

Automating the Prescription Filling and Workflow Process



A Before and After Analysis of an Automated Counting and Workflow System and its Effect on Productivity, Efficiency and Safety

The Thomsen *Group* Inc.

Table of Contents	Page
Executive Summary	3 - 4
Introduction	5
Location	5
Goals and Objectives	5
Methodology	5 - 6
Data Collection	6
Figures	7
Pre-installation Technology and Layouts	9
Post-installation Technology and Layouts	10
Results	11 - 13
Conclusion	14 - 17
Appendix A	18 - 25

Executive Summary

This study utilized the standard observation based method of data collection and analysis and applied both video and audio taping to gather the data.

The purpose of this study was to review the efficiency, productivity and safety of an automated pharmacy workflow system in a real world setting of a community pharmacy.

Conducted over a period of 90 days, before and after the system was installed, the study's goal was also to determine the cost effectiveness of such a system when compared to the current manual method of pharmacy workflow and dispensing.

Siegel's Pharmacy filled an average of 320 prescriptions per day before the AutoMed systems were installed and an average of 328 prescriptions per day after the AutoMed systems were installed.

Time and Labor Savings

The prescription filling and prescription location times were significantly reduced after the AutoMed systems were installed. A reduction in filling time of 1.631 minutes per prescription (57%) and a reduction in prescription location time of 0.114 minutes per prescription (41%) were realized in the post-installation phase.

Prescription filling capacity, defined as the number of prescriptions that can be completed by each person in the pharmacy, during a normal 8 hour (480 minute) workday, increased by 20.256 prescriptions per person, per day or an increase of 24%.

Increased Efficiency and Safety

Before installing the robotics and automated workflow system Siegel's replaced their standard shelving with high density drawers and stock keeping units which boosted their usable counter space from 59 square feet to 125 square feet.

Once the systems were installed the pharmacy then realized that the robotics filled an average of 53.5% of the total daily volume and reduced the number of steps to fill a prescription, from 14 to 7, and doubled the number of times that a single prescription was verified for accuracy.

Pharmacists greatly removed themselves from the filling process, 65% in pre-installation and only 5% in post-installation, and were able to perform a greater number quality control checks during order entry, prescription inspections and verifications and patient assistance or counseling.

Tracking Prescriptions

Before installing the robotics and automated workflow systems, Siegel's averaged 6 lost or misplaced prescriptions per day with an average locating time of 5.83 minutes per prescription. After the systems were installed the pharmacy averaged 2 lost or misplaced prescriptions per day with an average locating time of 4.81 minutes per prescription. This is a reduction of 25.36 minutes per day to locate lost or misplaced prescriptions.

Using the following wage rates (RPhlink.com) for pharmacists and technicians in Trenton, NJ, the prescription filling costs drop from \$560.07 per day to \$113.70 per day after the robotics and automated workflow systems are installed. This equates to a savings of \$446.37 per day.

Pharmacists: \$40/hour + 20% for benefits = \$48/hour

Technicians: \$13/hour + 20% for benefits = \$15/hour

The study also provides evidence that dispensing safety, patient counseling and customer interaction and satisfaction have been great improved.

Introduction

The purpose of this study was to determine the effect of an automated workflow system on the productivity, efficiency and profitability of a community pharmacy filling between 200 and 400 prescriptions per day. Siegel's Pharmacy, an independent pharmacy, was selected for this project and all pharmacy related activities were observed and recorded over a five day period, before and after the installation of an automated workflow system.

Location

Siegel's Pharmacy

1201 South Broad Street
Trenton, NJ 08610
609.394.8111
Pharmacist in Charge, Dominick Vizzoni

Hours of Operation:

Monday to Friday - 9:00 AM to 8:30 PM
Saturday - 9:00 AM to 5:00 PM
Sunday - 9:00 AM to 12:00 Noon

Goal and Objectives

This study was based on a scientific approach for analyzing the efficiency and productivity of an automated pharmacy workflow system in the real world setting of a community pharmacy and reviewed the cost effectiveness of such a system when compared to the current manual method of receiving, filling, storing, tracking and dispensing prescriptions.

The specific objectives of this research were to:

1. Determine the efficiency and productivity of the automated pharmacy workflow system in a community pharmacy setting.
2. Determine the cost effectiveness of such a system when compared to the current manual method of pharmacy workflow.

Methodology

To accomplish the above objectives, this study was conducted over a period of 90 days and utilized the standard observation based method of data collection and analysis.

