Reducing Pharmaceutical Waste in Long Term Care using an Automated Distribution System

MnTAP Intern Project Report
Oak Hills Living Center, New Ulm, MN

Seth Thompson
2009

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Preface

The work described in this report is a service of the Minnesota Technical Assistance Program (MnTAP), University of Minnesota, School of Public Health, Division of Environmental Health Sciences. MnTAP is funded by a grant from the Minnesota Office of Environmental Assistance.

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As outlined in the MnTAP Intern Project Agreement, MnTAP staff will contact key facility personnel for up to two years following completion of the intern's work to collect information on which, if any, of the recommendations have been implemented.

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Executive Proposal

Reducing Pharmaceutical Waste in a Long Term Care Facility Using an Automated Distribution System

August 21, 2009

Summary

Oak Hills Living Center (Oak Hills) is destroying an estimated $7800 of unused controlled substances, sending 12,000 oral tablets of resident's prepaid medicine to the pharmacy for destruction, and sending an estimated 18,000 oral tablets to the pharmacy through reverse distribution. These processes are resulting in waste costing an estimated $26,640 to Oak Hills and its residents. To reduce this waste I investigated the use of an automated distribution system (ADS). An ADS was not tested or implemented due to feasibility issues of linking the machine to the pharmacy's electronic profile, but cost analyses were performed to determine the ADS best suited for Oak Hills. I also performed an inventory assessment to establish reorder limits, and recommended future use of a hazardous waste management service.

Solution

I propose that Oak Hills implement the options below:
Implement a Talyst InSite ADS machine to reduce pharmaceutical waste and decrease Oak Hills and residents' expenses on pharmaceuticals.

Utilize a hazardous waste management service to remove hazardous and non hazardous pharmaceutical waste. Management of hazardous pharmaceuticals is a best management practice, and assures compliance with state and federal regulations. Although the cost of waste management is at least $500 per year, this cost of non-compliance could include fines of $5500-$27,500.

Justification

The InSite packages oral tablet pharmaceuticals as needed to be given to the residents. It is this just-in-time distribution capability that decreases the amount of unused dispensed medications. In other nursing homes, implementation of automated distribution systems has allowed for more time and resources to be dedicated to caring for the residents. The InSite will also allow for increased the amount of resident-nurse face to face time at Oak Hills. Time for medicine distribution is decreased because the pharmacy monitors, and loads the machine which can distribute medications for use more quickly and more efficiently than the current medicine cart system. Medical errors resulting from incorrect medicine, incorrect dose, and incorrect time may diminish because the automation of the machine may be more accurate and efficient than a person.

Consequently, the InSite eliminates the need to annually dispose of 17,100 oral tablets, and each resident will save over $200 on medication expenses. Implementation of a Talyst InSite will reduce pharmaceutical waste, decrease the amount of money Oak Hills and its residents pay for unused pharmaceuticals, increase resident and nursing face to face time, and save pharmacy time.

Challenges

The Minnesota Board of Pharmacy feels the InSite "dispenses" (MS 151.01, subp. 30, MR 6800.3100 and 6800.3200) rather than "distributes" medications and as such, cannot be located outside of the direct supervison of a pharmacist. Other states such as California, Maryland, Texas, California, and Pennsylvania permit the use of an ADS. To gain approval by the Board of Pharmacy, Oak Hills, the supplying pharmacy, and Talyst need to prove to the Board of Pharmacy that the machine fits within the current rules and regulations, or that the machine provides superior technological innovation that decreases the chance for medical errors in the facility.

The novelty of the InSite will require staff education on the new technology. It may take time to tweak the formulary of the machine, to discover the most efficient form of communication with the pharmacy and ensure proper billing. These obstacles can be overcome through teamwork with the pharmacy and nursing staffs and by utilizing Talyst's resources.

Key Staff

Seth Thompson, Minnesota Technical Assistance Program, University of Minnesota, Summer Intern 2009
Christie Gallagher, Director of Nursing, Oak Hills Living Center 507-233-0808

References

Reducing Pharmaceutical Waste in a Long Term Care Facility Using an Automated Distribution System, August 21, 2009

Table 1. Summary of Waste Reduction Options

Waste reduction option	Waste reduced (per year)	Implementation cost	Cost savings (per year)	Payback period	Status
Use of Med Dispense™ ADS to distribute pharmaceuticals in the Rehabilitation wing	1,150 oral tablets	$1350.00	-$7500	NA	Not Recommended
Use of Med Dispense™ to store controlled substances for the entire facility	4,600 pharmaceutical doses	$1350.00	-$710	NA	Not Recommended
Use of Talyst InSite™ to store oral tablets for the entire facility	Eliminates waste of 16,600 tabs from disposal and 18,000 tabs sent through reverse distribution per year add	$9,250	$18,400	7 months	Recommended
Incinerate all pharmaceutical waste	Eliminates exposure of 17,000 oral tablets to drinking water	$90	-$665	NA	Recommended
Incinerate hazardous pharmaceutical waste and flush controlled substance waste	Eliminates exposure of 13,500 oral tablets to drinking water	$90	-$555	NA	Not Recommended

NA = not applicable.

Background

Company Description

Address:	1314 8th Street, New Ulm, Minnesota, 56073
Telephone:	507-233-0800
Fax:	507-354-2751
Principal Products:	Long Term Care Facility
No. Employees:	220
NAICS code:	6321 Nursing Care Facilities

Oak Hills Living Center (Oak Hills) is a community owned non-profit senior care center located in New Ulm, Minnesota. The 14 year old facility includes a nursing home and assisted living center. Oak Hills is home to over 125 seniors and its 220 employees provide around the clock care every day of the year. In its effort to provide complete care to its residents, Oak Hills provides its residents laundry and housekeeping, three meals per day, as well as physical, occupational, and speech therapy services.

Incentives for Change

At Oak Hills, the average resident takes about 10 oral tablets of m medication per day. These medications are most commonly distributed in blister packs containing up to 30 doses of medication. Often times, a portion of the blister pack will go unused because a resident's medication is discontinued, the dose is changed, or the resident switches to or from a Medicare health plan. The resulting medication is either sent back to the pharmacy for credit or destruction. Oak Hills is currently throwing away a conservative estimate of 17,000 oral tabs annually.

Controlled substances, pharmaceuticals that are highly regulated by the Drug Enforcement Agency (DEA) , Minnesota Pollution Control Agency (MPCA), the pharmacy board and others, are a particular worry. Due to the diversion concerns associated with controlled substances, if a prescription is changed or the drug is unused, controlled substances unlike other pharmaceuticals cannot be returned to the pharmacy for credit. According the DEA rules, controlled substances must be disposed of and recorded onsite, or incinerated through use of a certified hazardous waste management service inability to obtain credit for these drugs and the tracking of them coupled with t[S1]he current management method of sewer disposal were significant drivers to reduce waste.

Unlike DEA controlled substances, non controlled pharmaceuticals can be returned to the pharmacy for credit. Often these medicines receive partial or no credit at all. If not credited, the pharmacy will often dispose of pharmaceuticals by flushing them down the toilet, or sending them to the landfill. Pharmaceutical disposal is regulated by hazardous waste regulations in addition to DEA rules. Disposal via the sanitary sewer or to the landfill may not be permitted and are not considered best management practices. Incineration is the preferred method for pharmaceutical waste management.

Another result of this process is that Oak Hills, or a resident is ultimately responsible for paying for medications that have not been administered. Even if the medication is creditable, the crediting process is slow and time consuming.

The medication ordering and distribution process is labor intensive, has many opportunities for human error, and does not properly account for hazardous waste disposal. The current system has many opportunities for diversion, as many people have the chance to handle the medication. The system also requires the nurse to remember to call the pharmacy when certain prescriptions such as PRN medications are low. The calling nurse is supposed to write down refills have been ordered. This does not always

happen, and the nurses often orally communicate to inform one another that the medication has or hasn't been ordered. These factors suggest improvement can be made to lessen the labor time, increase safety, decrease and dispose of waste in an appropriate manner.

In summary, Oak Hills wants to properly document, manage, and reduce their pharmaceutical waste to because they believed there are potential cost savings that can be realized, and are concerned with the risks associated with flushing medications down the toilet.

Process Description

Ordering Controlled Substances

Once a nurse visually sees few doses of a controlled substance left, he or she consults the resident's medical administrative record (MAR) to see if the medication should be reordered. The nurse then calls the resident's pharmacy, Cashwise/Coborn's or HyVee, and reorders the resident's medication. Multiple pharmacies are used because Oak Hills tries to accommodate a resident's preference, as per Medicare rules, and because Oak Hills has not signed a contract with a particular pharmacy. The pharmacy fills the prescription for oral medication in a blister pack which contains up to 30 unit doses in the pack. The prescription is delivered to Oak Hills by the pharmacy the same or next day.

At Oak Hills, the prescriptions are temporarily stored in one of three locked medicine rooms until a nurse has time to place the controlled substances into the locked drawer of the medicine cart; this normally occurs within an 8 hour shift. Once placed in the designated controlled substance locked drawer, controlled substances will remain there at all times unless it is being administered to the resident. Keys to the locked drawer are kept in the possession of the charge nurse on duty.

Ordering Non Controlled Substances

Unlike controlled substances, which are ordered on an as-needed basis, non-controlled medications are ordered for all the residents at one time. This order is supposed to cover all the residents' medication needs for the next 30 days. The non-controlled medications are delivered in resident-specific blister packs. Each blister pack has a label containing the residents name, type of medication, dose of medication, how often the medicine is to be taken, doctor of the resident, pharmacy of the resident, and physical description of the medicine. Once the new 30-day supplies of medications arrive, the previous 30 day blister packs are removed from the medication cart and exchanged with the medication for the next 30 days. Medications are organized by resident name inside the medication cart, but these names are not listed in any particular order.

Distribution of Medication

Nurses are responsible for administering all medication. Most medication, including controlled substances, are stored in and distributed from medicine carts throughout the facility. However, unlike non-controlled substances, controlled substances are kept locked within the medicine cart.

To give the resident the medication, the nurse unlocks the medication cart, and takes out the resident's corresponding blister packs or bottles containing their prescriptions The nurse then punches the pills out of the blister packs and into a soufflé cups, or takes the pills out of the bottle and places them into the soufflé cup. Multiple types of medicine can be put in the cup, but controlled substances are always given in their own cup. Some medicines need to be crushed and/or mixed with pudding or water, for the resident to take. These are not placed in the soufflé cups, but are prepared as needed.

The nurse then takes the residents medications to the resident's current location. The resident takes or rejects the medication. If rejected, the medicine is set aside to attempt to be given later, or thrown in the trash or flushed down the toilet.

Reimbursement, Returns and Waste

As residents' medications often change, it is not uncommon for at least a partial amount of a 30 day supply to go unused and become waste. Unused medications, other than controlled substances, remaining in the blister pack are returned to the pharmacy. If a resident is covered under Medicare A Oak Hills is reimbursed for the unused medication. For non-Medicare A prescriptions no credit is offered for unused drugs. There is no current policy specifying what medications should and should not be sent back to the pharmacy.

Controlled substances cannot be returned to the pharmacy for credit if they go unused per DEA regulations.

A process diagram of the medication ordering and distribution processes can be seen in Appendix B.

Waste Issue 1: Reduction of Pharmaceutical Waste

Quantity of Waste

Oak Hills is flushing $7800 (average wholesale price, AWP) of controlled substance pharmaceuticals, sending 12,500 oral tablets at an estimated annual cost of $18,000 AWP back to the pharmacy for destruction, and sending another 12,000 oral tablets back to the pharmacy through reverse distribution per year. Each resident is annually paying over $200 for unused medication.

The waste results in direct expenses to Oak Hills and its residents for payment of unused medication. Management of the waste pharmaceuticals also includes nursing time to find, handle, and record allocated but unused medications. This time is not only an added expense to the facility, but compromises resident care as well.

Table 2. Quantity of Pharmaceutical Waste

Population	Amount of Medicine Annually Unused*	Annual Cost **
Controlled Substances	4600 oral tabs	$7800
Medicare	18,000 oral tabs	$840
Unused meds paid in advance by residents	12,500 oral tabs	$18,000
Total	35,100	$26,640

*Based on data from 3/1/09-6/31/09.

**See Appendix E.

Management Method

Medications, including controlled substances are currently dispensed as 30 day supply. Often times, residents will not use all their medications because a doctor will switch medication in the middle a 30 day supply, or change the dose. If the 30 day supply is not completely used, it is either returned to the pharmacy for credit if the resident is Medicare A, or becomes waste if the resident is private pay. Private pay residents' drug waste is returned to the pharmacy for destruction. According to DEA regulations, controlled substances cannot be returned to the pharmacy for credit.

It may sound like there is no waste associated with medication that has been returned to the pharmacy for Medicare A credit. However, there are time and labor costs that the facility and the pharmacy incur for sorting, documenting, and shipping unused medication. The labor used to find and document unused medications back to the pharmacy could be used towards resident care.

Reasons for Researching Options

The majority of pharmaceuticals given in the nursing home are oral tablets. Tablets are sent from the pharmacy in unit dose blister packs that contain a 30 day supply of the resident's medication. Often, a resident's health status will change during the 30 day supply period, resulting in a medication change, and discontinuation of the current medication. This medication is then sent back to the pharmacy for full or partial credit, or is destroyed on site by the pharmacy.

Due to the possibility of frequent changes, medication provided in smaller quantities would reduce waste, cost, and labor. Unused controlled substances and private pay pharmaceuticals would not need to be disposed of, and the amounts of medication sent back to the pharmacy for credit would diminish.

Automated Distribution System Background

An automated distribution system (ADS) is a medicine storing machine which in essence is considered an on-site pharmacy. Hospitals have long used ADS units because they increase the chance that the right resident is getting the right medicine at the right time, and because their advanced technology streamlines the billing process. An ADS has many drawers and uses a computerized touch screen interface. Each drawer contains multiple single unit doses of a specific medication, and the opening and closing of these drawers is controlled by the touch screen interface. Access to the machine is limited to a select number of people, as determined by the facility using the ADS. To use the machine, the user must enter their own individual password, or use fingerprint identification. The machine records all medication transactions, and provides real time inventory reports. This allows for increased accountability of medication distribution and up to date records. The machine is restocked with more medication once the inventory is low. Monitoring and stocking of an ADS is performed by a facility's pharmacy.

To give medication, the nurse or other qualified individual first signs into the machine using their specific password or fingerprint identification. The touch screen interface then shows a main menu with options available to the user. The nurse will press a symbol that corresponds to medicine distribution. A list of residents will then appear on the screen. [ST2]Next, the nurse chooses the resident he or she wants to give medicine to. The screen then prompts the nurse to view medications alphabetically or by time of day. After the nurse chooses this, a list of medications appears. The nurse then selects all the medicines he or she wants to obtain. Drawers of the machine containing the medicine selected by the nurse then open. The nurse takes the unit dose of medication out of the machine. The nurse then closes the drawer, allowing the next drawer with the corresponding type of medicine to open. This process is repeated until all the medicine for a specific resident is obtained.

There are two different modes of operation for an ADS: standalone and profile. In the standalone mode, the machine is not connected to a patient's electronic profile at the pharmacy, nor is it connected to the resident's medical administrative record (MAR) at the facility. The pharmacy's electronic profile contains information such as active prescriptions, allergies, physicians' orders, billing information, etc. For a more complete list of what information is kept in the pharmacy software see Minnesota Rule 6800.3110, in Appendix O. A pharmacy electronic profile differs from a resident's MAR which is a comprehensive record is kept at the LTC facility with charting information, physician orders, and medication data about a resident. Since the ADS unit is not linked to pharmacy software, all resident names need to be entered by the facility in standalone mode. These names do not connect to the pharmacy software, but they can be used to sort different types of data such as which nurse gave which resident a type of medication.

The standalone mode is not routinely used to give daily medication. One reason for this is that in standalone mode, the nurse would be allowed access [S3]to every type of medication in the machine for a particular resident; after the resident's name is selected via the touch screen interface, the screen would

display all types of medication in the machine. Inventory would be tracked by daily or twice a day print outs of the medications contained in the machine. This inventory would then have to be cross referenced with a resident's MAR to determine the payment for each medicine withdrawn from the machine. This information would then have to be faxed to the pharmacy so every day the pharmacy can track and record the billing to the residents, complicating the billing process. Thes unlimited access to medications is essentially an archaic floor stock model of medicine distribution. The Minnesota Board of Pharmacy has outlawed use of a floor stock system under rule 6800.3400 because this system has been proven to be more error prone. However, although not used for daily medication passes, the standalone system is routinely used to store medicines for an emergency kit, or to give first dose medications.

Unlike standalone mode, an ADS in profile mode is regularly used as a medication distribution system. The electronic profile of a patient is set up by the pharmacist, and places a limit on the type of medicines that can be accessed for a specific resident. The touch screen will only allow an operator of the machine to choose the medicines that a resident has current prescriptions for. Use of the profile mode also limits the time at which a patient can be given a certain medication. This is useful to help the nurse find medications for a particular medication pass, and allows a nursing supervisor to determine if medications have been distributed at the proper time. With profile mode, a resident is also immediately billed each time a drawer of the ADS is opened with medicine intended for the resident. The added benefits of profile mode make the system safer to operate than a machine in standalone mode, yet machines in profile mode also tend to be more expensive to lease because of the added software requirements. It is important to note that because of the automatic billing capabilities of profile mode, policies regarding appropriate use such as removal of only one resident's medications, and removal of only unit doses of medicine per use of the ADS. Policies like these will ensure the units are being used safely and make certain the unit is automatically billing the proper resident. However, the ADS in profile mode cannot normally be used to replace a resident's paper or electronic MAR. Most machines do not communicate with both the pharmacy software and the facilities electronic MAR software.

