gross Profit – Pharmacist Salary (Number of hours x \$54.14/hour)

4. RESULTS

The study investigators prospectively enrolled 20 patients aged ≥65 years with ≥5 chronic medications. 90% of patients remain enrolled in the program. One patient transitioned to nursing home care and one patient expired.

Baseline Characteristics: The baseline characteristics are summarized in **Table 1**. 14 women and 6 men aged 79.8 ± 8.7 years were enrolled throughout the 1-year enrollment period. On average, body mass index was in the overweight range (25-30 kg /m²), while blood pressure and lipids were well controlled. Fasting glucose and hemoglobin A₁C were slightly elevated in patients with pre-diabetes or diabetes. On average, patients were on 10.6 ± 3.9 medications, of which they were aware of 8.5 ± 4.5 medication indications, and taking 9.9 ± 4.0 medications appropriately. Total medication-related problems were 2.7 ± 2.7 (patient-related, 1.4 ± 2.2; prescriber-related, 0.4 ± 1.0, medication related, 1.0 ± 0.9). Realm-SF scores averaged 6.1 ± 1.8. General health perception was most commonly designated as good (50%) or fair (25%). The number of days out of the previous 30-days that patients felt they were not in good physical health was 11.9 ± 11.4, while days not in good mental health was 5.3 ± 8.7, and days where usual care activities were limited was 7.6 ± 10.2.

Medication Adherence: Mean possession ratio data for patients enrolled in the geriatric care program are presented in **Table 2**. On average, patients had an adherence rate of $94.6 \pm 14.0\%$. 35% of patients had a 3-17% excess of medication stock on-hand (as indicated by a mean possession ratio >1 or 100%). Correcting for this excess, mean adherence rate was $91.0 \pm 9.7\%$. Adherence rates ranged from 72.8% to 100%. 80% of patients achieved an adherence rate of $\geq 80\%$.

Medication-Related and Clinical Outcomes (6-months): Medication-related and clinical outcomes for patients reaching the 6-month study follow-up benchmark with paired data available are summarized in **Table 3**. There was no significant increase in the number of total medications on the regimen. On average, patients were aware of the indication of an additional 1.0 ± 3.2 medications (non-significant) and tended to increase the number of medications taken appropriately ($+1.2 \pm 1.8$; $p=0.052$). Beer's Criteria medications were not significantly changed. The total number of medication-related problems were significantly reduced (-3.2 ± 2.9 ; $p=0.011$). Medication related-problems classified as patient-related (-1.8 ± 2.9 ; $p=0.011$) and medication-related (-1.1 ± 0.8 ; $p<0.001$) were significantly reduced, prescriber-related problems were not significantly reduced. Weight and cholesterol biomarkers were not significantly altered throughout the study period. Systolic blood pressure (-9.0 ± 3.4 mmHg; $p=0.004$) and diastolic blood pressure (-3.6 ± 3.7 ; $p=0.092$) tended to be reduced. Hemoglobin A_{1c} reduced $0.6 \pm 1.3\%$, but was not statistically significant.

Health Literacy and HRQOL: Pending completion of the 1-year study follow-up benchmark.

Care Process Requirements: Community pharmacist and pharmacist intern hours required to conduct care services are summarized in **Table 4**. To date, community pharmacist hours and pharmacist intern hours total 29.0 and 23.4 hours, respectively. Adjusting to date hour requirements to an annualized figure, projections indicate a total of 65.5 hours for the community pharmacist (average of 3.3 ± 1.4 hours/patient) and 48.7 hours for the pharmacist intern (average of 2.4 ± 1.5 hours/patient), a total of 5.7 ± 1.9 hours per patient per year.

Financial Sustainability: The financial viability for the geriatric care program is summarized in **Table 5**. Adjusting to date gross profit and pharmacist hour requirements to annualized figures, projections indicate a total of \$26,453.99 in gross profit and \$3,547.25 in pharmacist salary, for a total of \$22,906.74 in net income (\$1,145.34/patient). Inputting observed data for the net income obtained per patient into Equation 1, a total of 49.2 and 98.3 patients would be required to sustain a part time (0.5 FTE) and full-time pharmacist, respectively.

Perceived Value of Pharmacy Services: Pending completion of the 1-year study follow-up benchmark, **Table 6**.