The specific techniques of the observation method in this project applied both video and audio taping and work sampling data analysis.

Work sampling is a data quantification technique, which is based on the laws of probability. A large number of the observations are made over a period of time to provide a pattern of the distribution of time spent in the work activities. The videotapes are then analyzed using the fixed-interval (1 minute) work sampling approach. Work sampling categories (see Appendix A) were developed and defined based on the activities observed in the videos.

Work sampling and time study will also be applied to quantify the movement and operation of the pharmacy staff, the automated systems and the patients from the videotapes collected.

Graduate and undergraduate students from the University of Missouri Kansas City (UMKC) were trained and employed for this data collection and analysis.

Data Collection

For the study site, 60 to 80 hours of operation were recorded over a one week period before and after the automated pharmacy workflow system was installed.

The video and audio taping process for data collection is depicted in [Figure 1](#) and camcorders were strategically located within the pharmacy.

An example of video camcorder view is depicted in [Figure 2](#).

Designed to investigate and determine the effects of an automated pharmacy workflow system before and after the installation, this study utilized the following data collection protocol:

Two separate, five weekday operations as follows:

- Video and audio tape the designated pharmacy for five weekdays (Monday to Friday) **before** the automated pharmacy workflow system is installed.
- Video and audio tape the designated pharmacy for five weekdays (Monday to Friday) **after** the automated pharmacy workflow system is installed.

To secure the appropriateness of using videotaping approach in the pharmacy, permission for videotaping was obtained from corporate management. And, since the visual and audio data that is recorded on the videotapes may contain sensitive or confidential information between the patient and the pharmacy personnel, only the researchers were allowed to review the videotapes.

Upon completion of the data analysis from the tapes, the tapes will be destroyed.

Figures

Figure 1 - Array of Equipment

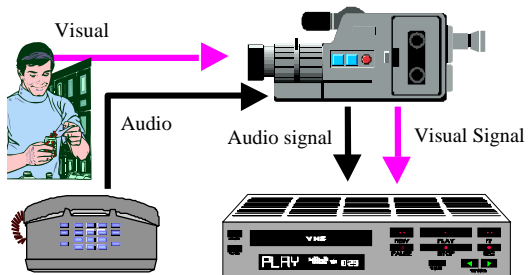


Figure 2 - Example of Video camcorder View



PRE AND POST PRESCRIPTION VOLUME

Pre-Installation Data Gathering Dates:

4 May 2004 to 10 May 2004

Daily Rx Volumes:

Tuesday	330 Rx
Wednesday	262 Rx
Thursday	320 Rx
Friday	286 Rx
Monday	404 Rx
Total	1,602 Rx

Average **320 Rx/day**

Post-Installation Data Gathering Dates:

28 June to 2 July 2004

Daily Rx Volumes:

Monday	381 Rx
Tuesday	297 Rx
Wednesday	329 Rx
Thursday	306 Rx
Friday	328 Rx
Total	1,641 Rx

Average **328 Rx/day**

PRE INSTALLATION TECHNOLOGY

Pharmacy Management System: Health Care Computer (HCC)