An ADS does not administer medication until it is needed. Rather, medication is stored in the secure machine, and is not paid for or administered until it leaves the unit. This "just in time," capability allows for only one pill to be distributed at a time. This eliminates the chance for medication dispensed from the pharmacy to go unused because of a change in prescription, dosage, etc. Hence, an ADS is being pursued because it would eliminate the need for unused medicine to be disposed of or credited.

Reduction Option 1.1: Use of an Automated Dispensing System in standalone mode for the Rehabilitation wing

Summary
Waste reduced (per year): 1,150 oral tablets
Implementation cost: $1350
Cost savings (per year): -$7000
Payback period: N/A
Status: Not recommended.

Two Med-Dispense Base 45 units would be placed in the Rehabilitation wing to hold the majority of the oral tablet medications for the sixteen residents on this wing. The machines would hold about 80% of the residents oral tablet medications, and of 100% of resident's controlled substance medications. All controlled substances including liquid medications would be ordered in unit dose. Other medications not stored in the ADS would be stored in the medication cart. A nurse would access the machines and use the machines as described in the "ADS Background" section of the report.

Benefits

An annual benefit of using the standalone system would be the elimination of sewering 1,150 tablets of controlled substance waste costing over $1750 (average wholesale price, AWP) per year. Oak Hills would see direct savings of roughly 25% resulting from less Medicare controlled substance waste. Savings result from the "just-in-time" capability of an ADS that allows medications to be distributed to a resident only moments prior to use. This just-in-time characteristic eliminates the need for destruction or reimbursement of a partially used 30 day supply of medication. This option would save at least $840 annually in labor costs associated with documenting and sending back unused medications for credit.

There are other benefits from using an ADS that cannot be as easily quantified. These include the prevention of possible environmental and human health effects resulting from no longer introducing pharmaceutical waste into the water supply. These potential effects include reduced risk of wildlife infertility and mutations, and reduced risk of human consumption of non-prescribed organic compounds.

Economic Analysis
Costs to implement the standalone system can be seen in Appendix F. A complete cost analysis of this option was terminated when the Minnesota Board of Pharmacy would not permit it.

Implementation Status
Not recommended. Use of an ADS in standalone mode increase the potential for medication errors. According to surveyors form the Minnesota Board of Pharmacy, nursing staff access to all medications that are unlabeled with resident names may lead to the incorrect medication being distributed. Medication distribution in this manner is essentially equivalent to the "floor stock" method of distribution which was abandoned in favor of the medication cart unit dose system that is currently in use. Due to the potential for increased medication errors with the floor stock system, it is likely that the MN Board of pharmacy would not permit an ADS to be used in this manner.

Reduction Option 1.2: Use of an ADS in profile mode for the Rehabilitation wing

Summary
Waste reduced (per year): 1,150 oral tablets
Implementation cost: $1350
Cost savings (per year): -$7500
Payback period: N/A
Status: Not recommended.

Two Med-Dispense Base 45 units would be placed in the Medicare wing to hold the majority of its residents' oral tablet medications . The machines would hold at least 80% of the residents' oral tablets and of 100% of the controlled substance. All controlled substances including liquid medications would be ordered in unit dose. Other medications not stored in the ADS would be stored in the medication cart. A nurse would access the machines and use the machines as described in the "ADS Background" section of the report.

Benefits

Medications in the ADS are still under control of the pharmacy, and are not considered distributed to the resident until they are taken out of the machine. This just-in-time capability means that there will be less waste of prepaid unused pharmaceuticals as compared to the current blister pack method. This will diminish disposal of unused medications by up to 1,150 oral tablets per year.

Studies have shown use of an ADS when linked to an electronic patient profile can reduce medical errors by up to 50% as opposed to traditional medicine carts[1]. Reduction in the error comes from the increased automation of the ADS which reduces the chance that a resident is given wrong medication, or the resident is given medication at the wrong time. Medication errors not only present substantial risks to the residents but can result in substantial fines to the facility,

The use of ADS may also result in substantial time savings, and may be beneficial for the culture change model that Oak Hills is pursuing. It takes about 15 seconds for the oral tablets to come out of the ADS compared to about 30 seconds for medication to be distributed from the medication carts. These tablets come out individually wrapped, and I estimate that it would take no more than another fifteen seconds to unwrap them. Unwrapping of the medicine can easily be done in a resident's room, facilitating interaction between the nurse and resident and creating more face to face time.

Lastly, an ADS has superior technological controls that allow for increased management of controlled substances. The ADS uses print identification to record who is using the machine. This allows for a more accurate and more apparent record of which nurse acquired which medicine, as compared to the traditional medication cart system. The machine also requires the nurse obtaining the controlled substance to count the number of tablets before use which helps prevents diversion. If there is an error in the count, the machine will not allow access to the controlled substance until the error is resolved. Better management of controlled substances translates into cost savings to the facility, and increased and streamlined resident care.

Economic Analysis

Labor and costs associated with the current system are summarized in Table 3. Labor costs have been determined with time study data which can be seen in Appendix P. Medicine usage was taken from medical June's medical records. A one month "snapshot" of the system provides a reasonable sample because Oak Hills is almost always filled near maximum, operating at a steady state.

Implementation of a Med-Dispense ADS system on the Rehabilitation wing will cost Oak Hills about $5700 more than the current medication distribution system. The pharmaceutical distribution and management time savings are not justified by the cost of leasing two Med-Dispense Base 45 units. The largest savings the ADS would provide is a $7500 annual savings in the amount of time it takes a nurse to find and distribute medication. Use of the ADS would also eliminate the need to flush controlled substances, count the controlled substance book, and return meds to the pharmacy for credit. However, these labor savings are only about one third the cost of the ADS system.

[1] U.S Department of Health and Human Services, http://www.ahrq.gov/clinic/ptsafety/chap11.htm

There are factors in this cost analysis that have been estimated or may change. These factors are important to analyze in more detail because a slight change in their calculation may greatly change the economic favorableness of an option. A discussion of these factors is given in Appendix C.

Table 3. Summary of Costs: Current system vs. Med Dispense system on Medicare wing

Activity Cost ($)	Current System per year	Med Dispense ADS per year
value of controlled substances flushed	$1,950.00	$ -
ordering of controlled substances	$305	$44
distribution of controlled substances	$1,330	$1,000
management of controlled substance book	$1,680	$ -
management of non-controlled substances returned to pharmacy	$970	$ -
distribution of non-controlled substances	$11,200	$5,185
ordering and changing of 30 day supply of meds	$1,970	$ -
ordering non controlled substances	$ -	$93
Med Dispense machine	$ -	$19,008
hazardous waste management	$110	$ -
TOTAL ANNUAL COST	$17,565	$25,330
ONE TIME COSTS		
installation of Med Dispense	$ -	$750.00
shipping of Med Dispense	$ -	$600.00

Implementation Status

This option is not recommended. The increase of costs of the system of $7500 per year is significantly higher than the cost of operating the current system, and I do not believe that this cost is justified by a possible reduction in medical errors for just one wing of the facility.

Another obstacle to implementation is added pharmacy time. An ADS compartment typically holds less than 30 doses of medication. This means that more commonly used medications may have to be refilled up to every other day (hospitals typically fill an ADS 1 to 3 times per day). Stocking of the machine requires a pharmacist to count the number of medications needed at the pharmacy, come to Oak Hills, recount the number of medications as they are put in the machine, and go back to the pharmacy. As this may need to happen every other day, this increases pharmacy time and resources. It may be difficult to find a pharmacy perform this task without extra fees.

The ADS may also be prone to billing errors if not used in the correctly. A user of the machine may take more medications out of the drawer than the machine has accounted for to save time. This can cause billing errors as dispensing fees associated with the opening of the drawers may not be captured, or a resident could be over or under charged for medication they may or may not have taken. However, this problem could be avoided as long as strict policies are followed regarding appropriate use of the machine.

Lastly, a formulary would need to be created stating what types of medicines would be placed and stocked in the machine. This list should condense the number of similar medications in the facility, and should be made with the help of the consultant pharmacist, and given to the physicians who regularly support Oak Hills. This will help ensure that the most used medications are being stocked in the machine to obtain its full benefit. If a Med-Dispense system is implemented without having made a set formulary or taken previous usage into account, the Med-Dispense system may be decreasingly utilized over time. Use of blister packs will increase if the Med-Dispense machine is confusing for the pharmacy to stock and nurses to use because of lack of a formulary.

Reduction Option 1.3 Use of an ADS in profile mode to administer controlled substances in the entire facility

Summary
Waste reduced (per year): 4600 controlled substance doses
Implementation cost: $1350
Cost savings (per year): -$710
Payback period: N/A
Status: Not recommended. Further analysis is necessary.

Under this system, each neighborhood would use one Med-Dispense Base 45 machine. All the controlled substances used in the neighborhood would be stored in the machine. A nurse would access the machine with fingerprint identification. The machine is able to record which nurse accessed the machine who, when, and what was removed each time it is accessed.

Use of the machine to distribute controlled substances will require the number of scheduled drugs in each drawer to be manually counted before any are removed. This will decrease diversion, and help ensure that the resident is getting his or her proper medicine. If for some reason the nurse incorrectly counts the amount of medications in a drawer, the machine will not allow access to that drawer into the problem has been resolved by someone with override access such as the nurse's supervisor (case manager) or the director of nursing.

Benefits
Automatic number counts and real time inventory would allow Oak Hills' increase the security of their controlled substance management. This ultimately leads to better patient care as the technological controls of the ADS help to ensure medications are available as needed. Real time inventory controls would also reduce confusion of nursing staff caused by oral communication to each other of what residents' controlled substances have and have not been ordered. Real time inventory would also allow the pharmacy to view the inventory of a machine at any given time, streamlining communication between Oak Hills and the pharmacy. All of these attributes ultimately lead to better patient care as the technological controls of the ADS help to ensure that the medication is not being mishandled and can be given to the resident at the correct time.

Economic Analysis
Excluding onetime installation costs, the Med-Dispense system to distribute controlled substances to the facility is about $1,000 more expensive per year the current system. The largest cost savings is the elimination of the $15,500 labor cost to count the controlled substance book after every shift. The Med-Dispense unit also decreases the costs associated with ordering and distributing controlled substances.

The annual costs of the current system and the Med Dispense ADS are similar. Due to the similarity, a sensitivity analysis was performed to determine how estimates and outliers in the data may change the favorableness of the alternatives. Sensitivity analyses found that a decrease in the time it takes to count

the controlled substance books would increase the favorability of the current system, and a decrease in the time to distribute a controlled substance would increase the favorability of the Med Dispense system. The analysis shows that potential changes in the amount of time needed to count the narcotic book and the time it takes to distribute a controlled substance can greatly affect the economic favorability of the Med Dispense based system. The full sensitivity analysis can be read in Appendix D.

Table 4. Summary of Costs – Current system vs. Med Dispense ADS for controlled substances

Activity Costs ($)	Current System	Med Dispense ADS
controlled substance waste	$7,800.00	$ -
ordering controlled substances	$1,399	$416
distribution of controlled substances	$7,632	$4,303
management of controlled substance book	$15,547	$ -
cost of Med Dispense units	$ -	$28,512
hazardous waste management	$110.00	$ -
TOTAL ANNUAL COSTS	$32,488	$33,232
ONE TIME COSTS		
installation of Med Dispense	$ -	$750.00
shipping of Med Dispense	$ -	$600.00

Implementation Status
Recommended pending further analysis of other alternatives. Although more expensive, this option has technologically advanced safeguards, decreases nursing time spent on controlled substance management, and streamlines the controlled substance ordering process for a cost similar to the current system. This system should only be implemented if no other economically favorable system can be found that would have the ability to distribute controlled and non-controlled substances to the entire facility.

The same factors considered for reduction option 1.2 apply to 1.3: creation of a formulary, added pharmacy time, proper use. Other qualitative factors cannot be ignored if this system were to be implemented. The use of this system to manage controlled substances would require the use of one pharmacy to supply all the controlled substances to the residents. Currently, multiple pharmacies are supplying these medications. A change to one pharmacy for controlled substance distribution may further complicate the billing process because about half the residents would be using two different pharmacies, one for non controlled substance pharmaceuticals, and one for controlled substances pharmaceuticals. Facilitating this change, and updating this billing process may take added administrative time and resources.

Reduction Option 1.4: Use of Talyst InSite to distribute oral tabs for the entire facility

Summary
Waste reduced (per year): $25,800 (AWP) of pharmaceuticals, eliminate disposal of 17,100 oral tablets
Implementation cost: $9250
Cost savings (per year): $18,400
Payback period: 7 months
Status: Recommended

The Talyst InSite (InSite) has canisters inside of it that can hold up to 300 doses of 240 different types of oral tablets. The canisters are filled by a pharmacist at the pharmacy and then placed inside the machine for use. The machine would be used in profile mode, and only specific medications prescribed by a physician could be accessed.

Like most other ADS units, the InSite has a touch screen interface. A nurse can use this interface to prepare a medication pass, get as needed (PRN) medication, or get a specific medication for a resident. When the nurse enters what type of medication he or she wants, the machine will distribute the corresponding tablets from the canisters into a small plastic bag labeled with the resident's name, time for use, and a description of the types of medication packaged in the bag. A unique feature of the InSite is that it is capable of packaging an entire medication pass for a wing of the facility. If the nurse uses this feature, the machine will continuously pack individually labeled resident bags for an entire wing, without the nurse having to input the medicine she wants for each individual resident.

Resident specific bags containing the oral tablets can be customized in a variety of ways. The InSite can print a label with up to 19 lines of customizable print. This printing can display any type of information such as a residents' name, location, time of day for the medication to be given, or a medications' NDC code, physical description, dose, etc. The quantity of medications placed in the bag can also be adjusted. The machine can be configured to place only one type of unit dose medication in a bag. This option may be used to keep P list hazardous wastes separate, or to meet current Minnesota Board of Pharmacy standards.

Controlled substance pharmaceuticals can also be placed inside of the InSite. The machine has a separate locked compartment that can hold up to 33 types of controlled substances. A nurse is able to access scheduled drugs through the touch screen interface just like any other drugs. However, as a safety constraint, the machine will not package controlled substances in a normal medication pass; rather it will make a second separate strand of resident specific bags containing the controlled substances.

Due to the large amount of medicines that the Talyst InSite can hold, only one machine would be needed for the entire facility. The machine would be put in a central area, and would hold the vast majority of oral tablets used in the facility. All other oral tablets, such as medications used specifically for few residents, or non prescriptions medicines such as acetaminophen or multivitamins not placed in the machine would still be kept in the medication cart or residents' rooms along with other medications such as eye drops, topicals, etc.

Benefits

This option, like other ADS models would decreases the amount of wasted medications because its just-in-time capability and pharmacy control. The InSite would be used by the entire facility so both Medicare and private pay insurance residents would benefit from reduced waste. The labor associated with crediting Medicare would be eliminated and the conservatively estimated $22,000 of unused medication from private pay patients would be eliminated. The 76 private pay residents would save an average of $237 annually.

Chances for medication errors are minimized with the Insite. The use of computerized chips located on the canisters and their corresponding locations eliminates the chance for a canister to be loaded incorrectly. Also, the machine will automatically distribute medication into a corresponding small bag, without relying on human interaction to do this task. This eliminates the chance for a nurse to punch an incorrect supply of medications out of a blister pack, or take more than one unit dose out of an ADS. Also, unlike a Pyxis or Med Dispense ADS, the InSite is capable of packaging the tablets prescribed for the resident with the resident's name, reducing the chance for medications to be distributed to the wrong resident.

The possibility of the diversion of controlled substances is minimized with the InSite due to limited access. Only resident specific controlled substances are distributed when the machine is accessed by an approved user. Limited access is also advantageous for distribution of non-controlled medications. Only one dose per resident per time can be accessed, minimizing the potential for the distribution of multiple doses. Avoiding access of multiple doses not only reduces the potential for medication error, but also reduces billing errors.

The ability of the machine to create an entire medication pass in only 10 minutes is another benefit of the machine. Less time spent finding and punching oral tablets out of blister packs allows more face time with the resident, which is a current goal of Oak Hills' culture change. The InSite machine would allow nurses to spend more time with the resident while giving medication, rather than spending most of their time at the medication cart.

Economic Analysis

The economic analysis of the InSite system assumes that the machine will be leased for 5 years, and the pharmacy pays a monthly fee of $2150 for technical support of the machine. This fee is reasonable because the InSite will eliminate pharmacy labor costs associated with crediting unused Medicare medications, eliminates the labor associated with blister packs, eliminate the demand spike caused from the changing of a 30 day supplies, decrease the number of special courier trips to distribute small quantities of medicines, and eliminate excess medications being sent back to the pharmacy for disposal or destruction. The $2150 is a combined technical service fee that can be seen in Appendix F.