5. DISCUSSION

The VascuScript Pharmacy, Inc. was formed in August 2009 with a mission to deliver high quality prescription dispensing and structured medication management services to patients in the Western New York community. The innovative business design focuses on workflow that protects the pharmacist's time from day-to-day distractions and dedicates time to be spent on direct patient care. The business model allows for the pharmacist to conduct patient visits in the community pharmacy, or be mobile to visit patients in their home or preferred setting. Approximately 80% of medications are delivered to the patient's home or care setting, free of charge. With walk-in traffic being a minority source of prescription revenue, the sustainability of the business model has been accomplished through networking with hospitals, outpatient clinics, physician medical groups, independent physician practices, surgical practices, mobile practitioner groups, and health plans.

Our experience with the geriatric care program demonstrates that the innovative practice model and structured workflow of the community pharmacy can create adherence rates in excess of 90%. Accompanying the success with medication adherence, interim data supports an increase in knowledge and compliance with the proper administration of medications on the regimen. Medication-related problems identified at baseline were able to be significantly reduced at the 6-month follow-up visit. Predominantly, the correction of medication-related problems was derived from problems identified with adherence, compliance, or adverse events. Prescriber-related issues were not as commonly resolved.

The added set of care services, including an initial in-home and at least monthly telephonic contacts, for the geriatric patients were completed by the community pharmacist and pharmacist interns in their final year of academic training. On average, patients receive an additional 5.7 hours of dedicated medication management services from the pharmacist and intern. Reimbursement from Health Plans, physicians, or patients for medication management services has been challenging for the community pharmacy. In the VascuScript Pharmacy business model, all patrons of the pharmacy are afforded the opportunity for expanded access to the community pharmacist. As a consequence, patients were not inclined to pay for pharmacist interventions and pharmacists were ethically challenged to have separate standards for study and non-study patients. The main source of revenue to sustain medication management services in the geriatric patient was prescription volume. In this project, patients were on an average of 10.6 medications, which did not increase. Annualizing financial data, the recruitment of patients for the geriatric care program through the community pharmacy led to a net income of \$22,906.74. Consistent with initial projections, the recruitment of approximately 50 patients would be required to justify a 0.5 FTE position for a community pharmacist at an annual salary of \$56,306. Approximately 100 patients would be required to justify the creation of a new pharmacist position at an annual salary of \$112,611. The number of patients required to be enrolled to sustain a pharmacist may be lessened in the event patients are willing to provide payment for such services. The understanding of approximate hour requirements per patient beyond normal dispensing functions (5.7 hours in this study) provides a reasonable benchmark to advertise or request payment for such services. Acquisition of health literacy, HRQOL, and financial survey data at the conclusion of this study regarding perception of value will provide additional reference for benchmarking the value of services to the patient, physician, and/or health plan.

6. LIMITATIONS

Barriers to Enrollment: The primary limitation experienced throughout the study period was inability to enroll patients into the geriatric care program. Target enrollment was 50 patients, 20 patients were able to be enrolled over the one-year study period. The recruitment experience from this study has elucidated numerous important barriers to community pharmacies interacting with geriatric patients. Most notably, the program was well received by the physician community and was not perceived to be a barrier. The primary difficulty encountered was leering of geriatric patients to have a pharmacist visit the home environment. Irrespective of physician recommendations, it was common for patients to desire children or caregivers to be present for the initial visit. Therefore, scheduling was complicated and enrollment into the study required the approval of numerous individuals with varying levels of interaction with the patient. Another barrier with significant impact on enrollment was the presence of existing pharmacy ‘contracts’ with senior living homes. Interest and buy-in was expressed from numerous senior living homes and individual practitioners treating patients within the homes. Long-standing contractual agreements with community pharmacies providing medications to the senior living homes limited hundreds of potential referrals for enrollment into the geriatric care program. This issue is an important one for the enrollment of this study, but also for future community pharmacy approaches that endeavor to engage geriatric patients because prescription revenues may not be able to be recuperated.

Barriers to Information Access: While physician support for the project was perceived to be adequate, gaining access to anthropometric and laboratory data through the respective offices was complex. Anthropometric and laboratory data that was maintained in an electronic medical record was more commonly obtained from the managing physician. Similarly, with multiple physicians involved in the patients care there exist additional steps and requests for information that may not be prioritized by the non-referring physician office. Lastly, because this is not a randomized controlled clinical trial the ability to schedule and have laboratory assessments approved by insurance are not always attainable. This limitation when coupled with diminished enrollment from the target limited statistical power and ability to assess change in anthropometric and laboratory data.