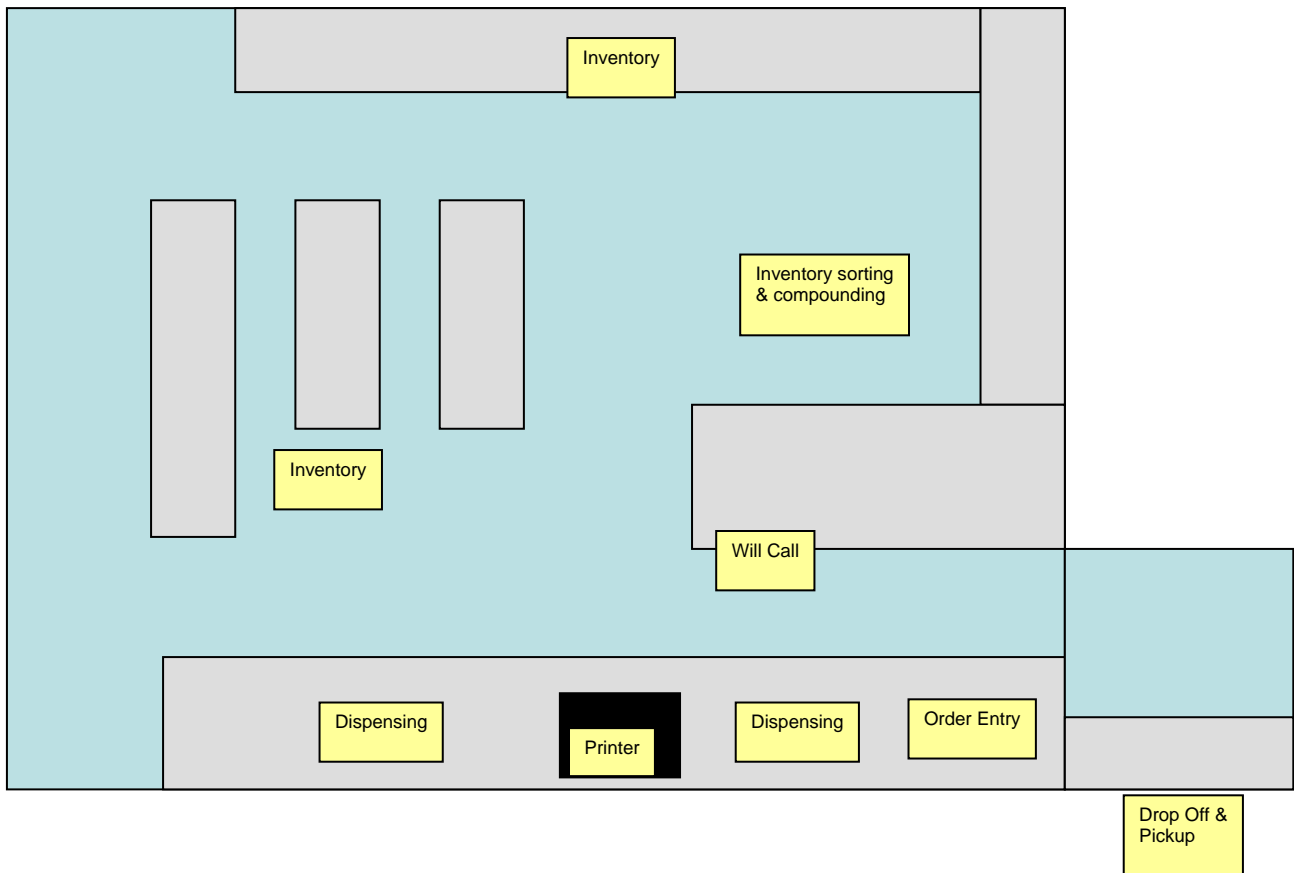
Interactive Voice Response: Voice Tech

Automated Workflow System: None

Counting Technology: None

Electronic Signature: None

PRE INSTALLATION PHARMACY LAYOUT



Usable counter space - 59 square feet

POST INSTALLATION TECHNOLOGY

Pharmacy Management System: Health Care Computer (HCC)