Table 5. Summary of Costs – Current system vs. Talyst InSite machine

Activity Costs ($)	Current System per year	Talyst InSite per year
value of controlled substances flushed	$7,800	$ -
ordering controlled substances	$1,400	$230
distribution of controlled substances	$7,630	$12,590
Management of controlled substance sook	$15,550	$ -
cost of pharmaceuticals disposed (AWP)	$18,080	$ -
cost of distributing non-controlled substance	$51,250	$25,175
cost of giving non controlled PRNs	$7,420	$17,530
ordering a non controlled substance	$2,980	$470
cost of exchanging 30 day supply of meds	$4,240	-
hazardous waste management	$110.00	$ -
cost of Talyst InSite system per year	$ -	$42,000.00
TOTAL ANNUAL COSTS	$116,465	$97,990[S4]
ONE TIME COSTS		
Installation, Training, Shipping	$ -	$9,250.00

After an initial capital investment of $9,250, the Talyst would be about $18,000 less expensive than the current medication cart system of distribution. This would result in a short payback period time of about 7 months. The InSite machine would greatly reduce the cost of distributing non-controlled pharmaceuticals per month because the automation of the machine allows it to package an entire medicine pass on demand. However, the cost of giving PRN medication per month would increase because of the

increase in time it would take for a nurse to walk to a centrally located machine to get medicine. An analysis of this factor and other sensitive estimates such as payment of the machine and PRN distribution can be seen in Appendix E.

Implementation Status

Recommended. This option is recommended due to its economic favorability, reduction in pharmaceutical waste, increase in nursing-resident interaction, and added pharmacy control. A number of pharmacists consulted for this project also support the InSite.

Although this option is recommended, the Minnesota Board of Pharmacy (Board) has reservations. They believe it may be compromising certain regulations.

According to Minnesota rule 6800.3100 subpart 1, "The practice of compounding and dispensing a prescription... shall be performed only by a pharmacist, practitioner, or pharmacist-intern under the immediate and personal supervision of a pharmacist." This rule places restrictions on who can "dispense." Under Minnesota rule 151.01 Subd. 30, "dispense or dispensing" is defined as "preparation or delivery of a drug pursuant to a lawful order of a practitioner in a suitable container appropriately labeled for subsequent administration to or use by a patient or other individual entitled to receive the drug." The Board currently believes that use of the Talyst InSite would be be "dispensing." Operation of the machine is therefore illegal because someone other than a licensed pharmacist or practitioner would be dispensing medication.[S5]

However, it could be argued that the "dispensing" is performed when the pharmacist loads and certifies the InSite for sue. At the LTC facility, the medication is provided to the nurse in an appropriate container for administration. At any given time, a nurse does not have access to the medication canisters, packaging supplies, or labeling supplies in the InSite. These materials are kept locked inside of the machine at all times unless accessed by the pharmacist for restocking of the medication. The only time the nurse will physically handle the medicine is after it comes out the machine in a small square plastic package. The package is appropriately labeled per Board of Pharmacy rules with the patient's name, location in the facility, dosing time, and details of the medication inside the package. [S6]

The Board has also expressed concern about the possible failure of the machine itself. Automated instrument is subject to the possibility of failure as are humans. However, the use of such machines is not limited by justifying worst case failure scenarios. The concern that a canister inside the machine will jam causing a surplus of medications is akin to and should be viewed with the same amount of concern of a Pyxis Cubie system opening the wrong compartment. Possible failure of a Pyxis machine has not prevented the implementation of these machines, nor should possible failure of an InSite machine prevent its implementation.

The contact at Talyst, Dave Doane, is willing to work with Oak Hills, the pharmacy it chooses to supply the InSite machine, and the Pharmacy Board of Minnesota to meet current state guidelines or determine policies that would be accepted by the Pharmacy Board to ensure appropriate use of the machine. Talyst is also willing to use third party consultants such as Shelly Spiro, president elect for the American Society of Consultant Pharmacists (ASCP) to draft policies that can coincide with Board of Pharmacy regulations.

A blueprint of a possible plan to implementation for a Talyst InSite can be seen in Appendix L.

Waste Issue 2: Hazardous Waste Management

Quantity of Waste

Disposal of hazardous waste in the United States has been regulated since the mid 1970's with the Resource Conservation and Recovery Act (RCRA). More recently, under legislation such as the Clean Water Act, increasing involvement of the Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) has strengthened the regulation of hazardous waste.

Wastes that accumulate at in the health care industry include hazardous, industrial solid, infectious, pharmaceutical, and radioactive. A waste is considered hazardous if it is listed on one of four lists, F, K, P, and U lists and/or has any of certain characteristics; corrosive, ignitable, lethal reactive or toxic.

"P list" wastes are considered "acutely" hazardous. If a facility produces more than 1kg (2.2 lbs) of P list waste in a month, the facility is considered a Large Quantity Generator (LQG). The LQG label incurs increased regulation leading to more training requirements and development of contingency plans. These can at great expense to the facility. Failure to comply with these regulations may result in substantial fines and penalties. Oak Hills is currently producing an estimated 1.25lbs of P listed waste per month. However, this waste could be better documented and managed in accordance with best management practices.

Similar to P list wastes, the MPCA defines other types of waste as hazardous because they contain ignitable, corrosive, reactive, or toxic levels of a dangerous substance. Like P listed wastes these hazardous wastes also need special disposal. However, these hazardous wastes not listed on the P list do not as readily contribute to a facility's Small Quantity Generator or Large Quantity Generator status because up to 220lbs can be generated per month. A diagram and list of the types of potentially hazardous pharmaceutical waste at Oak Hills can be seen in Appendix J and Appendix H respectively.

The ultimate goal of researching pharmaceutical waste management methods was to ensure that Oak Hills is disposing of their hazardous and non hazardous waste in a responsible manner. The first step of ensuring proper management was to identify the hazardous waste. This information was found through the Minnesota Pollution Control Agency (MPCA) and EPA websites (include citation in footnotes). Next, Oak Hills needed to document all the hazardous wastes that have come through, or are present in the facility. To do this, I obtained the pharmacy receipts for all medicines ordered by Oak Hills from the past five months. I then took the NDC code for each medication and entered it into the PharmEcology database, which signaled if the drug was hazardous, and the reason why. A table containing the types of potentially hazardous pharmaceutical waste at Oak Hills can be found in Appendix F. I then cross listed this list with the lists of unused medical waste and controlled substance disposal list to determine the quantity of hazardous waste the facility was generating per month. From this information, I was then able to get a quote for hazardous waste management, and quantify its costs.

There were 35 DEA non-controlled pharmaceuticals that were unidentified and can potentially become hazardous waste if they are not used for their intended purpose. On average $650 worth of DEA controlled hazardous drugs are being flushed down the toilet every month.

It is important to note Oak Hills may be generating hazardous wastes other than pharmaceuticals. Examples may include alcohols, aerosols, paint, and mercury-related items, such as blood pressure cuffs, batteries and fluorescent lamps.

Management Method

Oak Hills has not classified the hazardous wastes in the facility, so they do not know which wastes are hazardous. All unused oral tablets that are still contained in the blister packaging are sent back to the

pharmacy. It is presumed the pharmacy manages the waste through reverse distribution. Unused medicine that has been removed from the blister packs is either thrown away or flushed. The packaging for all used medications is disposed in the trash; including containers that stored P listed wastes.

Reasons for Researching Options

Two options were considered for the management of hazardous and pharmaceutical waste at Oak Hills; Incineration of all pharmaceutical waste including controlled substances and incineration of only hazardous pharmaceutical waste. Incineration of all pharmaceutical waste as hazardous waste can be implemented as a best management practice. It also saves labor time associated with sorting pharmaceuticals. Incineration of only hazardous waste and continued sewering of controlled substances, minimizes waste management costs, but is not a best management option. Appropriate management of Oak Hills' hazardous waste will help ensure their compliance with both Minnesota Pollution Control Agency and U.S. Environmental Protection Agency rules. Substantial incompliance fees may cost up to $27,500 per day.

Management Option 2.1: Incinerate all Pharmaceutical Waste

Summary
Waste managed (per year): 19,300 oral tablets
Implementation cost: $89.75
Cost savings (per year): ($665.20)
Payback period: N/A
Status: Recommended

My suggestion is to incinerate all pharmaceutical waste. There would be two designated waste streams, one for P listed wastes, and one for all other hazardous and non hazardous pharmaceutical wastes. Hazardous and non hazardous pharmaceutical wastes can enter the same waste stream because I believe it is cheaper to pay for all waste to be managed as hazardous, rather than the cost it would to take to educate nurses, and document hazardous and non hazardous waste.

Each neighborhood would have two different containers, one to keep P-listed waste, and one to keep all other wastes. Both containers should be DOT rated and have sealable lids. The P listed container should be labeled as "P listed hazardous waste," and should be a different color than the other container which should be labeled "Hazardous pharmaceutical waste." There should be a log kept for each container showing what the type and quantity of waste placed inside. P-listed waste includes container immediately surrounding the waste (blister pack or bottle), and therefore this packaging should also be placed in the P listed hazardous waste container. Other hazardous listed wastes can be removed from their packaging, and placed in the appropriate bins

Once a neighborhood fills a container, the waste should be carried to a P-list designated or hazardous waste designated 14 gallon drum at a central location in the facility. These drums will be marked in the same way as the containers. It is my belief that these drums will be large enough to hold up to a years' worth of waste. Therefore, every 12 months, a hazardous waste management service should be called to transport and incinerate the waste.

Benefits
Best management practices dictate that all pharmaceutical waste should be incinerated. Incineration of the waste will save a conservative estimate of 19,300 doses of medication from being exposed to the water supply per year. Management of all pharmaceutical waste as hazardous decreases nursing time required to identify waste and eliminates the need for nursing to remember complex waste streams. Another benefit of managing hazardous waste through incineration is that the facility would be able to track waste use of P-listed pharmaceuticals such as Coumadin. This will help ensure that Oak Hills does not exceed the monthly generation limit of 1 kg (2.2 lbs) of P list waste and become a large quantity generator of hazardous waste.

Economic Analysis
Quotes for hazardous waste management were requested from: Stericycle, Baywest Incorporated, and Veolia Environmental services. Veolia provided the following estimated costs that can be seen in Table 6. There would be an initial cost for purchasing the proper containers to store the pharmaceutical waste. This cost would include the cost of three 5 gallon fiber drums, three 5 gallon white poly pails, and two 14 gallon fiber drums. One each of the 5 gallon drums and 5 gallon pails would be placed on each neighborhood. The drum would be used to hold P-list hazardous waste, and the white pail would be used to hold all other hazardous and non hazardous wastes. Of the two drums, one would be designated for P-listed waste and one would be designated for all other pharmaceutical wastes. They would be placed in a central location and used to store a larger amount of the waste. The initial investment of these containers total $89.75.

In addition to these initial costs, there are fixed and variable fees for pickup and transportation of the waste. Flat fees for environmental specialist and transportation equal $507 per trip to Oak Hills. Variable fees would include the price of non hazardous, hazardous, and controlled substances at $0.95, $3.50, and $22.00 a pound, respectively. As long as Oak Hills maintains very small or small generator hazardous waste status, there are minimal limits on the amount of waste Oak Hills could generate before disposal. Therefore, I would recommend that Oak Hills dispose of its hazardous waste only once a year to minimize cost. Estimated costs can be seen in Table 6 below.

Table 6a. Annual costs to incinerate hazardous waste

Service and Personnel cost	Unit of Measurement	Quantity	Cost	Total cost
Incineration of Non hazardous Pharmaceuticals	pounds	1	0.95	$0.95
Incineration of Hazardous Waste	pounds	5	3.5	$17.5
Incineration of Controlled Substances	pounds	5	22	$110
Mobilization Fee	Mile	115	4	$460
Vermiculite, 4 CUFT Bag	Each	2	15	$30
Environmental Specialist	Hour	1	46.75	$46.75
TOTAL				$665.2

Table 6b. Implementation costs to incinerate hazardous waste

Material Costs (1 time cost)	Unit of Measurement	Quantity	Cost	Total cost
5 Gallon Fiber Drum	Each	3	7.5	$22.5
5 Gallon White Poly Pails	Each	3	7.75	$23.25
14 Gallon Fiber Drum	Each	1	14	$14
Vermiculite, 4 CUFT Bag	Each	2	15	$30
TOTAL				$89.75

Implementation Status

This option is a recommended. A flow chart that could assist in the implementation of this option is seen in Appendix I. Management of pharmaceutical waste in the process described conforms to state and federal laws. It also gives the facility of which drugs are most commonly wasted. Implementation of this option is also environmentally responsible as it prevents a conservative estimate of 19,300 tabs of pharmaceutical waste from possibly entering ground, surface, and drinking water.

It should be noted that if the facility were to implement one or more ADS, the amount of hazardous and non hazardous waste may be greatly reduced. The ADS would allow for source reduction of the pharmaceutical waste, meaning that waste would not be generated in the first place. Therefore, there would be less need to pay for expensive management of pharmaceutical waste if no waste is generated in the first place. However, as the law defines that P-listed packaging is also considered a hazardous waste, there will still be a need for the facility to incinerate some hazardous waste.

Management Option 2.2: Flush controlled substances and incinerate all other hazardous waste

Summary
Waste managed (per year): 12,400 (estimate) oral tablets of non controlled hazardous pharmaceutical waste prevented from contaminating surface, ground, or drinking water each year.
Implementation cost: $89.75
Cost savings (per year): ($540)
Payback period: N/A
Status: Not recommended.

Although this method of hazardous pharmaceutical management may be permitted by the wastewater treatment authority, and recommended by some hazardous waste management haulers, it is not a best management practice. The flushing of controlled substances may harm wildlife because organic compounds in the controlled substances may contaminate surface water. Also, flushing of these substances has been shown to contaminate human drinking water. The medical effects of long term exposure to low concentrations of these compounds are unknown and may have a negative impact on human health. Consequently, introducing these compounds into the water supply would be irresponsible and may threaten wildlife and human safety. The cost savings resulting from flushing of medication rather than incineration do not justify the potential damage that could be done the environment and human health.

Benefits
The benefits of this method would include a decreased cost of hazardous waste management to Oak Hills. I estimate that Oak Hills will dispose of 5 pounds of controlled substances per year. At a cost of 22.00 a pound for disposal, Oak Hills would save $110 dollars in disposal fees per year for flushing controlled substances as compared to incineration.

Economic Analysis
As in option 1.1, there would be an initial cost for purchasing containers to store pharmaceutical waste. This cost would total $89.75. In addition to this initial cost, there are fixed and variable fees for mobilization and pickup of the material. Flat fees including labor and mobilization would include an environmental specialist and transportation, totaling $506.75 per trip to Oak Hills. Variable fees would include the price to manage non hazardous waste and hazardous waste at $0.95 and $3.50 a pound, respectively. There are no strict limits on the amount of waste Oak Hills could generate before disposal. Therefore, I would recommend that Oak Hills dispose of its hazardous waste only once a year to minimize cost.

Implementation Status
This suggestion is not recommended. Although an estimated $110 may be saved per year from choosing not to incinerate controlled substances, I do not believe this cost justifies the risk to wildlife and human health of contaminating surface and drinking water with organic compounds from controlled substances. An annual savings of $110, or only thirty cents a day, does not provide enough financial motivation to the facility as compared to the possible dangers that may result from water contamination.

Waste Issue 3: Inventory Management

Quantity of Waste

Oak Hills' does not currently track or record the amount medical supplies such as briefs, gloves, lotions, that it is ordering. Reorder points have roughly been set in the past that have not been updated. Supply

rooms are kept completely full and updated at least three times a week. This signaled to me that Oak Hills may be ordering unnecessary amounts of inventory.

Management Method

Medical supplies are kept in two different places. A medical supply room is kept for each neighborhood. Here, supplies are kept stocked to a level at which it is believed the supply could never be exhausted. For example, if the nurses use on average three bottles of lotion per week, the supply room may be packed with ten bottles of lotion. There are rough estimates of how many of each type of supply should be stocked. However, these values are not based on use, but rather they are set to an amount that is believed to be enough so that the supply could not be exhausted in a week. Supply rooms are usually checked and restocked every three days.

Supplies are also kept in a central large storage room that supports the satellite medical rooms. In the storage room, back up supplies are kept to ensure that if any of the supplies in the med room are depleted, more can immediately obtained. The number of supplies kept in the storage room is based on a predetermined quantity or number of packages of a particular supply. This number is assumed to be enough as so medical supplies will never run out.

Reasons for Researching Option

After visually inspecting the amount of supplies in one of the medical rooms, the number of supplies kept on hand seemed excessive. I was unsure if so many supplies would be needed for a weeks' worth of supply. After tracking the usage, different re-stocking, and re-ordering points for the supplies based on actual usage, rather than on rough estimates. If ordering and stocking was based on probable usage, fewer supplies may need to be unnecessarily stocked. Consequently, this may lead to a decrease in the operating budget of Oak Hills medical supply expenses.

Reduction Option 3.1: Inventory Assessment

Summary
Waste reduced (per year): N/A
Implementation cost: $0
Cost savings (per year): N/A
Payback period: N/A
Status: Implemented

The amount of supplies used was tracked over a one month period from Neighborhood 1's medical supply room. Every time the room was stocked, the number of supplies that have been used and the date were marked. This data was entered into a spreadsheet, and at the end of the month, average use and standard deviation was calculated. The standard deviation was multiplied by the inverse of the standard normal distribution function corresponding to 99%, an added to the average. This number represents the level at which the supplies should be stock to statistically ensure that the supply will be available 99% of the time. A 99% probability was chosen because of the critical nature of ensuring that medical supplies are available to residents.