Financial Model and Sustainability: The financial model includes the variables of total revenue, gross profit, net income, and pharmacist salary. In the presented financial model the figures are generated from the historical experience of the VascuScript Pharmacy, Inc and average pharmacist salary in Western New York. Additionally, the financial model does not account for an increase in other direct and indirect business expenses (i.e. office supplies, ancillary personnel time, gas, postage, taxes, etc.). Furthermore, the VascuScript Pharmacy business model has a strong focus in academic training and has the benefit of extended pharmacist intern experiences throughout the year. Therefore, it must be considered that additional expenses may be considered and that all model variables may require adjustment for other independent and chain pharmacy practice models.

7. CONCLUSIONS

Geriatric patients enrolled in the innovative community pharmacy practice model had an adherence rate >90%, reduced their number of medication-related problems, and tended to improve their knowledge and use of the medication regimen. Systolic and diastolic blood pressure tended to decrease over the study period. Health literacy and HRQOL data are pending final study assessment at one-year. The delivery of community pharmacist-based in-home and ongoing telephonic medication management consults to the geriatric patient appears to be a sustainable and potentially revenue generating endeavor for the community pharmacy.

Figure 1. Schedule of Patient Interactions

Activity	Enrollment	F/U #1	F/U #2	F/U #3	F/U #4	F/U #5	F/U #6	F/U #7	F/U #8	F/U #9	F/U #10	F/U #11	F/U #12
Visit	1	2	3	4	5	6	7	8	9	10	11	12	13
Type	In-person	Phone	Phone	Phone	Phone	Phone	Phone	Phone	Phone	Phone	Phone	Phone	In-person
Study Day	0	30	60	90	120	150	180	210	240	270	300	330	365
Informed consent	X												
Anthropometrics ¹	X						X						X
Demography	X												
Medical history	X												
Medications	X	X	X	X	X	X	X	X	X	X	X	X	X
Clinical Outcomes													
Adherence/knowledge		X	X	X	X	X	X	X	X	X	X	X	X
Beer's criteria	X	X	X	X	X	X	X	X	X	X	X	X	X
Health literacy	X												X
Laboratory work-up ²	X						X						X
Medication problems	X	X	X	X	X	X	X	X	X	X	X	X	X
Humanistic Outcomes													
HRQOL	X												X
Economic Outcomes													
Economic evaluation													X

¹ Anthropometrics will include weight, height, systolic and diastolic blood pressure
² Laboratory work-up will include total cholesterol, low density lipoprotein, high density lipoprotein, triglycerides, fasting glucose, hemoglobin A₁C, AST, ALT, Alk-Phosphatase, blood urea nitrogen, serum creatinine, and creatinine clearance, where clinically appropriate.

Table 1: Baseline Characteristics for Patients Enrolled in the Geriatric Care Program

Parameter (Age, Gender)	Value
Anthropometric and Laboratory Data	
Weight (N=12)	179.4 ± 39
Height (N=12)	63.7 ± 3.4
Body Mass Index (N=12)	27.3 ± 9.6
Systolic Blood Pressure (N=14)	136 ± 17
Diastolic Blood Pressure (N=14)	81 ± 13
Fasting Plasma Glucose (N=14)	114 ± 26
Hemoglobin A _{1c} (N=10)	6.6 ± 0.6
Total Cholesterol (N=14)	161 ± 32
LDL Cholesterol (N=14)	87 ± 25
HDL Cholesterol (N=14)	49 ± 15
Triglycerides (N=14)	126 ± 46
Blood Urea Nitrogen (N=14)	23 ± 7
Serum Creatinine (N=14)	1.0 ± 0.3
Creatinine Clearance (N=14)	56 ± 23
AST (N=14)	22 ± 9
ALT (N=14)	19 ± 5
Alkaline Phosphatase (N=14)	69 ± 25
Medication Regimen	
Total medications (N=20)	10.6 ± 3.9 [7-20]
Medications patient aware of indication (N=20)	8.5 ± 4.5 [4-20]
Medications patient is taking as intended (N=20)	9.9 ± 4.0 [4-20]
Beer's criteria medications (N=20)	0.8 ± 0.8 [0-3]
Medication Related Problems	
Patient-related (N=20)	1.4 ± 2.2 [0-9]
Prescriber-related (N=20)	0.4 ± 1.0 [0-4]
Medication-related (N=20)	1.0 ± 0.9 [0-2]
Total Medication-related problems (N=20)	2.7 ± 2.7 [0-10]
Health Literacy and Quality of Life	
Realm-SF Score (N=20)	6.1 ± 1.8 [0-7]
General Health Perception (N=20)	
- Excellent	2
- Very Good	2
- Good	10
- Fair	5
- Poor	1
Days not in Good Physical Health (N=20)	11.9 ± 11.4 [0-30]
Days not in Good Mental Health (N=20)	5.3 ± 8.7 [0-28]
Days Usual Activities limited due to Poor Health (N=20)	7.6 ± 10.2 [0-30]