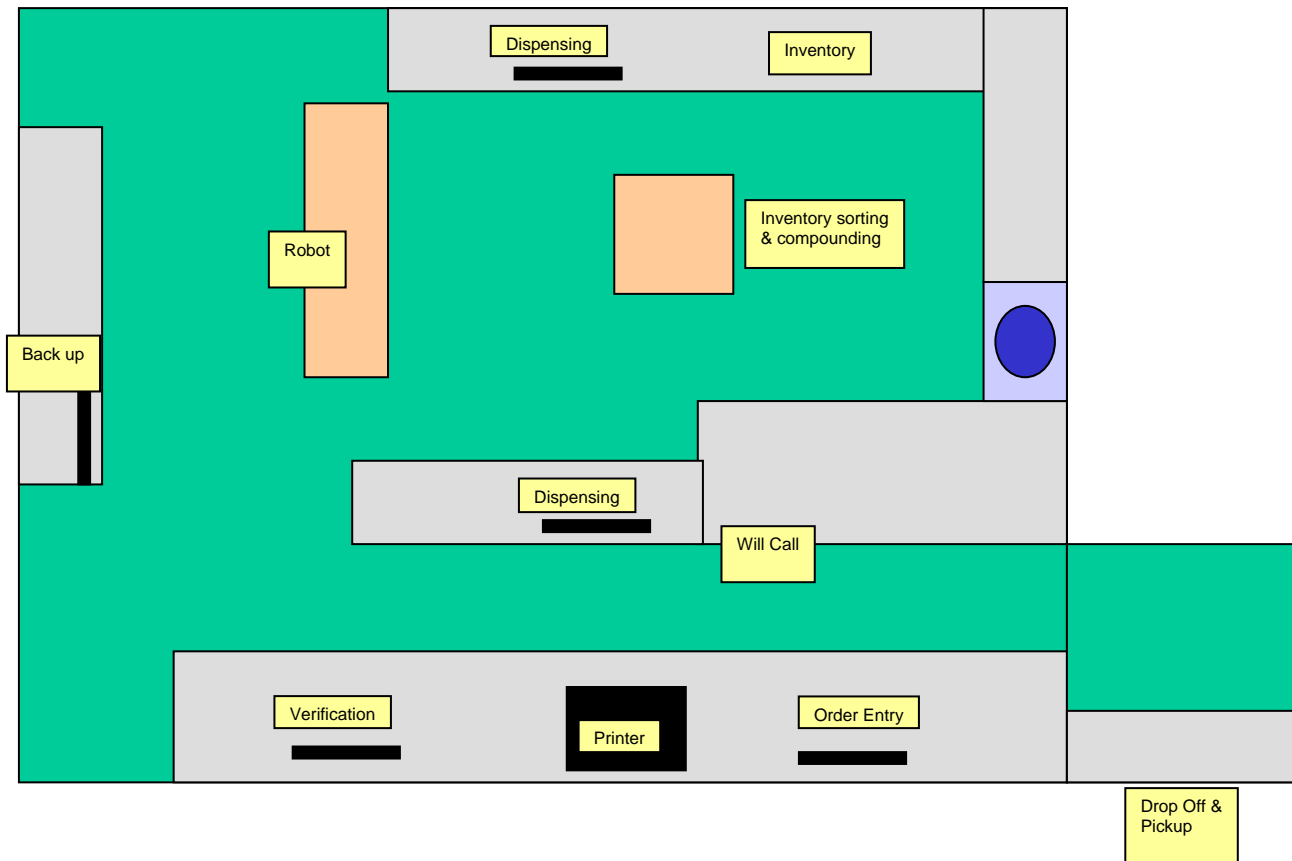
Interactive Voice Response: Voice Tech

Automated Workflow System: WorkPath by AutoMed

Counting Technology: FastFill 200 by AutoMed

Electronic Signature: Health Care Computer (HCC)

POST INSTALLATION PHARMACY LAYOUT



Usable counter space - 125 square feet

RESULTS

The results of work sampling illustrate the time spent in performing the various pharmacy activities. To adjust the impact of various workload involved in the pre-installation and post-installation phases, the work sampling data were converted to total and average prescription filling time, before and after the automated workflow system was installed. The workload data of the pre-installation and post-installation phases were used in this adjustment.

A total of 19,237 minutes (5 days pre-installation and 5 days post-installation) were observed. 731 minutes (3.8%) were not viewable.

Table A lists the daily prescription volumes before and after installing the AutoMed robotics and automated workflow systems. The change in dispensing level may have been due to seasonal variation, but additional personnel were not needed to cope with the change.

Table A

Before installing the AutoMed Systems	After installing the AutoMed Systems
Five Day Test Period - May 2004	Five Day Test Period - June 2004
Total Prescription Volume - 1,602	Total Prescription Volume - 1,642
Average Daily Volume - 320 prescriptions	Average Daily Volume - 328 prescriptions

Based on the data, time spent and the number of the prescriptions filled the Table B lists a variety of prescription processing categories and the time that was calculated to process each activity, per prescription filled.

Table B

Prescription Activity Categories	Pre-installation (in minutes)		Post-installation (in minutes)	
	Total	Per Rx	Total	Per Rx
Receiving	676	0.422	639	0.389
Order Entry	2,901	1.811	2,952	1.798
Filling	4,615	2.881	2,052	1.250
Inspection/Verification	294	0.183	468	0.285
Packaging/Storing	953	0.595	1,005	0.612
Prescription Location	452	0.282	276	0.168
Dispensing/Billing	1,620	1.011	1,629	0.992
Total	11,311	7.185	9,021	5.494

Table C illustrates additional prescription filling and staff model findings, the impact of automation on prescription safety, the time to locate prescriptions in will call and lost or misplaced prescriptions and other automation and staffing findings:

Table C

	Pre-installation (times are in minutes)	Post-installation (times are in minutes)	Net Change (times are in minutes)
Prescription Filling and Staff Functions			
Prescription filling staffing model	2 RPh 2 Techs	1.5 Techs	-2 RPh -0.5Tech
Percent of prescription filling by staff member	65% RPh 35% Technician	5% RPh 95% Technician	-60% +60%
Average number of steps to process a prescription	14 steps	7 steps	-7 steps
Total average time to fill a prescription	2.88 min/RX	1.25 min/Rx	-1.63 min/Rx

Prescription Filling Safety			
Average time spent on inspection/verification	0.16 min/Rx	0.285 min sec/Rx	+0.125 min/Rx
Number of safety/accuracy checkpoints before prescription is released to patient	2 steps	4 steps	+2 steps
Types of checks	Visual	Bar code scan & onscreen drug images	Filling, verification

Locating Prescriptions			
Average time to locate a prescription in will call	0.282 min/Rx	0.168 min/Rx	-0.114 min/Rx
Average number of lost/misplaced prescriptions	6 Rx/day	2 Rx/day	-4 Rx/day
Average time to locate a lost/misplaced prescription	5.83 min/Rx	4.81 min/Rx	-25.36 min/day

Automation and Staffing			
Impact of automation on total daily volume	0% of the TDV	53.5% of the TDV	+53.5%
Staffing during peak hours:			
Monday-Tuesday	3 RPh/4 Techs	2 RPh/4 Techs	-1 RPh
Wednesday - Friday	3 RPh/3 Techs	2 RPh/2 Techs	-1 Tech
Evenings	1 RPh/2 Techs	1 RPh/2 Techs	NA

Pre-installation



Post-installation



Pre-installation



Post-installation



CONCLUSION

Prescription Volume

Automation did not affect the changes in prescription volume, but additional personnel were not needed to cope when there was an increase in the daily volume due to seasonal variation.

Siegel's Pharmacy filled an average of 320 prescriptions per day before the AutoMed systems were installed and an average of 328 prescriptions per day after the AutoMed systems were installed.

Table D

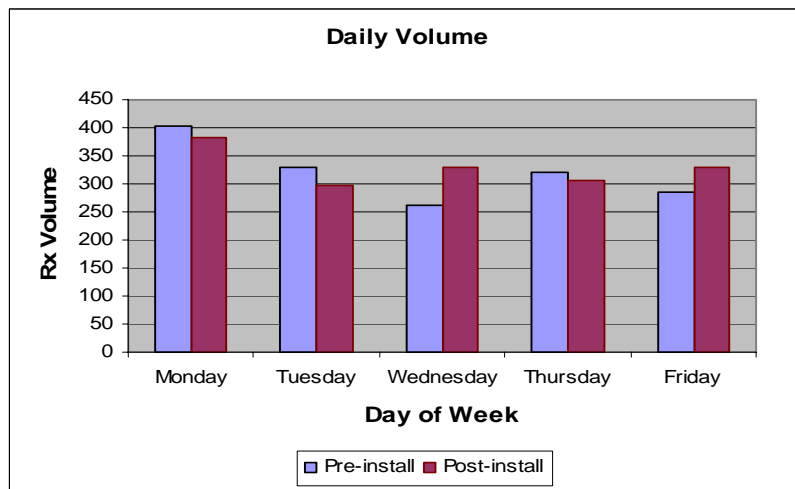


Table E compares prescription activity categories before and after the AutoMed systems were installed:

Table E

Prescription Activity Categories	Pre-installation (in minutes)	Post-installation (in minutes)
	Per Rx	Per Rx
Receiving	0.422	0.389
Order Entry	1.811	1.798
Filling	2.881	1.250
Inspection/Verification	0.183	0.285
Packaging/Storing	0.595	0.612
Prescription Location	0.282	0.168
Dispensing/Billing	1.011	0.992
Total	7.185	5.494

While most times remain the same or very close, the prescription filling and prescription location times were significantly reduced after the AutoMed systems were installed. A reduction in filling time of 1.631 minutes per prescription (57%) and a reduction in prescription location time of 0.114 minutes per prescription (41%) were realized in the post-installation phase.

Overall, Siegel’s Pharmacy realized a reduction of total prescription processing time of 1.691 minutes per prescription after installing the AutoMed robotics and automated workflow systems.

Prescription Filling Capacity

Siegel’s pharmacy reduced the prescription filling times after the AutoMed systems were installed and, whereas automation did not affect prescription volume, additional personnel were not needed to cope with increases in prescription volume. This would indicate that the AutoMed robotics and automated workflow systems provided an increase in prescription filling capacity.