Benefits:
Performing the inventory assessment gives Oak Hills clear usage based values to set reorder points for medical supplies. This should streamline the ordering process because there is now a set standard as to when supplies should be ordered. Establishment of reorder points reduces the chance for Oak Hills to order more supplies than necessary, while ensuring that supplies are available to meet the needs of the residents. Reorder points can be seen in Appendix L.

Economic Analysis
Use of new reordering points may decrease the budget for ordering supplies in the future. It also save time for someone checking the supply rooms more, as he or she will not have to take the time to estimate a reorder point.

Implementation Status
Implemented. A template created with Microsoft Excel asks for an input of usage and returns average use, and reorder points for 95% and 99% assurance of supplies. This will be used after Oak Hills' facility renovation to help determine how smaller decentralized supply cabinets should be stocked. For example, based on use it may make more sense for 1 box of gloves to be stocked in 5 small closets, rather than having 10 boxes of gloves placed in one small closet.

Appendices

Appendix A: Recognition and References

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Techforltc.com
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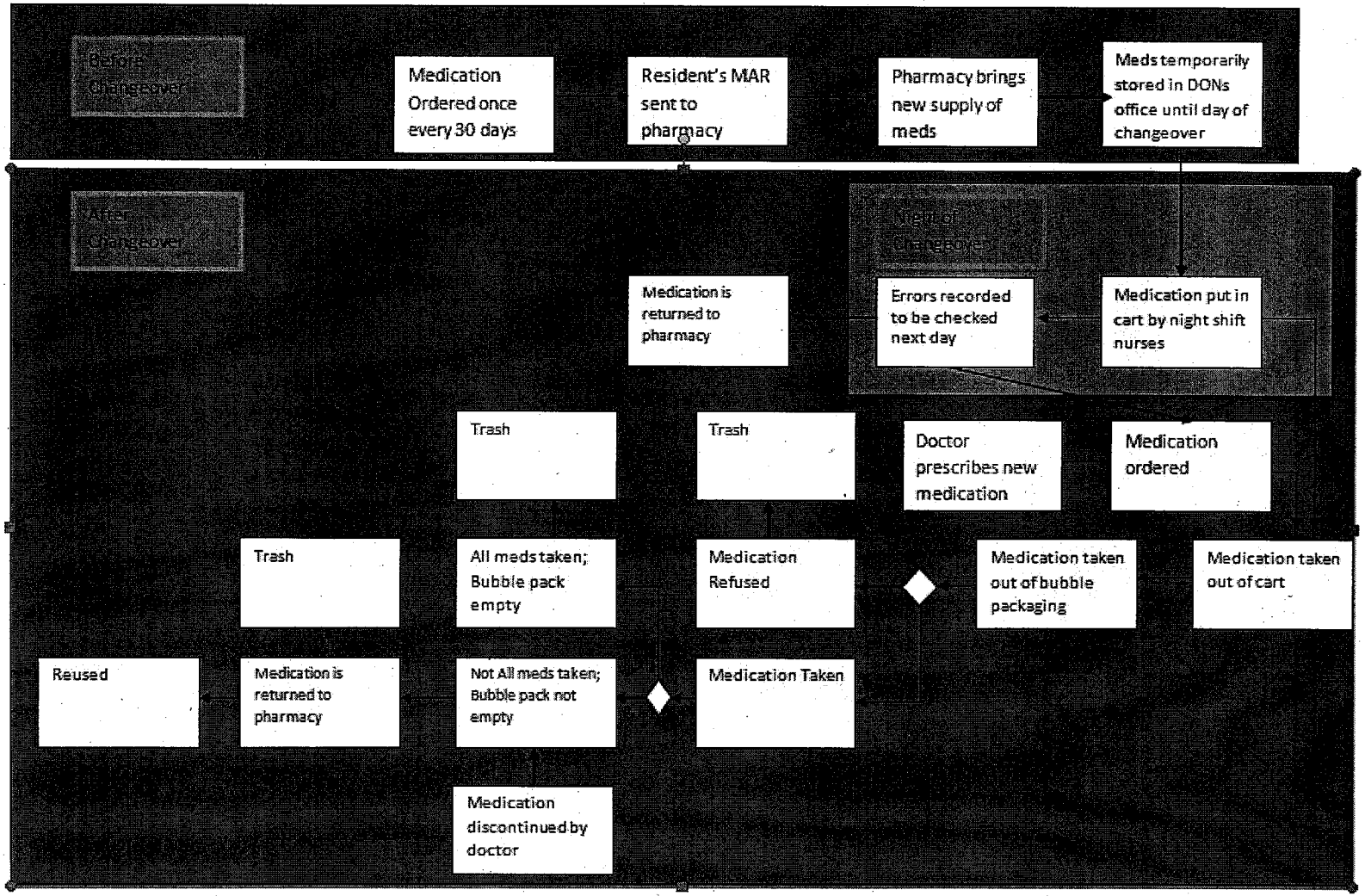
Appendix B: Process Diagrams of Oral Tablet Distribution

Current System of Med Distribution – Medical Carts

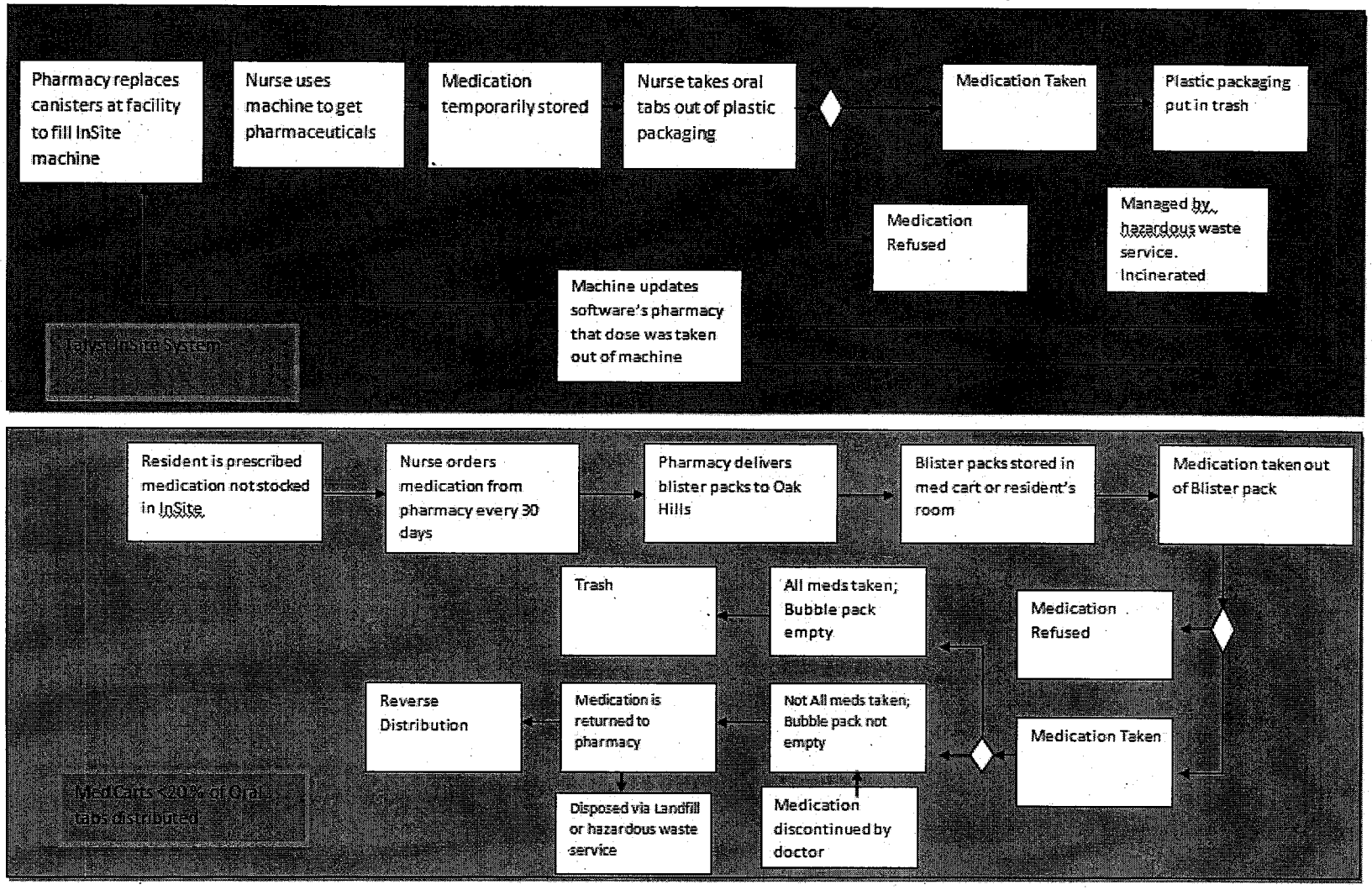


Observations:

- The current system is a "push" based system. Every month Oak Hills will order everyone a 30 day supply of medications. This 30 day supply should theoretically last the entire month until the next 30 day supply is given. The ordering of the medicine "pushes" the order of events, and the system is not restored until the medications are again ordered by Oak Hills.
- This is a new system for Oak Hills. This process was to be implemented before I came here. I believe that in no interruptions to the theory, the system is sound and would work smoothly. However, I'm concerned with how this system will last overtime. As patients are admitted at different times of the month, it will make estimation of how many doses of medications they will need to last the current month until they cycle starts over. Also, this requires consulting with a MAR before every major order to ensure that the medications that will be ordered are up to date what the doctor is prescribing. This is needed to ensure that medications discontinued throughout the month are not ordered again. I believe that this process will be very time consuming, and leaves a great amount of room for human error. This will also put a great burden on the night staff to place the next 30 day supply for 95 residents away.
- An advantage to this system, is that the in theory, if the pharmacy counted right, and the resident didn't reject more than 2 doses, the resident should never run out of medication
- A disadvantage of this system is that if a doctor discontinues a medicine early in the cycle (for example on day 3 of the 30 day supply) of medications, a greater amount of pharmaceuticals may be potentially wasted. It is possible that these medicines may be credited and reused, but they may also be thrown away or improperly disposed.

Pro	**Con**
Inventory should not need to be taken	Hazardous waste is disposed of improperly
Most times resident should not run out of medication	Ordering for the next med cycle will be very time consuming
	Places burden on night staff to switch all medications in one shift
	Burden on pharmacist to fill 95 prescriptions in a limited time
	If abundance of drops and spits medication needs to be ordered prematurely
	Oral communication needed to deal with exceptions to rules. Example: if doctor prescribes a new medication halfway through the cycle, pharmacist needs to count pills

System of Medicine Distribution Processes- Use of Talyst InSite



Observations:

- The system surrounded in blue describes the how medications would be delivered with the use of a Talyst machine. The system surrounded in green describes how medications would still be delivered with the med cart or in a resident's room. Both systems are shown because it is unrealistic to imagine a med distribution based completely on an InSite machine. However, it should be noted that at least 80% of the oral tabs would be given from the InSite machine. This InSite based system is much more streamlined and requires less processes than the Med Cart system
- An InSite system would keep a constant supply of 240 different types of pharmaceuticals in the facility at any given time. This decreases the chance that a resident will run out of his or her medications. This also increases the chance that a new admission resident will have the medications he or she needs already on hand. The presence of medications on hand would decrease the amount of communication needed with the pharmacy to order the residents new medications before they are admitted to the facility.
- The pharmacy may also benefit from the implementation of this system. Installment of an Insite may help reduce the cost of filling medications. The canisters used in the InSite take about the same time to fill as a conventional blister pack. However, unlike the blister pack, the canisters can hold up to 300 doses of medication, rather than 30. The Insite will also cut down on the number of special deliveries that need to be made from the pharmacy per month.
- Medicine would be packaged only as needed. This will diminish the amount of medicine wasted due to a distributed 30 day supply of medications going unused. Less medicine wasted means that each resident will save about $236 medication per year, and neither Oak Hills nor the pharmacy will have to perform the lengthy tasks to obtain credit for Medicare A pharmaceuticals.

Pro	**Con**
Allows for more nursing "face to face" time	Not currently supported by Minnesota Board of Pharmacy
Most times resident should not run out of medication	Process change may be time consuming if a plan is not agreed upon
Diminished need to credit Medicare A waste	Switch to one pharmacy may decrease price competition
Increased pharmacy control of system	
Computer can track inventory and send updates directly to the pharmacy	
Decreases amount of same day orders to be delivered from pharmacy for a residents first dose	
Streamlines communication with pharmacy	

Appendix C: Med-Dispense option for the Medicare Wing

Calculation of Costs: Medicare Wing with Medicine Carts

Controlled Substances flushed per month

Monthly retail cost of flushed controlled substances for the entire facility	% of controlled substance using population on Medicare	**Cost of controlled substance flushed waste per month**
$650	25%	**$163**

Ordering of Controlled Substances per month

Controlled substances being ordered per month (QD)	Controlled substances being ordered per month (PRN)	Time to order controlled substances per month (hours)	**Cost of ordering controlled substances per month**
10	4	1.63	**$25.382**

Nurses are currently ordering controlled substances as the blister pack supply runs out

Distribution of Controlled Substances per month

Monthly use of a controlled substance (QD)	Monthly use of a controlled substance (PRN)	Average number of controlled substances distributed per month	Time to distribute controlled substance per month (hours)	**Cost of distributing controlled substance per month**
70	252	322	7.13	**$110.92**

Distribution includes getting the proper blister pack, taking the controlled substance out of the blister pack, and marking this in the controlled substance book. This process does not include counting the book at the end of the shift.

Management of Controlled Substance book

Time to count the book (mins)	Number of people counting book	Number of times book is counted per month	Time to count book per month (hours)	**Monthly cost of managing book for Medicare residents**
3	2	90	9	**$139.86**

Management of the controlled substance books is defined as the time required by nursing to count the narcotic book to verify accuracy at the end of the shift

Management of Non-Controlled Substances Returned to Pharmacy

Prescriptions returned for credit per month	Time to credit a prescription (mins)	Time to credit prescriptions per month (hours)	**Cost of crediting Medicare drugs**
156	2	5.2	**$80.81**

Distribution of Non-Controlled Substances per month

Number of oral tabs given per day	Time to dispense each medication (min)	Total hours dispensing medication per month	**Cost of Dispensing per month**
222.39	0.54	61.9353	**$962.47**

Distribution is defined as the time it takes a nurse to find a residents blister pack, take it out of the cart, and punch the oral tab out of the blister pack. The time taken to further prepare/mix the pill in water or pudding is not included.

Ordering and Changing of 30 day supply of meds

Total Time to order and change 30 day med supply per month (hours)	**Cost of Ordering 30 day supply of meds each month**
10.5	**$163.95**

Hazardous Waste Management

Management of P list Hazardous waste	Management of non P list Hazardous waste	Management of Controlled Substance Hazardous waste	**Cost of appropriate hazardous waste management per year**
$8.87	$63	$27.5	**$99.37**

There are other flat costs associated with hazardous waste management (HWM) such as a mobilization fee and labor fee. However, as I recommend that Oak Hills use a HWM regardless of implementing or not implementing an ADS, I only include the reduction in variable costs resulting from the use of an ADS.

Cash Flow:

Table A. Monthly cash flows of current system vs Med Dispense system for the Medicare wing.