Table 2. Mean Possession Ratio (MPR) for Patients Enrolled in the Geriatric Care Program

<u>Patient</u>	<u>MPR</u>	<u>MPR (Max 100%)</u>	<u>>80%</u>	<u>>100%</u>	<u>Follow-up Point</u>
1	97.91%	97.91%	Yes	No	11
2	113.25%	100.00%	Yes	Yes	4
3	84.12%	84.12%	Yes	No	8
4	80.59%	80.59%	Yes	No	8
5	88.09%	88.09%	Yes	No	8
6	96.72%	96.72%	Yes	No	9
7	116.75%	100.00%	Yes	Yes	3
8	92.90%	92.90%	Yes	No	7
9	72.77%	72.77%	No	No	7
10	110.97%	100.00%	Yes	Yes	7
11	103.05%	100.00%	Yes	Yes	6
12	113.73%	100.00%	Yes	Yes	6
13	79.65%	79.65%	No	No	6
14	99.46%	99.46%	Yes	No	5
15	104.71%	100.00%	Yes	Yes	5
16	90.94%	90.94%	Yes	No	5
17	110.08%	100.00%	Yes	Yes	4
18	78.27%	78.27%	No	No	3
19	76.49%	76.49%	No	No	3
20	82.37%	82.37%	Yes	No	2
Totals	<u>94.6 ± 14.0%</u>	<u>91.0 ± 9.7%</u>	<u>80%</u>	<u>35%</u>	-

Table 3. Medication-related and Clinical Outcomes (6-month follow-up benchmark)

<u>Parameter</u>	Δ 6-month	<u>p-value</u>
Medication Regimen		
Total number of medications (N=11)	+0.2 \pm 1.9	0.756
No. medications patient aware of indication (N=11)	+1.0 \pm 3.2	0.319
No. medications patient is taking as intended (N=11)	+1.2 \pm 1.8	0.052
Number of beer's criteria medications (N=11)	+0.2 \pm 0.4	0.169
Medication Related Problems		
Patient-related (N=11)	-1.8 \pm 2.9	0.011
Prescriber-related (N=11)	-0.3 \pm 0.5	0.107
Medication-related (N=11)	-1.1 \pm 0.8	<0.001
Total Medication-related problems (N=11)	-3.2 \pm 2.8	0.001
Anthropometric and Laboratory Data		
Weight (N=6)	-1.3 \pm 6.4	0.634
Body Mass Index (N=6)	-0.4 \pm 1.4	0.578
Systolic Blood Pressure (N=5)	-9.0 \pm 3.4	0.004
Diastolic Blood Pressure (N=5)	-3.6 \pm 3.7	0.092
Fasting Plasma Glucose (N=6)	+4.2 \pm 22.3	0.666
Hemoglobin A _{1c} (N=3)	-0.57 \pm 1.3	0.519
Total Cholesterol (N=4)	+4.3 \pm 21.0	0.711
LDL Cholesterol (N=4)	+1.8 \pm 16.0	0.844
HDL Cholesterol (N=4)	-1.5 \pm 1.3	0.103
Triglycerides (N=4)	+16.5 \pm 25.4	0.284
Blood Urea Nitrogen (N=5)	+2.0 \pm 4.3	0.357
Serum Creatinine (N=5)	+0.1 \pm 0.2	0.470
Creatinine Clearance (N=5)	-10.1 \pm 29.1	0.482
AST (N=5)	+2.2 \pm 5.5	0.425
ALT (N=5)	-3.4 \pm 6.3	0.292
Alkaline Phosphatase (N=5)	+8.6 \pm 9.6	0.116