Prescription filling capacity is defined as the number of prescriptions that can be completed by each person in the pharmacy, during a normal 8 hour (480 minute) workday.

Prescription filling capacity is illustrated in Table F as follows:

Table F

Prescription Filling Capacity	Pre-installation	Post-installation
Total average time to complete and dispense a prescription - in minutes	7.185	5.494
Prescription Filling Capacity - in prescriptions	66.806 Rx per person, per day	87.368 Rx per person, per day
Additional Prescription Filling Capacity per person - in prescriptions	+20.256 Rx per day	
Additional Prescription Filling Capacity per person - percentage	+24%	

Prescription Inspection and Safety

The pharmacy staff noted that the AutoMed automated workflow system brought a higher level of confidence to the filling process because of the utilization of bar code scanning and onscreen drug images.

While it is noted that the number of steps to complete a single prescription (53.5% of the total daily volume) was reduced from 14 to 7, the number of times that a single prescription was scanned and reviewed with an onscreen image increased to 2 different times for a total of 4 safety checks. Time for check each prescription increased from 10.98 seconds per prescription to 17.10 seconds per prescription.

Pharmacists spent considerably less time filling prescriptions (from 65% to 5%) after the AutoMed systems were installed and this extra free time allowed them to perform a greater number quality control checks during order entry, prescription inspections and verifications and patient assistance or counseling.

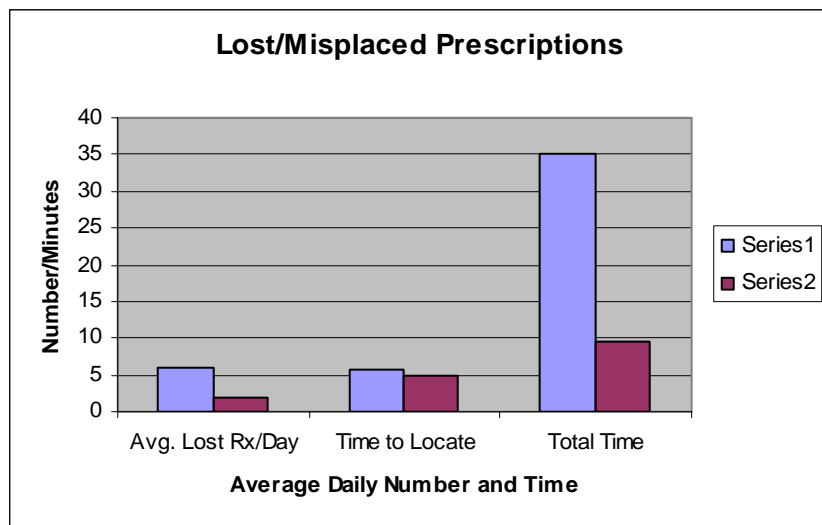
Other studies have also noted that prescription inspection or verification activity generally increases when automated counting or prescription dispensing systems are installed and utilized in community and outpatient pharmacies.

Prescription Location and Will Call

After prescription filling and inspection of the prescription the next largest amount of pharmacy staff time is spent in the location of lost or misplaced prescriptions. Before the AutoMed robotics and automated workflow systems were installed the pharmacy averaged 6 lost or misplaced prescriptions per day with an average locating time of 5.83 minutes per prescription. After the AutoMed systems were installed the pharmacy averaged 2 lost or misplaced prescriptions per day with an average locating time of 4.81 minutes per prescription.

This is a reduction of 25.36 minutes per day to locate lost or misplaced prescriptions.

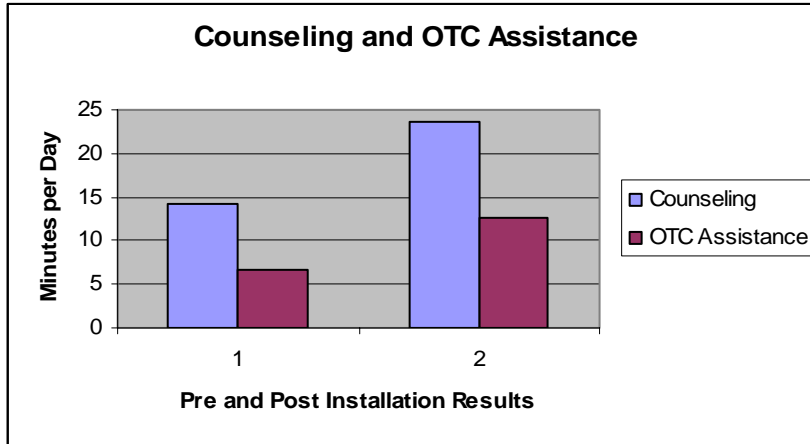
Table G



Patient Counseling and Staff Time

Prior to the installation of the robotics and automated workflow system, Siegel’s Pharmacy spent an average of 14.13 minutes per day counseling patients and 6.54 minutes per day assisting patients locate front end merchandise. In the post-installation phase those numbers increased to 23.64 minutes per day and 12.61 minutes per day, respectively.