Month	Current System	Med Dispense ADS	Payback	Discount Rate
0		$ (1,350.00)	$ (1,350.00)	10%
1	$ (1,616.52)	$ (2,188.49)	$ (1,921.97)	15%
2	$ (1,616.52)	$ (2,188.49)	$ (2,493.93)	20%
3	$ (1,616.52)	$ (2,188.49)	$ (3,065.90)	
4	$ (1,616.52)	$ (2,188.49)	$ (3,637.87)	
5	$ (1,616.52)	$ (2,188.49)	$ (4,209.83)	
6	$ (1,616.52)	$ (2,188.49)	$ (4,781.80)	
7	$ (1,616.52)	$ (2,188.49)	$ (5,353.76)	
8	$ (1,616.52)	$ (2,188.49)	$ (5,925.73)	
9	$ (1,616.52)	$ (2,188.49)	$ (6,497.70)	
10	$ (1,616.52)	$ (2,188.49)	$ (7,069.66)	
11	$ (1,616.52)	$ (2,188.49)	$ (7,641.63)	
12	$ (1,715.89)	$ (2,188.49)	$ (8,114.23)	
13	$ (1,616.52)	$ (2,188.49)	$ (8,686.19)	
14	$ (1,616.52)	$ (2,188.49)	$ (9,258.16)	
15	$ (1,616.52)	$ (2,188.49)	$ (9,830.13)	
16	$ (1,616.52)	$ (2,188.49)	$ (10,402.09)	

17	$	(1,616.52)	$	(2,188.49)	$ (10,974.06)
18	$	(1,616.52)	$	(2,188.49)	$ (11,546.03)
19	$	(1,616.52)	$	(2,188.49)	$ (12,117.99)
20	$	(1,616.52)	$	(2,188.49)	$ (12,689.96)
21	$	(1,616.52)	$	(2,188.49)	$ (13,261.93)
22	$	(1,616.52)	$	(2,188.49)	$ (13,833.89)
23	$	(1,616.52)	$	(2,188.49)	$ (14,405.86)
24	$	(1,715.89)	$	(2,188.49)	$ (14,878.46)
25	$	(1,616.52)	$	(2,188.49)	$ (15,450.42)
26	$	(1,616.52)	$	(2,188.49)	$ (16,022.39)
27	$	(1,616.52)	$	(2,188.49)	$ (16,594.36)
28	$	(1,616.52)	$	(2,188.49)	$ (17,166.32)
29	$	(1,616.52)	$	(2,188.49)	$ (17,738.29)
30	$	(1,616.52)	$	(2,188.49)	$ (18,310.25)
31	$	(1,616.52)	$	(2,188.49)	$ (18,882.22)
32	$	(1,616.52)	$	(2,188.49)	$ (19,454.19)
33	$	(1,616.52)	$	(2,188.49)	$ (20,026.15)
34	$	(1,616.52)	$	(2,188.49)	$ (20,598.12)
35	$	(1,616.52)	$	(2,188.49)	$ (21,170.09)
36	$	(1,715.89)	$	(2,188.49)	$ (21,642.69)
37	$	(1,616.52)	$	(2,188.49)	$ (22,214.65)
38	$	(1,616.52)	$	(2,188.49)	$ (22,786.62)
39	$	(1,616.52)	$	(2,188.49)	$ (23,358.58)
40	$	(1,616.52)	$	(2,188.49)	$ (23,930.55)
41	$	(1,616.52)	$	(2,188.49)	$ (24,502.52)
42	$	(1,616.52)	$	(2,188.49)	$ (25,074.48)
43	$	(1,616.52)	$	(2,188.49)	$ (25,646.45)
44	$	(1,616.52)	$	(2,188.49)	$ (26,218.42)
45	$	(1,616.52)	$	(2,188.49)	$ (26,790.38)
46	$	(1,616.52)	$	(2,188.49)	$ (27,362.35)
47	$	(1,616.52)	$	(2,188.49)	$ (27,934.31)
48	$	(1,715.89)	$	(2,188.49)	$ (28,406.91)
49	$	(1,616.52)	$	(2,188.49)	$ (28,978.88)
50	$	(1,616.52)	$	(2,188.49)	$ (29,550.85)
51	$	(1,616.52)	$	(2,188.49)	$ (30,122.81)
52	$	(1,616.52)	$	(2,188.49)	$ (30,694.78)
53	$	(1,616.52)	$	(2,188.49)	$ (31,266.75)
54	$	(1,616.52)	$	(2,188.49)	$ (31,838.71)
55	$	(1,616.52)	$	(2,188.49)	$ (32,410.68)
56	$	(1,616.52)	$	(2,188.49)	$ (32,982.64)
57	$	(1,616.52)	$	(2,188.49)	$ (33,554.61)
58	$	(1,616.52)	$	(2,188.49)	$ (34,126.58)
59	$	(1,616.52)	$	(2,188.49)	$ (34,698.54)
60	$	(1,715.89)	$	(2,188.49)	$ (35,171.14)

NPV@10%	($16,158.43)	($21,812.99)	IRR = N/A
NPV@15%	($10,797.18)	($14,586.58)	
NPV@20%	($8,095.01)	($10,942.24)	

The cash flow includes all the values from Table 3. The cash flow stretches for 60 months because that is the period of time required to lease the Med-Dispense Base 45 equipment. Med-Dispense also provided a purchase option for the equipment. However, this option was more expensive than the lease option, and would not include the free software updates given while leasing. The purchase option was therefore rejected.

Initial costs are represented in year zero to mimic the one time instillation fee and shipping fee of the equipment before it is used. The yearly cost of hazardous waste management is assumed to be paid for at the end of the year to reduce cost; this is reflected by the payment being incorporated into the cash flow every twelfth month.

The NPV has been given at a variety of discount rates. The discount rate can be viewed as what else the money could be used for that is currently funding the project alternatives, in other words it can be seen as the opportunity cost of the money. At no realistic discount rate, will the ADS option for the Medicare wing be more favorable than the current method.

Payback Period:
A payback period cannot be found from the ADS alternative. This is because the Med-Dispense option is more expensive than current method of using med carts, and the cost of using the Med-Dispense system is always more expensive than using the med carts. The cost of the Med-Dispense does not economically justify the potential time savings from nursing staff, or savings from less pollution of pharmaceuticals.

Sensitivity Analysis:
Although an ADS alternative may not currently be economically favorable, there are factors that may potentially change this status. A possible fifty percent medical error reduction important characteristic of an ADS that cannot be ignored. Medical errors are extremely dangerous, and carry potentially serious consequences for the resident involved, as well as the nurse who made the error. In this respect, the extra $571 that it costs to utilize an ADS may be worth the enhanced patient care. Medical errors are also time consuming and labor intensive to document and report. Although this cost to the facility is not accounted for in the cost analysis, the soft savings from the reduction in administrative costs from medical errors should also be considered when evaluating the ADS alternative.

Another area that may greatly impact the feasibility of and ADS is the nursing wage. Wage was calculated using the current average wage for a nurse administering medications in the nursing home. This consisted of a mix of TMAs, LPNs, and RNs. As RNs are paid more than TMAs and LPNs, if there is a movement towards more RNs distributing oral tabs, there would be a larger soft savings resulting from use of the ADS. Consequently, this would make the ADS alternative more economically favorable.

An increase in the amount of oral meds the residents are taking may also change the feasibility of an ADS option. If more non-controlled substances are being taken, more soft savings may be realized from the ADS system. Also, an increase in the amount of scheduled drugs being taken by residents may likely increase the amount controlled substance waste. As a result, the cost of controlled substance waste may increase, and possibly make the ADS a more favorable alternative.

Appendix D: Med-Dispense option to distribute controlled substances for the entire facility

Calculation of Costs – Controlled Substances in the entire facility using an ADS

Ordering Controlled Substances

Number of controlled substances ordered per month	Time to order controlled substances per month (hours)	Cost of Ordering Controlled Substances per month
64	2.233333333	34.71

The number of times a controlled substance is ordered is based upon 30 meds being stored in each drawer of the ADS. This estimate also assumes a worst case scenario that the nurse would always have to order meds because the supply would be extinguished. In reality this is unlikely because the pharmacist would be filling the machine at least once a week.

Distribution of Controlled Substances

Number of controlled substances used per month	Time spent distributing narcotics per month	Cost of Distributing Narcotics per month
1846	30.76666667	358.65

Cost of Equipment

Med Dispense Base 45 Units Needed	Cost per month of Med Dispense	Cost of Med Dispense per month
3	792	2376

Each neighborhood would need its own Med Dispense unit

Calculation of Costs – Controlled Substances in the entire facility using Med Carts

Average controlled substances wasted per month
$650

The retail value of the controlled substances flushed down the toilet is about $650 per month.

Ordering controlled substances

Number of controlled substance blister packs ordered per month	Time to order a controlled substance blister pack (mins)	Time to put away a controlled substance blister pack (mins)	**Cost of ordering controlled substances per month**
64	5	2	**$116.59**

Distribution of controlled substances

Controlled substances used in facility per month	Time to distribute controlled substances per month (hours)	**Cost of distributing controlled substances per month**
1846	40.92	**636.01**

Managing controlled substance book

Total time counting each book per shift	Number of books	Number of times each book is counted per month	Number of nurses counting the book	**Cost of counting the book per month**
5.56	5.00	90.00	2.00	**1295.64**

It should be noted that the average time per book count is affected greatly by one outlier. Some controlled substances in neighborhood 2 are kept in a bottle. This greatly increases the time of the narcotic count, and therefore increases the average time, as well as average cost.

Cash Flow:

Month	Current System	Med Dispense ADS	Payback	Discount Rate
0	0	$ (1,350.00)	$ (1,350.00)	10%
1	$ (2,698.24)	$ (2,769.36)	$ (1,421.12)	15%
2	$ (2,698.24)	$ (2,769.36)	$ (1,492.24)	20%
3	$ (2,698.24)	$ (2,769.36)	$ (1,563.35)	
4	$ (2,698.24)	$ (2,769.36)	$ (1,634.47)	
5	$ (2,698.24)	$ (2,769.36)	$ (1,705.59)	
6	$ (2,698.24)	$ (2,769.36)	$ (1,776.71)	
7	$ (2,698.24)	$ (2,769.36)	$ (1,847.83)	
8	$ (2,698.24)	$ (2,769.36)	$ (1,918.95)	
9	$ (2,698.24)	$ (2,769.36)	$ (1,990.06)	
10	$ (2,698.24)	$ (2,769.36)	$ (2,061.18)	
11	$ (2,698.24)	$ (2,769.36)	$ (2,132.30)	
12	$ (2,808.24)	$ (2,769.36)	$ (2,093.42)	
13	$ (2,698.24)	$ (2,769.36)	$ (2,164.54)	
14	$ (2,698.24)	$ (2,769.36)	$ (2,235.66)	
15	$ (2,698.24)	$ (2,769.36)	$ (2,306.77)	
16	$ (2,698.24)	$ (2,769.36)	$ (2,377.89)	
17	$ (2,698.24)	$ (2,769.36)	$ (2,449.01)	
18	$ (2,698.24)	$ (2,769.36)	$ (2,520.13)	
19	$ (2,698.24)	$ (2,769.36)	$ (2,591.25)	
20	$ (2,698.24)	$ (2,769.36)	$ (2,662.37)	
21	$ (2,698.24)	$ (2,769.36)	$ (2,733.48)	
22	$ (2,698.24)	$ (2,769.36)	$ (2,804.60)	
23	$ (2,698.24)	$ (2,769.36)	$ (2,875.72)	
24	$ (2,808.24)	$ (2,769.36)	$ (2,836.84)	
25	$ (2,698.24)	$ (2,769.36)	$ (2,907.96)	

26	$ (2,698.24)	$ (2,769.36)	$ (2,979.08)
27	$ (2,698.24)	$ (2,769.36)	$ (3,050.19)
28	$ (2,698.24)	$ (2,769.36)	$ (3,121.31)
29	$ (2,698.24)	$ (2,769.36)	$ (3,192.43)
30	$ (2,698.24)	$ (2,769.36)	$ (3,263.55)
31	$ (2,698.24)	$ (2,769.36)	$ (3,334.67)
32	$ (2,698.24)	$ (2,769.36)	$ (3,405.79)
33	$ (2,698.24)	$ (2,769.36)	$ (3,476.90)
34	$ (2,698.24)	$ (2,769.36)	$ (3,548.02)
35	$ (2,698.24)	$ (2,769.36)	$ (3,619.14)
36	$ (2,808.24)	$ (2,769.36)	$ (3,580.26)
37	$ (2,698.24)	$ (2,769.36)	$ (3,651.38)
38	$ (2,698.24)	$ (2,769.36)	$ (3,722.50)
39	$ (2,698.24)	$ (2,769.36)	$ (3,793.61)
40	$ (2,698.24)	$ (2,769.36)	$ (3,864.73)
41	$ (2,698.24)	$ (2,769.36)	$ (3,935.85)
42	$ (2,698.24)	$ (2,769.36)	$ (4,006.97)
43	$ (2,698.24)	$ (2,769.36)	$ (4,078.09)
44	$ (2,698.24)	$ (2,769.36)	$ (4,149.21)
45	$ (2,698.24)	$ (2,769.36)	$ (4,220.32)
46	$ (2,698.24)	$ (2,769.36)	$ (4,291.44)
47	$ (2,698.24)	$ (2,769.36)	$ (4,362.56)
48	$ (2,808.24)	$ (2,769.36)	$ (4,323.68)
49	$ (2,698.24)	$ (2,769.36)	$ (4,394.80)
50	$ (2,698.24)	$ (2,769.36)	$ (4,465.92)
51	$ (2,698.24)	$ (2,769.36)	$ (4,537.03)
52	$ (2,698.24)	$ (2,769.36)	$ (4,608.15)
53	$ (2,698.24)	$ (2,769.36)	$ (4,679.27)
54	$ (2,698.24)	$ (2,769.36)	$ (4,750.39)
55	$ (2,698.24)	$ (2,769.36)	$ (4,821.51)
56	$ (2,698.24)	$ (2,769.36)	$ (4,892.63)
57	$ (2,698.24)	$ (2,769.36)	$ (4,963.74)
58	$ (2,698.24)	$ (2,769.36)	$ (5,034.86)
59	$ (2,698.24)	$ (2,769.36)	$ (5,105.98)
60	$ (2,808.24)	$ (2,769.36)	$ (5,067.10)
NPV@10	($24,495.49)	($26,320.56)	
NPV@15	($15,660.38)	($17,224.50)	IRR = N/A
NPV@20	($11,254.04)	($12,663.78)	

Sensitivity Analysis 1: Use of a 30 second distribution time for controlled substances

Summary of Costs:

Monthly Cost	Current System	Med Dispense ADS
Controlled Substances flushed per month	$ 650.00	$ -
Ordering of Controlled Substances	$ 116.59	$ 34.71
Distribution of Controlled Substances	$ 636.01	$ 239.10
Managing Controlled Substance Book	$ 1,295.64	$ -
Cost of Med Dispense Units	$ -	$ 2,376.00
TOTAL MONTLY COSTS	$ 2,698.24	$ 2,649.81

Yearly Cost		
Hazardous Waste Management	$ 110.00	$ -

One Time Cost		
Instillation of Med Dispense	$ -	$ 750.00
Shipping of Med Dispense	$ -	$ 600.00

Cash Flow:

Month	Current System	Med Dispense ADS	Payback	IRR	Discount Rate
0	0	$ (1,350.00)	$ (1,350.00)	$ (1,350.00)	10%
1	$ (2,698.24)	$ (2,649.81)	$ (1,301.57)	$ 48.43	15%
2	$ (2,698.24)	$ (2,649.81)	$ (1,253.13)	$ 48.43	20%
3	$ (2,698.24)	$ (2,649.81)	$ (1,204.70)	$ 48.43	
4	$ (2,698.24)	$ (2,649.81)	$ (1,156.27)	$ 48.43	
5	$ (2,698.24)	$ (2,649.81)	$ (1,107.84)	$ 48.43	
6	$ (2,698.24)	$ (2,649.81)	$ (1,059.40)	$ 48.43	
7	$ (2,698.24)	$ (2,649.81)	$ (1,010.97)	$ 48.43	
8	$ (2,698.24)	$ (2,649.81)	$ (962.54)	$ 48.43	
9	$ (2,698.24)	$ (2,649.81)	$ (914.10)	$ 48.43	
10	$ (2,698.24)	$ (2,649.81)	$ (865.67)	$ 48.43	
11	$ (2,698.24)	$ (2,649.81)	$ (817.24)	$ 48.43	
12	$ (2,808.24)	$ (2,759.81)	$ (768.81)	$ 48.43	
13	$ (2,698.24)	$ (2,649.81)	$ (720.37)	$ 48.43	
14	$ (2,698.24)	$ (2,649.81)	$ (671.94)	$ 48.43	
15	$ (2,698.24)	$ (2,649.81)	$ (623.51)	$ 48.43	
16	$ (2,698.24)	$ (2,649.81)	$ (575.07)	$ 48.43	
17	$ (2,698.24)	$ (2,649.81)	$ (526.64)	$ 48.43	
18	$ (2,698.24)	$ (2,649.81)	$ (478.21)	$ 48.43	
19	$ (2,698.24)	$ (2,649.81)	$ (429.77)	$ 48.43	
20	$ (2,698.24)	$ (2,649.81)	$ (381.34)	$ 48.43	
21	$ (2,698.24)	$ (2,649.81)	$ (332.91)	$ 48.43	
22	$ (2,698.24)	$ (2,649.81)	$ (284.48)	$ 48.43	
23	$ (2,698.24)	$ (2,649.81)	$ (236.04)	$ 48.43	

24	$	(2,808.24)	$	(2,759.81)	$	(187.61)	$	48.43
25	$	(2,698.24)	$	(2,649.81)	$	(139.18)	$	48.43
26	$	(2,698.24)	$	(2,649.81)	$	(90.74)	$	48.43
27	$	(2,698.24)	$	(2,649.81)	$	(42.31)	$	48.43
28	$	(2,698.24)	$	(2,649.81)	$	6.12	$	48.43
29	$	(2,698.24)	$	(2,649.81)	$	54.55	$	48.43
30	$	(2,698.24)	$	(2,649.81)	$	102.99	$	48.43
31	$	(2,698.24)	$	(2,649.81)	$	151.42	$	48.43
32	$	(2,698.24)	$	(2,649.81)	$	199.85	$	48.43
33	$	(2,698.24)	$	(2,649.81)	$	248.29	$	48.43
34	$	(2,698.24)	$	(2,649.81)	$	296.72	$	48.43
35	$	(2,698.24)	$	(2,649.81)	$	345.15	$	48.43
36	$	(2,808.24)	$	(2,759.81)	$	393.58	$	48.43
37	$	(2,698.24)	$	(2,649.81)	$	442.02	$	48.43
38	$	(2,698.24)	$	(2,649.81)	$	490.45	$	48.43
39	$	(2,698.24)	$	(2,649.81)	$	538.88	$	48.43
40	$	(2,698.24)	$	(2,649.81)	$	587.32	$	48.43
41	$	(2,698.24)	$	(2,649.81)	$	635.75	$	48.43
42	$	(2,698.24)	$	(2,649.81)	$	684.18	$	48.43
43	$	(2,698.24)	$	(2,649.81)	$	732.62	$	48.43
44	$	(2,698.24)	$	(2,649.81)	$	781.05	$	48.43
45	$	(2,698.24)	$	(2,649.81)	$	829.48	$	48.43
46	$	(2,698.24)	$	(2,649.81)	$	877.91	$	48.43
47	$	(2,698.24)	$	(2,649.81)	$	926.35	$	48.43
48	$	(2,808.24)	$	(2,759.81)	$	974.78	$	48.43
49	$	(2,698.24)	$	(2,649.81)	$	1,023.21	$	48.43
50	$	(2,698.24)	$	(2,649.81)	$	1,071.65	$	48.43
51	$	(2,698.24)	$	(2,649.81)	$	1,120.08	$	48.43
52	$	(2,698.24)	$	(2,649.81)	$	1,168.51	$	48.43
53	$	(2,698.24)	$	(2,649.81)	$	1,216.94	$	48.43
54	$	(2,698.24)	$	(2,649.81)	$	1,265.38	$	48.43
55	$	(2,698.24)	$	(2,649.81)	$	1,313.81	$	48.43
56	$	(2,698.24)	$	(2,649.81)	$	1,362.24	$	48.43
57	$	(2,698.24)	$	(2,649.81)	$	1,410.68	$	48.43
58	$	(2,698.24)	$	(2,649.81)	$	1,459.11	$	48.43
59	$	(2,698.24)	$	(2,649.81)	$	1,507.54	$	48.43
60	$	(2,808.24)	$	(2,759.81)	$	1,555.97	$	48.43
NPV@10	($24,495.49)		($25,283.91)			IRR		2.97%
NPV@15	($15,660.38)		($16,553.59)					
NPV@20	($11,254.04)		($12,177.24)					

Economic Analysis:

When a 30 second distribution time is used to calculate the cost of obtaining a controlled substance from the machine,

the Med-Dispense option has a payback period of 28 months. However, the internal rate of return (IRR) of the option is low at around 3%. Although the Med dispense system has a relatively long payback period, and relatively low IRR, the net present value (NPV) of the Med-Dispense option only costs about 3% more than the current system (it is coincidence that IRR and the percentage difference of NPV are similar). Based on these factors, I believe that the alternatives are equal.