Table 4. Community Pharmacy and Intern Hour Requirements

Subject	Follow-up Point	Pharmacist Hours (To Date)	Pharmacist Hours (Annualized)	Intern Hours (To date)	Intern Hours (Annualized)	Total Hours (Projected)
1	11	1.40	1.53	0.88	0.96	2.49
2	4	1.00	3.00	0.25	0.75	3.75
3	8	1.00	1.50	2.75	4.13	5.63
4	8	1.17	1.76	1.85	2.78	4.53
5	8	3.50	5.25	1.17	1.75	7.00
6	9	2.43	3.24	1.30	1.73	4.97
7	3	1.00	4.00	0.65	2.60	6.60
8	7	1.75	3.00	2.72	4.66	7.66
9	7	1.83	3.14	0.42	0.71	3.85
10	7	2.17	3.72	1.52	2.60	6.32
11	6	1.00	2.00	1.17	2.33	4.33
12	6	1.00	2.00	0.77	1.53	3.53
13	6	1.00	2.00	0.97	1.93	3.93
14	5	1.12	2.69	2.73	6.56	9.25
15	5	1.83	4.39	1.27	3.04	7.43
16	5	1.00	2.40	1.17	2.80	5.20
17	4	1.52	4.56	0.20	0.60	5.16
18	3	1.08	4.32	0.52	2.07	6.39
19	3	1.00	4.00	0.82	3.27	7.27
20	2	1.17	7.02	0.32	1.90	8.92
Totals	-	29.0	65.5	23.42	48.7	114.2
Avg/Pt	-	1.5 ± 0.7	<u>3.3 ± 1.4</u>	1.2 ± 0.8	<u>2.4 ± 1.5</u>	<u>5.7 ± 1.9</u>

Table 5. Financial Viability of the Geriatric Care Program

Subject	Rx's Filled	Follow Months	Gross Profit (To date)	Gross Profit (Annualized)	Pharmacist Hrs (Annualized)	Pharmacist Cost	Net Income
1	76	11	\$1,140.00	\$1,243.64	1.53	\$82.83	\$1,160.80
2	49	4	\$735.00	\$2,205.00	3.00	\$162.42	\$2,042.58
3	44	8	\$660.00	\$990.00	1.50	\$81.21	\$908.79
4	77	8	\$1,155.00	\$1,732.50	1.76	\$95.29	\$1,637.21
5	28	8	\$420.00	\$630.00	5.25	\$284.24	\$345.77
6	85	9	\$1,275.00	\$1,700.00	3.24	\$175.41	\$1,524.59
7	16	3	\$240.00	\$960.00	4.00	\$216.56	\$743.44
8	58	7	\$870.00	\$1,491.43	3.00	\$162.42	\$1,329.01
9	43	7	\$645.00	\$1,105.71	3.14	\$170.00	\$935.71
10	29	7	\$435.00	\$745.71	3.72	\$201.40	\$544.31
11	27	6	\$405.00	\$810.00	2.00	\$108.28	\$701.72
12	30	6	\$450.00	\$900.00	2.00	\$108.28	\$791.72
13	57	6	\$855.00	\$2,052.00	2.00	\$108.28	\$1,943.72
14	55	5	\$825.00	\$1,980.00	2.69	\$145.64	\$1,834.36
15	59	5	\$885.00	\$2,124.00	4.39	\$237.67	\$1,886.33
16	19	5	\$285.00	\$684.00	2.40	\$129.94	\$554.06
17	24	4	\$360.00	\$1,080.00	4.56	\$246.88	\$833.12
18	13	3	\$195.00	\$780.00	4.32	\$233.88	\$546.12
19	24	3	\$360.00	\$1,440.00	4.00	\$216.56	\$1,223.44
20	20	2	\$300.00	\$1,800.00	7.02	\$380.06	\$1,419.94
Totals	833	-	\$12,495.00	<u>\$26,453.99</u>	65.5	<u>\$3,547.25</u>	<u>\$22,906.74</u>

Table 6. Patient Perception of Clinical Pharmacy Service Benefit and Value

Patient feels the program has been beneficial	
Yes	Data not yet available (final visit)
No	Data not yet available (final visit)
Willing to continue participation if program were free	
Yes	Data not yet available (final visit)
No	Data not yet available (final visit)
Willing to continue participation for an added cost	
Yes	Data not yet available (final visit)
\$0-49/year	Data not yet available (final visit)
\$50-99/year	Data not yet available (final visit)
\$100-149/year	Data not yet available (final visit)
\$150+	Data not yet available (final visit)
No	Data not yet available (final visit)

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