Pharmacy staff personal time, lunch breaks, increased from an average of 6.93 minutes per day, per person to 12.54 minutes per day, per person after the installation of the robotics and automated workflow systems.



Final Notes

While the AutoMed robotics and automated workflow systems have greatly improved efficiency, productivity and patient safety at Siegel's Pharmacy there are three areas that might be addressed in the future. The first area would be the utilization of original prescription scanning during the order entry process, the second would be the status and tracking of prescriptions after completion and verification (will call) and integration of the electronic signature after prescription pick-up.

The last suggestion would simply help to provide closure of the filling record and automated workflow process.

--END--

Appendix A

Work Sampling Categories

Classification and Descriptions of Work Activities

Prescription processing activities

A. Receiving

1. Patient-in prescription(s)[script(s)][*new/refill*]
 - Greet patient and receive script(s)
 - Ask patient to show his/ her insurance card [*new*]
 - Review script(s) for readability or missing information [*new*]
 - Ask patient to provide complete required information [*new*]
 - Travel to the order entry counter
 - Place new script order(s) into green bin and refill script order(s) into bin for differentiation*
2. Phone-in script(s) from medical doctor (M.D.) office [*new*]
 - Transcribe script order(s)
 - Place order(s) into green bin by patient
 - Travel to place to-be-entered bin(s) on order entry counter
3. Phone-in script(s) from patient [*refill*]
 - Check voice mail messages
 - Record call-in date, patient name, phone number, script number, and pick up date
 - Place order(s) into red bin by patient
 - Travel to place to-be-entered bin(s) on order entry counter

B. Order entry

- Retrieve order from to-be-entered bin [*new*]
- Code script [*new*]
- Establish patient profile [*new*]

- Review patient profile [refill]
- Enter physician's order into computer system
- Examine drug regimen of a patient
- Conduct Medication Use Evaluation
- Remove bar code from printer and adhere to original script (with automated workflow system)
- Scan original script (with automated workflow system)

C. Filling

1. Manual

- Print out script label
- Obtain label from printer
- Review script label(s)
- Travel to drug storage shelves
- Obtain drug(s)
- Travel back to filling counter
- Use counting tray or an automated system to count oral solids
- Discard empty drug bottle
- Obtain vial, pour medication into vial, and cap it
- Change oral liquid bottle with secured cap if needed
- Record drug lot number and expiration date on sticker
- Attach the label to filled vial or unit-of-use container
- Place drug bottle(s), filled vial(s), and script label(s) into green/red bin by patient
- Travel to place to-be-checked bin(s) on inspection counter

3. Automated

- Print out script label
- Obtain label from printer
- Review script label(s)
- Retrieve filled vial from automated system
- Cap filled vial
- Gather the receipts and filled vial(s) into bin by patient
- Move completed scripts and bin to the inspection area

D. Inspection and verification

1. Manual

- Retrieve drug bottle(s), filled vial(s), order(s), and script label(s) from to-be-checked bin
- Proofread labels one by one, including name, strength, dosage form, and quantity of the drug.
- Inspect and verify medication appearance (size, shape, and color), expiration, *etc*
- Review patient profile as needed
- Attach auxiliary label(s) to vial or container
- Waterproof labels on vial or container
- Correct the problem by repeating appropriate steps if there is a problem
- Sign inspection log after verification
- Attach log sticker on order [*new*] or inspection book [*refill*]
- Place checked script order in script organizer or drop script into file box [*new*]
- Tear off label backing from script label
- Discarding label backing and keep receipt and information forms
- Group filled script(s), receipt and information forms into to-be-packed bin by patient
- Travel to place to-be-packed bin(s) on packaging counter