I believe that the Med-Dispense system to distribute controlled substances should be implemented if the times associated with processes follow conditions of this sensitivity analysis. However, implementation of this system will be difficult. This is because this system will require all the controlled substances to be purchased from only one pharmacy. Currently, about half the residents are getting medications from HyVee and half are getting medications through Coborns. A switch requiring half the residents to get only controlled substances from a different pharmacy, while maintaining their current pharmacy for other drugs may be difficult and may require a lot of administrative work and communication between pharmacies, the residents, and the billing department. I am unsure of the effort or feasibility required to do this, and this factor needs to be taken into consideration before a switch to this system would be made.

Sensitivity Analysis 2: Time decrease of counting the controlled substance book to 3 minutes

Summary of Costs:

Monthly Cost	Current System	Med Dispense ADS
Controlled Substances flushed per month	$ 650.00	$ -
Ordering of Controlled Substances	$ 116.59	$ 34.71
Distribution of Controlled Substances	$ 636.01	$ 358.65
Managing Controlled Substance Book	$ 699.10	$ -
Cost of Med Dispense Units	$ -	$ 2,376.00
TOTAL MONTLY COSTS	$ 2,101.70	$ 2,769.36
Yearly Cost		
Hazardous Waste Management	$ 110.00	$ -
One Time Cost		
Instillation of Med Dispense	$ -	$ 750.00
Shipping of Med Dispense	$ -	$ 600.00

Cash Flow:

Month	Current System	Med Dispense ADS	Payback	IRR	Discount Rate
0	0	$ (1,350.00)	$ (1,350.00)	$ (1,350.00)	10%
1	$ (2,101.70)	$ (2,769.36)	$ (2,017.66)	$ (667.66)	15%
2	$ (2,101.70)	$ (2,769.36)	$ (2,685.32)	$ (667.66)	20%
3	$ (2,101.70)	$ (2,769.36)	$ (3,352.97)	$ (667.66)	
4	$ (2,101.70)	$ (2,769.36)	$ (4,020.63)	$ (667.66)	
5	$ (2,101.70)	$ (2,769.36)	$ (4,688.29)	$ (667.66)	
6	$ (2,101.70)	$ (2,769.36)	$ (5,355.95)	$ (667.66)	
7	$ (2,101.70)	$ (2,769.36)	$ (6,023.61)	$ (667.66)	

8	$	(2,101.70)	$	(2,769.36)	$	(6,691.26)	$	(667.66)
9	$	(2,101.70)	$	(2,769.36)	$	(7,358.92)	$	(667.66)
10	$	(2,101.70)	$	(2,769.36)	$	(8,026.58)	$	(667.66)
11	$	(2,101.70)	$	(2,769.36)	$	(8,694.24)	$	(667.66)
12	$	(2,211.70)	$	(2,769.36)	$	(9,251.90)	$	(557.66)
13	$	(2,101.70)	$	(2,769.36)	$	(9,919.55)	$	(667.66)
14	$	(2,101.70)	$	(2,769.36)	$	(10,587.21)	$	(667.66)
15	$	(2,101.70)	$	(2,769.36)	$	(11,254.87)	$	(667.66)
16	$	(2,101.70)	$	(2,769.36)	$	(11,922.53)	$	(667.66)
17	$	(2,101.70)	$	(2,769.36)	$	(12,590.19)	$	(667.66)
18	$	(2,101.70)	$	(2,769.36)	$	(13,257.84)	$	(667.66)
19	$	(2,101.70)	$	(2,769.36)	$	(13,925.50)	$	(667.66)
20	$	(2,101.70)	$	(2,769.36)	$	(14,593.16)	$	(667.66)
21	$	(2,101.70)	$	(2,769.36)	$	(15,260.82)	$	(667.66)
22	$	(2,101.70)	$	(2,769.36)	$	(15,928.48)	$	(667.66)
23	$	(2,101.70)	$	(2,769.36)	$	(16,596.13)	$	(667.66)
24	$	(2,211.70)	$	(2,769.36)	$	(17,153.79)	$	(557.66)
25	$	(2,101.70)	$	(2,769.36)	$	(17,821.45)	$	(667.66)
26	$	(2,101.70)	$	(2,769.36)	$	(18,489.11)	$	(667.66)
27	$	(2,101.70)	$	(2,769.36)	$	(19,156.77)	$	(667.66)
28	$	(2,101.70)	$	(2,769.36)	$	(19,824.43)	$	(667.66)
29	$	(2,101.70)	$	(2,769.36)	$	(20,492.08)	$	(667.66)
30	$	(2,101.70)	$	(2,769.36)	$	(21,159.74)	$	(667.66)
31	$	(2,101.70)	$	(2,769.36)	$	(21,827.40)	$	(667.66)
32	$	(2,101.70)	$	(2,769.36)	$	(22,495.06)	$	(667.66)
33	$	(2,101.70)	$	(2,769.36)	$	(23,162.72)	$	(667.66)
34	$	(2,101.70)	$	(2,769.36)	$	(23,830.37)	$	(667.66)
35	$	(2,101.70)	$	(2,769.36)	$	(24,498.03)	$	(667.66)
36	$	(2,211.70)	$	(2,769.36)	$	(25,055.69)	$	(557.66)
37	$	(2,101.70)	$	(2,769.36)	$	(25,723.35)	$	(667.66)
38	$	(2,101.70)	$	(2,769.36)	$	(26,391.01)	$	(667.66)
39	$	(2,101.70)	$	(2,769.36)	$	(27,058.66)	$	(667.66)
40	$	(2,101.70)	$	(2,769.36)	$	(27,726.32)	$	(667.66)
41	$	(2,101.70)	$	(2,769.36)	$	(28,393.98)	$	(667.66)
42	$	(2,101.70)	$	(2,769.36)	$	(29,061.64)	$	(667.66)
43	$	(2,101.70)	$	(2,769.36)	$	(29,729.30)	$	(667.66)
44	$	(2,101.70)	$	(2,769.36)	$	(30,396.95)	$	(667.66)
45	$	(2,101.70)	$	(2,769.36)	$	(31,064.61)	$	(667.66)
46	$	(2,101.70)	$	(2,769.36)	$	(31,732.27)	$	(667.66)
47	$	(2,101.70)	$	(2,769.36)	$	(32,399.93)	$	(667.66)
48	$	(2,211.70)	$	(2,769.36)	$	(32,957.59)	$	(557.66)
49	$	(2,101.70)	$	(2,769.36)	$	(33,625.24)	$	(667.66)
50	$	(2,101.70)	$	(2,769.36)	$	(34,292.90)	$	(667.66)
51	$	(2,101.70)	$	(2,769.36)	$	(34,960.56)	$	(667.66)

52	$	(2,101.70)	$	(2,769.36)	$ (35,628.22)	$	(667.66)
53	$	(2,101.70)	$	(2,769.36)	$ (36,295.88)	$	(667.66)
54	$	(2,101.70)	$	(2,769.36)	$ (36,963.53)	$	(667.66)
55	$	(2,101.70)	$	(2,769.36)	$ (37,631.19)	$	(667.66)
56	$	(2,101.70)	$	(2,769.36)	$ (38,298.85)	$	(667.66)
57	$	(2,101.70)	$	(2,769.36)	$ (38,966.51)	$	(667.66)
58	$	(2,101.70)	$	(2,769.36)	$ (39,634.17)	$	(667.66)
59	$	(2,101.70)	$	(2,769.36)	$ (40,301.82)	$	(667.66)
60	$	(2,211.70)	$	(2,769.36)	$ (40,859.48)	$	(557.66)
NPV@10	($19,090.22)		($26,320.56)				
NPV@15	($12,202.97)		($17,224.50)				
NPV@20	($8,768.50)		($12,663.78)				

Economic Analysis:
A reduction in the average time dedicated to management of the controlled substance book represents a model of the current system if time for management of the controlled substance book on neighborhood two is reduced to three minutes. A decrease in the management of the book greatly impacts the favorability of the two alternatives. Using this model, use of the Med Dispense machines becomes much more expensive than the current system, about $7,000 more at a discount rate of 10%. The Med Dispense system would not only inquire an initial capital investment, but it would be more costly per month as well. This means that the ADS alternative would never break even, and should not be seen as an economically favorable option. However, as previously stated, the increased technological safeguards the Med-Dispense has may justify the additional cost of the ADS.

Sensitivity Analysis 3: Time decrease of counting the controlled substance book to 3 minutes and a reduction in ADS distributing time to 30 seconds

Summary of Costs:

Monthly Cost	**Current System**	**Med Dispense ADS**
Controlled Substances flushed per month	$ 650.00	$ -
Ordering of Controlled Substances	$ 116.59	$ 34.71
Distribution of Controlled Substances	$ 636.01	$ 239.10
Managing Controlled Substance Book	$ 699.10	$ -
Cost of Med Dispense Units	$ -	$ 2,376.00
TOTAL MONTLY COSTS	$ 2,101.70	$ 2,649.81
Yearly Cost		
Hazardous Waste Management	$ 110.00	$ -
One Time Cost		
Instillation of Med Dispense	$ -	$ 750.00
Shipping of Med Dispense	$ -	$ 600.00

Cash Flow:

Month	Current System	Med Dispense ADS	Payback	IRR	Discount Rate
0	0	$ (1,350.00)	$ (1,350.00)	$ (1,350.00)	10%
1	$ (2,101.70)	$ (2,649.81)	$ (1,898.11)	$ (548.11)	15%
2	$ (2,101.70)	$ (2,649.81)	$ (2,446.21)	$ (548.11)	20%
3	$ (2,101.70)	$ (2,649.81)	$ (2,994.32)	$ (548.11)	
4	$ (2,101.70)	$ (2,649.81)	$ (3,542.43)	$ (548.11)	
5	$ (2,101.70)	$ (2,649.81)	$ (4,090.53)	$ (548.11)	
6	$ (2,101.70)	$ (2,649.81)	$ (4,638.64)	$ (548.11)	
7	$ (2,101.70)	$ (2,649.81)	$ (5,186.75)	$ (548.11)	
8	$ (2,101.70)	$ (2,649.81)	$ (5,734.85)	$ (548.11)	
9	$ (2,101.70)	$ (2,649.81)	$ (6,282.96)	$ (548.11)	
10	$ (2,101.70)	$ (2,649.81)	$ (6,831.07)	$ (548.11)	
11	$ (2,101.70)	$ (2,649.81)	$ (7,379.17)	$ (548.11)	
12	$ (2,101.70)	$ (2,759.81)	$ (8,037.28)	$ (658.11)	
13	$ (2,101.70)	$ (2,649.81)	$ (8,585.39)	$ (548.11)	
14	$ (2,101.70)	$ (2,649.81)	$ (9,133.50)	$ (548.11)	
15	$ (2,101.70)	$ (2,649.81)	$ (9,681.60)	$ (548.11)	
16	$ (2,101.70)	$ (2,649.81)	$ (10,229.71)	$ (548.11)	
17	$ (2,101.70)	$ (2,649.81)	$ (10,777.82)	$ (548.11)	
18	$ (2,101.70)	$ (2,649.81)	$ (11,325.92)	$ (548.11)	
19	$ (2,101.70)	$ (2,649.81)	$ (11,874.03)	$ (548.11)	
20	$ (2,101.70)	$ (2,649.81)	$ (12,422.14)	$ (548.11)	
21	$ (2,101.70)	$ (2,649.81)	$ (12,970.24)	$ (548.11)	
22	$ (2,101.70)	$ (2,649.81)	$ (13,518.35)	$ (548.11)	
23	$ (2,101.70)	$ (2,649.81)	$ (14,066.46)	$ (548.11)	
24	$ (2,101.70)	$ (2,759.81)	$ (14,724.56)	$ (658.11)	
25	$ (2,101.70)	$ (2,649.81)	$ (15,272.67)	$ (548.11)	
26	$ (2,101.70)	$ (2,649.81)	$ (15,820.78)	$ (548.11)	
27	$ (2,101.70)	$ (2,649.81)	$ (16,368.88)	$ (548.11)	
28	$ (2,101.70)	$ (2,649.81)	$ (16,916.99)	$ (548.11)	
29	$ (2,101.70)	$ (2,649.81)	$ (17,465.10)	$ (548.11)	
30	$ (2,101.70)	$ (2,649.81)	$ (18,013.20)	$ (548.11)	
31	$ (2,101.70)	$ (2,649.81)	$ (18,561.31)	$ (548.11)	
32	$ (2,101.70)	$ (2,649.81)	$ (19,109.42)	$ (548.11)	
33	$ (2,101.70)	$ (2,649.81)	$ (19,657.52)	$ (548.11)	
34	$ (2,101.70)	$ (2,649.81)	$ (20,205.63)	$ (548.11)	
35	$ (2,101.70)	$ (2,649.81)	$ (20,753.74)	$ (548.11)	
36	$ (2,101.70)	$ (2,759.81)	$ (21,411.85)	$ (658.11)	
37	$ (2,101.70)	$ (2,649.81)	$ (21,959.95)	$ (548.11)	
38	$ (2,101.70)	$ (2,649.81)	$ (22,508.06)	$ (548.11)	
39	$ (2,101.70)	$ (2,649.81)	$ (23,056.17)	$ (548.11)	
40	$ (2,101.70)	$ (2,649.81)	$ (23,604.27)	$ (548.11)	
41	$ (2,101.70)	$ (2,649.81)	$ (24,152.38)	$ (548.11)	

42	$	(2,101.70)	$	(2,649.81)	$ (24,700.49)	$	(548.11)
43	$	(2,101.70)	$	(2,649.81)	$ (25,248.59)	$	(548.11)
44	$	(2,101.70)	$	(2,649.81)	$ (25,796.70)	$	(548.11)
45	$	(2,101.70)	$	(2,649.81)	$ (26,344.81)	$	(548.11)
46	$	(2,101.70)	$	(2,649.81)	$ (26,892.91)	$	(548.11)
47	$	(2,101.70)	$	(2,649.81)	$ (27,441.02)	$	(548.11)
48	$	(2,101.70)	$	(2,759.81)	$ (28,099.13)	$	(658.11)
49	$	(2,101.70)	$	(2,649.81)	$ (28,647.23)	$	(548.11)
50	$	(2,101.70)	$	(2,649.81)	$ (29,195.34)	$	(548.11)
51	$	(2,101.70)	$	(2,649.81)	$ (29,743.45)	$	(548.11)
52	$	(2,101.70)	$	(2,649.81)	$ (30,291.55)	$	(548.11)
53	$	(2,101.70)	$	(2,649.81)	$ (30,839.66)	$	(548.11)
54	$	(2,101.70)	$	(2,649.81)	$ (31,387.77)	$	(548.11)
55	$	(2,101.70)	$	(2,649.81)	$ (31,935.87)	$	(548.11)
56	$	(2,101.70)	$	(2,649.81)	$ (32,483.98)	$	(548.11)
57	$	(2,101.70)	$	(2,649.81)	$ (33,032.09)	$	(548.11)
58	$	(2,101.70)	$	(2,649.81)	$ (33,580.20)	$	(548.11)
59	$	(2,101.70)	$	(2,649.81)	$ (34,128.30)	$	(548.11)
60	$	(2,101.70)	$	(2,759.81)	$ (34,786.41)	$	(658.11)
NPV@10	($19,043.61)		($25,283.91)				
NPV@15	($12,180.98)		($16,553.59)				
NPV@20	($8,756.92)		($12,177.24)				

Economic Analysis:

The cost savings resulting from assuming an ADS 30 second controlled substance distribution time are less than the cost savings from assuming a 3 minute time of counting the controlled substance book. At a 10% discount rate, the reduction in distribution time of controlled substances saves only about 1,000 dollars over five years. Therefore, this scenario differs little than Sensitivity Analysis 2. Even under these conditions, choosing the Med-Dispense machine may not only be justified, but may be viewed as a better option because of the technological controls it has.

Appendix E: Talyst InSite to administer controlled substances for the entire facility

Calculation of Cots – Oral tablets for entire facility using medication carts:

Cost (AWP) of Narcotics flushed per month

650

Cost of ordering controlled substances								
Blister packs (QD) ordered monthly neighborhood 1	Blister packs (QD) ordered monthly neighborhood 2	Blister packs (QD) ordered monthly neighborhood 3	Blister packs (PRN) ordered month neighborhood 1	Blister packs (PRN) ordered month neighborhood 2	Blister packs (PRN) ordered month neighborhood 3	Time to order blister pack(mins)	Time to put away controlled substances (mins)	**Cost of ordering controlled substances per month**
14	25	6	11.3	3.66	3.44	5	2	**114.95**
Data gathered from June's medical records. Times are based upon time studies performed. Blister packs ordered per month (PRN) are estimated based upon usage and the number of medications (30) that a blister pack holds.								

Cost of distributing controlled substance

Time to distribute controlled substance (mins)	Use of controlled substances (QD) neighborhood 1	Use of controlled substances (QD) neighborhood 2	Use of controlled substances (QD) neighborhood 3	Use of controlled substances (PRN) neighborhood 1	Use of controlled substances (PRN) neighborhood 2	Use of controlled substances (PRN) neighborhood 3	Use of controlled substances (QD & PRN) entire facility	**Cost of distributing narcotics per month**
1.33	420	750	180	312	95.00	89	1846	**636.01**
Data gathered from June's medical records.								

Cost of controlled substance book management

Time counting book neighborhood 1 W. Wing (mins)	Time counting book neighborhood 1 N. Wing (mins)	Time counting book neighborhood 2 W. Wing (mins)	Time counting book neighborhood 2 N. Wing (mins)	Time counting book neighborhood 3 (mins)	Average total time counting the narcotic book	Number of times books are counted per month	Number of nurses counting the narcotic book	**Cost of counting the narcotic book per month**
3	3.25	3.00	16.00	2.54	27.79	90.00	2.00	**1295.64**
Times are based on time study observations. Neighbood 2 N. Wing time is so much larger than the other because controlled substances for a resident are stored in bottles not blister packs.								

Cost (AWP) of pharmaceutical waste

Number of non controlled, non Medicare oral tabs thrown per month	**Cost of Pharmaceuticals (AWP) disposed from normal use per month**
1061	**$1507**
Costs based upon average whole sale prices (AWP) found in the Redbook. These costs were multiplied by the ratio of returned medicines for non-Medicare unused tablets to unused tablets for the entire facility.	

Cost of distributing non controlled substances (QD)

Non Controlled oral tabs given per day neighborhood 1	Non Controlled oral tabs given per day neighborhood 2	Non Controlled oral tabs given per day neighborhood 3	Non Controlled oral tabs given per day	Time to find and punch med out of blister pack	**Cost of finding and giving non-controlled substance per month**
360.493	407.563	249.72	1017.776	0.54	**$ 4,270**
Number of tablets given were found from June's Medical record. A daily quantity of tablets that were to be given less than once every day was found by dividing the amount given per week by 7. Example: if a pill were to be taken once a week it would be counted as 1/7 or 0.14					

Cost of distributing non controlled substances (PRN)

PRN oral tabs given per day	Nursing time to walk to Med Cart (roundtrip)	Time to find and punch med out of blister pack	**Cost of giving PRNs per month**
47	2	0.54	**618.3884**
Assumes that half the residents take PRN medications per day.			

Cost of ordering non controlled substance per month

Time to order non controlled substances per month neighborhood 1 (hrs)	Time to order non controlled substances per month neighborhood 1 (hrs)	Time to order non controlled substances per month neighborhood 1 (hrs)	**Total Cost of ordering a non controlled substance per month**
6.4	6.4	3.2	**$ 248.64**
Assumes that one nurse takes 16 hours to prepare and order medicines (conservative estimate).			

Cost of ordering non controlled substance per month

Time spent putting meds away (hrs), neighborhood 1	Time spent putting meds away (hrs), neighborhood 2	Time spent putting meds away (hrs), neighborhood 3	People	Number of errors from changing meds over	Time spent trying to fix error (hrs)	Hourly wage of someone putting meds away	**Cost of exchanging 30 day supply of meds per month**
2	2	1.5	3	25	0.25	15.54	**$ 353.54**
Continuation of table from above. Times based upon time study data. Errors were captured during time study data. More errors occurred later, but a specific amount could not be captured							

Calculation of Cots – Oral Tabs for entire facility using Talyst InSite

Ordering controlled substances

Ordering of narcotics: neighborhood 1	Ordering of narcotics: neighborhood 2	Ordering of narcotics: neighborhood 3	Time to order narcotic prescription (mins)	Average time to put away narcotics (mins)	**Cost of ordering Narcotics per Month**
5	5	5	5	0	**19.43**
Theoretically no medicines should ever have to be ordered. This assumes a worst case scenario that the machine would run out of					

controlled substance every other day and a call would need to be placed to the pharmacy

Cost of making a controlled substance med pass

Time to make a controlled substance med pass (QD) mins	Time to walk to machine, round trip (mins)	Number of med passes per wing	Number of wings of the building	Total number of narcotic med passes per day	**Cost of making narcotic med passes (QD) per month**
5	4	3	5	15	**1048.95**
Time to make a controlled substance med pass is conservatively estimated. Time to walk to the machine is the estimated time to walk to a centrally located machine. Other values are found based on observations					

Distribution of controlled substances (PRN)

Average monthly use of Narcotics (PRN) neighborhod 1	Average monthly use of Narcotics (PRN) neighborhod 2	Average monthly use of Narcotics (PRN) neighborhod 3	Number of trips to machine per month for PRN use	Time to walk to machine, ruond trip (mins)	Time to use the machine	**Cost of distributing narcotics per month**
312.28	95.00	89.06	496.34	4	1	**642.76**
Drug use is found based on June's medical records. Time to use the machine is conservatively estimated. The model assumes that only one controlled substance would be taken per trip to the machine. This provides the most conservative estimate.						

Cost of making a non controlled substance med pass

Time to make a non controlled substance Med Pass	Time to walk to machine, round trip (mins)	Number of med passes per wing per day	Number of wings of the building	Total number of med passes per day	Cost of making non controlled substance med pass per month
10	3	3	5	15	**1515.15**
Time to make the med pass is conservatively estimated.					

Distribution of non controlled substance per month (PRN)

Number of PRN meds given per day	Time to walk to machine, round trip (mins)	Time to use machine	Hourly nursing wage	Cost of giving non controlled PRN per month
47.00	4	1.00	15.54	**1460.76**
Assumes that 1 out of 2 residents are taking a PRN medication per day				

Cash Flow:

Month	**Current System**	**Talyst InSite**	**Payback**	Discount Rate
0	0	$ (9,250.00)	$ (9,250.00)	10%
1	$ (9,696.06)	$ (8,165.89)	$ (7,719.83)	15%
2	$ (9,696.06)	$ (8,165.89)	$ (6,189.65)	20%
3	$ (9,696.06)	$ (8,165.89)	$ (4,659.48)	

4	$	(9,696.06)	$	(8,165.89)	$	(3,129.31)
5	$	(9,696.06)	$	(8,165.89)	$	(1,599.14)
6	$	(9,696.06)	$	(8,165.89)	$	(68.96)
7	$	(9,696.06)	$	(8,165.89)	$	1,461.75
8	$	(9,696.06)	$	(8,165.89)	$	2,991.38
9	$	(9,696.06)	$	(8,165.89)	$	4,521.55
10	$	(9,696.06)	$	(8,165.89)	$	6,051.73
11	$	(9,696.06)	$	(8,165.89)	$	7,581.90
12	$	(9,806.06)	$	(8,165.89)	$	9,222.07
13	$	(9,696.06)	$	(8,165.89)	$	10,752.24
14	$	(9,696.06)	$	(8,165.89)	$	12,282.42
15	$	(9,696.06)	$	(8,165.89)	$	13,812.59
16	$	(9,696.06)	$	(8,165.89)	$	15,342.76
17	$	(9,696.06)	$	(8,165.89)	$	16,872.93
18	$	(9,696.06)	$	(8,165.89)	$	18,403.11
19	$	(9,696.06)	$	(8,165.89)	$	19,933.28
20	$	(9,696.06)	$	(8,165.89)	$	21,463.45
21	$	(9,696.06)	$	(8,165.89)	$	22,993.62
22	$	(9,696.06)	$	(8,165.89)	$	24,523.80
23	$	(9,696.06)	$	(8,165.89)	$	26,053.97
24	$	(9,806.06)	$	(8,165.89)	$	27,694.14
25	$	(9,696.06)	$	(8,165.89)	$	29,224.31
26	$	(9,696.06)	$	(8,165.89)	$	30,754.49
27	$	(9,696.06)	$	(8,165.89)	$	32,284.66
28	$	(9,696.06)	$	(8,165.89)	$	33,814.83
29	$	(9,696.06)	$	(8,165.89)	$	35,345.01
30	$	(9,696.06)	$	(8,165.89)	$	36,875.18
31	$	(9,696.06)	$	(8,165.89)	$	38,405.35
32	$	(9,696.06)	$	(8,165.89)	$	39,935.52
33	$	(9,696.06)	$	(8,165.89)	$	41,465.70
34	$	(9,696.06)	$	(8,165.89)	$	42,995.87
35	$	(9,696.06)	$	(8,165.89)	$	44,526.04
36	$	(9,806.06)	$	(8,165.89)	$	46,166.21
37	$	(9,696.06)	$	(8,165.89)	$	47,696.39
38	$	(9,696.06)	$	(8,165.89)	$	49,226.56
39	$	(9,696.06)	$	(8,165.89)	$	50,756.73
40	$	(9,696.06)	$	(8,165.89)	$	52,286.90
41	$	(9,696.06)	$	(8,165.89)	$	53,817.08
42	$	(9,696.06)	$	(8,165.89)	$	55,347.25
43	$	(9,696.06)	$	(8,165.89)	$	56,877.42
44	$	(9,696.06)	$	(8,165.89)	$	58,407.59
45	$	(9,696.06)	$	(8,165.89)	$	59,937.77
46	$	(9,696.06)	$	(8,165.89)	$	61,467.94
47	$	(9,696.06)	$	(8,165.89)	$	62,998.11

48	$	(9,806.06)	$	(8,165.89)	$	64,638.28
49	$	(9,696.06)	$	(8,165.89)	$	66,168.46
50	$	(9,696.06)	$	(8,165.89)	$	67,698.63
51	$	(9,696.06)	$	(8,165.89)	$	69,228.80
52	$	(9,696.06)	$	(8,165.89)	$	70,758.97
53	$	(9,696.06)	$	(8,165.89)	$	72,289.15
54	$	(9,696.06)	$	(8,165.89)	$	73,819.32
55	$	(9,696.06)	$	(8,165.89)	$	75,349.49
56	$	(9,696.06)	$	(8,165.89)	$	76,879.66
57	$	(9,696.06)	$	(8,165.89)	$	78,409.84
58	$	(9,696.06)	$	(8,165.89)	$	79,940.01
59	$	(9,696.06)	$	(8,165.89)	$	81,470.18
60	$	(9,806.06)	$	(8,165.89)	$	83,110.36
NPV @ 10		($87,903.09)		($82,400.60)		IRR = 17%
NPV @ 15		($56,218.19)		($55,371.14)		
NPV @ 20		($40,411.10)		($41,732.25)		

Sensitivity Analysis 1: Increase in PRN medication distributed

Summary of Costs:

Monthly Cost	**Current System**	**Talyst InSite**
Controlled Substances flushed per month	$ 650.00	$ -
Ordering of Controlled Substances	$ 116.59	$ 19.43
Distribution of Controlled Substances	$ 636.01	$ 1,048.95
Managing Controlled Substance Book	$ 1,295.64	$ -
Cost of pharmaceuticals disposed of per month	$ 1,506.87	$ -
Cost of distributing non-controlled substance per month	$ 4,270.38	$ 1,515.15
Cost of giving non controlled PRNs per month	$ 618.39	$ 2,921.52
Ordering a non controlled substance per month	$ 248.64	$ 38.85
Cost of exchanging 30 day supply of meds per month	$ 353.54	
Cost per month of Talyst system	$ -	$ 3,500.00
TOTAL MONTLY COSTS	$ 9,696.06	$ 9,043.90
Yearly Cost		
Hazardous Waste Management	$ 110.00	$ -
One Time Cost		
Installation, Training, Shipping	$ -	$ 9,250.00
Shipping of Med Dispense	$ -	-

Cash Flow:

Month	Current System	Talyst InSite	Payback	Discount Rate
0	0	$ (9,250.00)	$ (9,250.00)	10%
1	$ (9,696.06)	$ (9,043.90)	$ (8,597.84)	15%
2	$ (9,696.06)	$ (9,043.90)	$ (7,945.67)	20%
3	$ (9,696.06)	$ (9,043.90)	$ (7,293.51)	
4	$ (9,696.06)	$ (9,043.90)	$ (6,641.35)	
5	$ (9,696.06)	$ (9,043.90)	$ (5,989.19)	
6	$ (9,696.06)	$ (9,043.90)	$ (5,337.02)	
7	$ (9,696.06)	$ (9,043.90)	$ (4,684.86)	
8	$ (9,696.06)	$ (9,043.90)	$ (4,032.70)	
9	$ (9,696.06)	$ (9,043.90)	$ (3,380.54)	
10	$ (9,696.06)	$ (9,043.90)	$ (2,728.37)	
11	$ (9,696.06)	$ (9,043.90)	$ (2,076.21)	
12	$ (9,806.06)	$ (9,043.90)	$ (1,314.05)	
13	$ (9,696.06)	$ (9,043.90)	$ (661.89)	
14	$ (9,696.06)	$ (9,043.90)	$ (9.72)	
15	$ (9,696.06)	$ (9,043.90)	$ 642.44	
16	$ (9,696.06)	$ (9,043.90)	$ 1,294.60	
17	$ (9,696.06)	$ (9,043.90)	$ 1,946.76	
18	$ (9,696.06)	$ (9,043.90)	$ 2,598.93	
19	$ (9,696.06)	$ (9,043.90)	$ 3,251.09	
20	$ (9,696.06)	$ (9,043.90)	$ 3,903.25	
21	$ (9,696.06)	$ (9,043.90)	$ 4,555.41	
22	$ (9,696.06)	$ (9,043.90)	$ 5,207.58	
23	$ (9,696.06)	$ (9,043.90)	$ 5,859.74	
24	$ (9,806.06)	$ (9,043.90)	$ 6,621.90	
25	$ (9,696.06)	$ (9,043.90)	$ 7,274.06	
26	$ (9,696.06)	$ (9,043.90)	$ 7,926.23	
27	$ (9,696.06)	$ (9,043.90)	$ 8,578.39	
28	$ (9,696.06)	$ (9,043.90)	$ 9,230.55	
29	$ (9,696.06)	$ (9,043.90)	$ 9,882.72	
30	$ (9,696.06)	$ (9,043.90)	$ 10,534.88	
31	$ (9,696.06)	$ (9,043.90)	$ 11,187.04	
32	$ (9,696.06)	$ (9,043.90)	$ 11,839.20	
33	$ (9,696.06)	$ (9,043.90)	$ 12,491.37	
34	$ (9,696.06)	$ (9,043.90)	$ 13,143.53	
35	$ (9,696.06)	$ (9,043.90)	$ 13,795.69	
36	$ (9,806.06)	$ (9,043.90)	$ 14,557.85	
37	$ (9,696.06)	$ (9,043.90)	$ 15,210.02	

38	$	(9,696.06)	$	(9,043.90)	$	15,862.18
39	$	(9,696.06)	$	(9,043.90)	$	16,514.34
40	$	(9,696.06)	$	(9,043.90)	$	17,166.50
41	$	(9,696.06)	$	(9,043.90)	$	17,818.67
42	$	(9,696.06)	$	(9,043.90)	$	18,470.83
43	$	(9,696.06)	$	(9,043.90)	$	19,122.99
44	$	(9,696.06)	$	(9,043.90)	$	19,775.15
45	$	(9,696.06)	$	(9,043.90)	$	20,427.32
46	$	(9,696.06)	$	(9,043.90)	$	21,079.48
47	$	(9,696.06)	$	(9,043.90)	$	21,731.64
48	$	(9,806.06)	$	(9,043.90)	$	22,493.80
49	$	(9,696.06)	$	(9,043.90)	$	23,145.97
50	$	(9,696.06)	$	(9,043.90)	$	23,798.13
51	$	(9,696.06)	$	(9,043.90)	$	24,450.29
52	$	(9,696.06)	$	(9,043.90)	$	25,102.45
53	$	(9,696.06)	$	(9,043.90)	$	25,754.62
54	$	(9,696.06)	$	(9,043.90)	$	26,406.78
55	$	(9,696.06)	$	(9,043.90)	$	27,058.94
56	$	(9,696.06)	$	(9,043.90)	$	27,711.10
57	$	(9,696.06)	$	(9,043.90)	$	28,363.27
58	$	(9,696.06)	$	(9,043.90)	$	29,015.43
59	$	(9,696.06)	$	(9,043.90)	$	29,667.59
60	$	(9,806.06)	$	(9,043.90)	$	30,429.76
NPV @ 10		($87,903.09)		($90,356.29)		7%
NPV @ 15		($56,218.19)		($60,459.90)		
NPV @ 20		($40,411.10)		($45,390.56)		

Economic Analysis:

The cost associated with obtaining PRN medication from the machine is a sensitive factor in the Talyst cost analysis that has the most ability to increase or decrease the favorability of the InSite option. The majority of this cost comes from the time it takes for a nurse walking to the machine and the number of trips taken to the machine per day. Multiple factors can affect the frequency of trips such as how many PRN medications that the resident is taking. If the resident is taking many common PRN meds such as Senna or Aspirin, these pharmaceuticals could be kept on a nursing cart in each neighborhood. This would decrease the amount of trips to the Insite. Consequently, nursing time would be reduced, decreasing the cost of the InSite option. However, if a resident is taking many controlled substances PRN medications for pain, the cost associated with having to routinely retrieve these meds from a centrally located machine would increase the cost of the system significantly and decrease its economic favorability.