2. Automated

- Retrieve filled vial(s) from to-be-packed bin
- Scan bar code identification label one by one
- Inspect and verify medication appearance, expiration, *etc*
- Review patient profile as needed
- Attach auxiliary label(s) to vial or container
- Waterproof label on vial
- Correct the problem by repeating appropriate steps if there is a problem
- Group filled script(s) and place into bag
- Attach receipt and information forms and then staple
- Move bag to will call counter

E. Packaging and storing

1. Manual

- Retrieve completed prescription bags from will call counter
- Store prescription bags in plastic totes by first letter of patient surname

2. Automated

- Retrieve completed prescription bags from will call counter
- Scan bar code on prescription label and designated storage location

- Store prescription bags in hanging plastic bags (Monaco) by first letter of patient surname

F. Dispensing and billing

1. Manual

- Page patient *[new]*
- Greet patient and ask patient name *[refill]*
- Travel to obtain prescription from storage bin *[refill]*
- Retrieve filled script(s) from bag
- Check filled items with patients
- Ask the patient if there is any question for counseling
 - If yes, page a Pharmacist to answer patient's question
 - If no or after pharmacist's counseling, ask patient to sign on third-party log
- Wait for patient's signature
- Place medication in bag
- Hand packed medication to patient
- Receive co-pay and see patient off

2. Manual

- Page patient *[new]*
- Greet patient and ask patient name *[refill]*
- Travel to automated system monitor and lookup patient name
- Obtain prescription location
- Obtain prescription from hanging bag system *[refill]*
- Retrieve filled script(s) from bag
- Check filled items with patients
- Ask the patient if there is any question for counseling
 - If yes, page a Pharmacist to answer patient's question
 - If no or after pharmacist's counseling, ask patient to sign on third-party log
- Wait for patient's signature
- Place medication in bag
- Hand packed medication to patient
- Receive co-pay and see patient off

Problem-solving activities

A. Patient- or script-related problem solving

- Deal with the patient who is not qualified for filling script due to his/ her script or insurance problem
- Establish non-formulary drug profile as needed
- Take corrective actions if script label is incorrect
- Refill incorrect order as needed
- Deal with computer problems
- Handle exceptional case

B. Telephone follow-up

1. Script-related

- Call MD office to obtain proper interpretation of order as needed
- Call for physician's refill authorization as needed
- Answer phone call regarding refill authorization from MD office
- Call and inform patient if refill is not authorized
- Recommend different drug use

2. Insurance-related

- Call insurance company to verify patient's insurance status

C. Patient counseling

- Provide basic clinical information
- Review patient profile
- Answer question(s) about script or drug information

Inventory maintenance

A. Inventory ordering

- Record out-of-stock item on order list
- Send inventory order to wholesaler or dealer

B. Inventory stocking

- Refill stock on drug storage shelf
- Return remaining unused drugs back to storage shelves
- Restock returned medications
- Load drugs in dispensing cells

C. Other inventory control activities

- Receive new-coming drug totes from wholesalers or dealers
 - Process returned medications
 - Monitor remaining inventory
 - Remove expired and recalled medications
 - Other

Personal/Idle time

A. Lunch and break

- 30-minute lunch
- 15-minute break

B. Idle time

- Wait to perform a pharmacy task

C. Other non-work-relative activities

- Early departures or late arrivals
- Personal telephone calls
- Chat with consumers, patients, or other pharmacy staff
- Restroom
- Other

Miscellaneous Activities

A. Management

- File medication orders
- Input error inspection
- Run reports
- Other

B. Retail service

- Sell non-script products
- Manage retail inventory

- Counsel over-the-counter product(s)

C. Cash register

- Close cash register
- Complete cash deposit
- Exchange small change

D. Automated counting system maintenance (optional)

- Warm up system
- Test system
- Prepare and perform maintenance
- Load vials to dispensers
- Change printer ribbons and labels

E. Pre-packaging

- Get drugs and prepackage oral solid medications as needed

F. Customer relations

- Conversation with the patient or customer

G. Travel**

- Travel to next workstation when the previous activity is finished and the next activity has not started yet
- For example, the pharmacy staff moves from the filling station to the dispensing windows to answer patient requests.

H. Unobservable

- Any activities beyond observation
- Absent

I. Other work-related activities

- Cleaning of the automated counting systems
- Clean work counter
- Organize work area
- Provide drug information when questioned
- Attend scheduled meetings or educational seminars

- Other

**** Travel within the work area is often difficult to assign to a specific task classification. The researcher will make a judgmental assignment of these observations based on pre and post function of work.**