To perform a conservative cost analysis, I created a model where each resident would receive one PRN substance from the machine per day. Although I believe this is unrealistic, I created this to test the sensitivity of the factor. With this assumption, the InSite has a payback period of about 14 months, however, yet has an IRR of only 7%, and a lower net present value than the current system at a 10% discount rate. The payback period is relatively short, but the relatively low IRR resulting from the large initial investment signals a decrease in economic favorability of the InSite. However, I believe that the payback period of 14 months is small enough that it can be a more important indicator of the economic

favorability of the InSite than the IRR. Even given the extra costs of an improbable PRN cost, I believe the InSite should still be chosen over the current system.

Sensitivity Analysis 2: Increase in cost of the machine

Month	Current System	Talyst InSite	Payback
0	0	$ (9,250.00)	$ (9,250.00)
1	$ (9,696.06)	$ (10,315.89)	$ (9,869.83)
2	$ (9,696.06)	$ (10,315.89)	$ (10,489.65)
3	$ (9,696.06)	$ (10,315.89)	$ (11,109.48)
4	$ (9,696.06)	$ (10,315.89)	$ (11,729.31)
5	$ (9,696.06)	$ (10,315.89)	$ (12,349.14)
6	$ (9,696.06)	$ (10,315.89)	$ (12,968.96)
7	$ (9,696.06)	$ (10,315.89)	$ (13,588.79)
8	$ (9,696.06)	$ (10,315.89)	$ (14,208.62)
9	$ (9,696.06)	$ (10,315.89)	$ (14,828.45)
10	$ (9,696.06)	$ (10,315.89)	$ (15,448.27)
11	$ (9,696.06)	$ (10,315.89)	$ (16,068.10)
12	$ (9,806.06)	$ (10,315.89)	$ (16,577.93)
13	$ (9,696.06)	$ (10,315.89)	$ (17,197.76)
14	$ (9,696.06)	$ (10,315.89)	$ (17,817.58)
15	$ (9,696.06)	$ (10,315.89)	$ (18,437.41)
16	$ (9,696.06)	$ (10,315.89)	$ (19,057.24)
17	$ (9,696.06)	$ (10,315.89)	$ (19,677.07)
18	$ (9,696.06)	$ (10,315.89)	$ (20,296.89)
19	$ (9,696.06)	$ (10,315.89)	$ (20,916.72)
20	$ (9,696.06)	$ (10,315.89)	$ (21,536.55)
21	$ (9,696.06)	$ (10,315.89)	$ (22,156.38)
22	$ (9,696.06)	$ (10,315.89)	$ (22,776.20)
23	$ (9,696.06)	$ (10,315.89)	$ (23,396.03)
24	$ (9,806.06)	$ (10,315.89)	$ (23,905.86)
25	$ (9,696.06)	$ (10,315.89)	$ (24,525.69)
26	$ (9,696.06)	$ (10,315.89)	$ (25,145.51)
27	$ (9,696.06)	$ (10,315.89)	$ (25,765.34)
28	$ (9,696.06)	$ (10,315.89)	$ (26,385.17)
29	$ (9,696.06)	$ (10,315.89)	$ (27,004.99)
30	$ (9,696.06)	$ (10,315.89)	$ (27,624.82)
31	$ (9,696.06)	$ (10,315.89)	$ (28,244.65)
32	$ (9,696.06)	$ (10,315.89)	$ (28,864.48)
33	$ (9,696.06)	$ (10,315.89)	$ (29,484.30)
34	$ (9,696.06)	$ (10,315.89)	$ (30,104.13)
35	$ (9,696.06)	$ (10,315.89)	$ (30,723.96)
36	$ (9,806.06)	$ (10,315.89)	$ (31,233.79)

37	$ (9,696.06)	$ (10,315.89)	$ (31,853.61)
38	$ (9,696.06)	$ (10,315.89)	$ (32,473.44)
39	$ (9,696.06)	$ (10,315.89)	$ (33,093.27)
40	$ (9,696.06)	$ (10,315.89)	$ (33,713.10)
41	$ (9,696.06)	$ (10,315.89)	$ (34,332.92)
42	$ (9,696.06)	$ (10,315.89)	$ (34,952.75)
43	$ (9,696.06)	$ (10,315.89)	$ (35,572.58)
44	$ (9,696.06)	$ (10,315.89)	$ (36,192.41)
45	$ (9,696.06)	$ (10,315.89)	$ (36,812.23)
46	$ (9,696.06)	$ (10,315.89)	$ (37,432.06)
47	$ (9,696.06)	$ (10,315.89)	$ (38,051.89)
48	$ (9,806.06)	$ (10,315.89)	$ (38,561.72)
49	$ (9,696.06)	$ (10,315.89)	$ (39,181.54)
50	$ (9,696.06)	$ (10,315.89)	$ (39,801.37)
51	$ (9,696.06)	$ (10,315.89)	$ (40,421.20)
52	$ (9,696.06)	$ (10,315.89)	$ (41,041.03)
53	$ (9,696.06)	$ (10,315.89)	$ (41,660.85)
54	$ (9,696.06)	$ (10,315.89)	$ (42,280.68)
55	$ (9,696.06)	$ (10,315.89)	$ (42,900.51)
56	$ (9,696.06)	$ (10,315.89)	$ (43,520.34)
57	$ (9,696.06)	$ (10,315.89)	$ (44,140.16)
58	$ (9,696.06)	$ (10,315.89)	$ (44,759.99)
59	$ (9,696.06)	$ (10,315.89)	$ (45,379.82)
60	$ (9,806.06)	$ (10,315.89)	$ (45,889.64)
NPV @ 10	($87,903.09)	($101,881.86)	IRR = N/A
NPV @ 15	($56,218.19)	($67,832.07)	
NPV @ 20	($40,411.10)	($50,690.42)	

Economic Analysis:

The original cost analysis was performed assuming that the pharmacy would pay the $2150 technical support of the machine. This was included in the cost analysis because it is very probable that the pharmacy would experience cost savings that would justify the implementation of the machine as well. However, for completeness, a cost analysis should also be performed on the worst case scenario that Oak Hills were to pay for the entire cost of the machine. If this were the case, the InSite would cost the facility about $700 more per month than the current option. However, the added expense of $8400 per year may be justified due to possible medical error reduction, or integration within the culture change model. Although this option may not be economically favorable, it may still be chosen because it would allow nurses to spend more face time with the residents, and reduce the stress associated with the current frantic and verbal communication intensive medication ordering process.

Appendix F: Equipment Costs

Table B. Equipment Costs – Med-Dispense standalone mode

Part description	Lease Price (per month)	Total Price	Total Lease Price (5 year)
Base 45 Unit	$ 452.00	$ 22,316.00	$ 27,120.00
Control Center Access Station	$ 43.00	$ 2,135.00	$ 2,580.00
Technical Support – Base 45	$ 90.00	$ -	$ -
Technical Support – Control Access Station	$ -	$ -	$ -
TOTAL	$585.00	$24,451.00	$29,700

Table C. Equipment Costs –Med-Dispense profile mode

Part description	Lease Price (per month)	Total Price (Purchase all at once)	Total Lease Price (5 year)
Base 45 Unit	$452.00	$22,316.00	$27,120.00
Control Center Access Station	$43.00	$2,135.00	$2,580.00
Technical Support – Base 45	$90.00	N/A	N/A
Profile Interface	$96.00	N/A	N/A
Technical Support -Profile Interface	$110.00	N/A	N/A
Technical Support – Control Access Station	$ -	$ -	$ -
TOTAL	$791.00	$24,451.00	$29,700.00

Table E. Equipment Costs – Talyst InSite

Part description	Lease Price (per month)	Lease price Annual
Instillation, Training & Shipping (one time cost)	$ 9,250.00	$ 9,250.00
Dispensing System - InSite 240	$ 3,500.00	$ 42,000.00
Dispensing System Support	$ 1,500.00	$ 18,000.00
Enterprise Server Support	$ 350.00	$ 4,200.00
Canister Management Support	$ 300.00	$ 4,200.00
TOTAL	$ 5,650.00	$ 68,400.00

Appendix G: Calculation of Costs for Table 2

Calculation of Costs: Pharmaceutical waste for residents without Medicare

Name of Rx	Quantity		Date	Quantity	Reason	Cost per pill	Total
Loratadine 100mg	100	pill	2/7/2009	15	medication discontinued		0
Seroquel 25mg	25	pill	2/20/2009	4	medication discontinued	2.579333333	10.3173333
Seroquel 100mg	100	pill	2/20/2009	30	medication discontinued	4.426	132.78
Lexapro 10mg	10	pill	2/25/2009	2	medication discontinued	3.2387	6.4774
Lexapro 10mg	10	pill	2/25/2009	7	medication discontinued	3.2387	22.6709
Trazadone 50mg	50	pill	2/26/2009	12	doesage changed		0
Gabapentin 100mg		pill	3/2/2009	20	medication discontinued	0.5369	
Fluoexetine HCh		pill	3/5/2009	9	medication discontinued	2.5983	23.3847
Fluoextine		pill	3/5/2009	9	medication discontinued	2.5983	23.3847
Risperidone		pill	3/5/2009	8	medication	3.893	31.144
Risperidone		pill	3/5/2009	8	medication discontinued	4.214	33.712
Sertraline		pill	3/5/2009	24	medication discontinued	2.682333333	64.376
Sertraline		pill	3/5/2009	24	medication discontinued	2.682333333	64.376
Avapro		pill	3/6/2009	26	dosage changed	1.596333333	41.5046667
Avapro 150mg	150	pill	3/6/2009	26	medication discontinued	1.596333333	41.5046667
Citalompram 10mg	10	pill	3/6/2009	90	medication discontinued	2.456	221.04
Citalopram 20mg	20	pill	3/6/2009	90	dosage changed	3.097	278.73
Furosemide 20mg	20	pill	3/10/2009	23	death	0.0456	1.0488
Metaprolol 100mg		pill	3/10/2009	30	death		0
Omeprazaole 20mg		pill	3/10/2009	47	medication discontinued	4.152666667	195.175333
Seroquel		pill	3/10/2009	8	medication discontinued	2.579333333	20.6346667
Seroquel 25mg	25	pill	3/10/2009	8	medication discontinued	2.579333333	20.6346667
Trazadone 50mg	50	pill	3/10/2009	24	medication discontinued		0
Ocuvit		pill	3/11/2009	30	medication discontinued		0
Levothyrox		pill	3/12/2009	14	dosage decreased	0.2975	4.165

Cephalexin		pill	3/17/2009		13	dosage changed		0
Trazadone 100mg	100	pill	3/17/2009					0
Trazadone 50mg	50	pill	3/17/2009		20	doesage changed		0
Digoxin 125 mcg	125	pill	3/23/2009		54	death	0.2132	11.5128
Metoprololxl 100mg	100	pill	3/23/2009		20	death		0
Ondansetron 4mg	4	pill	3/23/2009		17	death	20	340
Pantoprazole 40mg	40	pill	3/23/2009		21	death	5.605666667	117.719
Warfarin 1mg	1	pill	3/23/2009		10	medication discontinued	0.5834	5.834
Warfarin 2mg	2	pill	3/23/2009		11	medication discontinued	0.6089	6.6979
Amlodipine 5mg	5	pill	3/24/2009		32	death	1.729666667	55.3493333
Humalog		liquid	3/24/2009	10 mL		death		
Nitroglycerin		patch	3/24/2009		28	death		0
Albuterol 5uL		ampule	3/24/2009		29	death		0
Chlorthalidone 25mg	25	pill	3/24/2009		8	death	0.0675	0.54
Citalopram 20mg	20	pill	3/24/2009		12	death	3.097	37.164
Gabapentin 100mg	100	pill	3/24/2009		382	death	0.5369	205.0958
Lasix 40mg	40	pill	3/24/2009		39	death	0.4207	16.4073
Metoprolol 50mg	50	pill	3/24/2009		52	death	0.442	22.984
Prednisone		pill	3/24/2009		3	medication discontinued	0.1943	0.5829
Prilosec 20mg	20	pill	3/24/2009		35	death	5.658333333	198.041667
SPS Susp			3/24/2009			death		0
Terazosin		pill	3/24/2009		32	death	1.61	51.52
Tikosyn		pill	3/24/2009		48	medication discontinued		0
Vitamin E		pill	3/24/2009		34	medication discontinued		0
Trazadone		pill	3/26/2009		6	doesage changed		0
Enablex		pill	3/30/2009		20	medication discontinued	4.647666667	92.9533333
Enablex		pill	3/30/2009		20	medication discontinued	4.647666667	92.9533333
Namenda		pill	3/30/2009		32	med olc'd	3.130166667	100.165333
Namenda		pill	3/30/2009		32	medication discontinued	3.130166667	100.165333
Citalopram 10mg	10	pill	3/31/2009		68	doesage changed	2.456	167.008
Metoprolol		pill	3/31/2009		41	wrong dose	0.442	18.122

Paroxetine 20mg	20	pill	3/31/2009	27	doesage changed	2.665	71.955
Aricept 10mg		pill	4/3/2009	14	medication discontinued	0.434	6.076
Comtan		pill	4/3/2009	63	medication discontinued	3.0724	193.5612
Effexor		pill	4/3/2009	3	medication discontinued	2.42	7.26
Mirapex		pill	4/3/2009	43	medication discontinued	2.986111111	128.402778
Mirtazapine		pill	4/3/2009	27	medication discontinued	1.677666667	45.297
Potassium		pill	4/3/2009	75	medication discontinued		0
Zyprexa		pill	4/3/2009	30	medication discontinued	7.669333333	230.08
Gabapentin 300mg		pill	4/4/2009	109	medication discontinued	1.3418	146.2562
levothyroxine 75mcg		pill	4/4/2009	21	death	0.2975	6.2475
Potassium 10mq		pill	4/4/2009	23	death		0
Torsemide 20mg		pill	4/4/2009	29	death	0.821	23.809
Levothyroxine		pill	4/6/2009	26	medication discontinued	0.2975	7.735
Levotyhroxine		pill	4/6/2009	26	medication discontinued	0.2975	7.735
Atenolol		pill	4/7/2009	9.5	medication discontinued	0.8176	7.7672
Celexa 20mg	20	pill	4/7/2009	28.5	dosage changed	2.711666667	77.2825
Nexium 40mg	40	capsules	4/7/2009	6	medicine change	6.05	36.3
Coumadin 2.5mg	2.5	pill	4/8/2009	11	medication discontinued	1.0728	11.8008
Coumadin 2mg	2	pill	4/8/2009	11	dosage changed	1.0398	11.4378
Coumadin 5mg	5	pill	4/8/2009	11	medication discontinued	1.1182	12.3002
DILT -XR 180mg	180	pill	4/8/2009	11	medication discontinued	0.9999	10.9989
Famotidine 20mg	20	pill	4/8/2009	10	medication discontinued	0.15	1.5
HCTZ 25mg	25	pill	4/8/2009	13	medication discontinued	0.07944	1.03272
Lisinopril 20mg	20	pill	4/8/2009	11	medication discontinued	1.0751	11.8261
Nexium 40mg	40	capsules	4/8/2009	11	medication discontinued	6.05	66.55
Cetirizine	10	pill	4/9/2009	23	medication discontinued	0.3346	7.6958
Clonidine	0.1	pill	4/9/2009	7	medication discontinued	0.259	1.813
Glimepiride		pill	4/11/2009	33	dosage changed	0.1341	4.4253
Warfarin 3mg	3	pill	4/11/2009	7	dosage changed	0.6307	4.4149
Duoneb		vials	4/12/2009	30	medication discontinued		0
Ranitidine 300mg	300	pill	4/14/2009	6	medication discontinued	2.93	17.58

Ranitidine 300mg	300	pill	4/14/2009	6	meidcation	2.93	17.58
Prevacid		pill	4/15/2009	27	medicatinon changed	5.950333333	160.659
Vitamin C		pill	4/15/2009	10	medication discontinued		0
Zinc		pill	4/15/2009	10	medication discontinued		0
Arilect		pill	4/16/2009	6	dosage changed		0
Azilect		pill	4/16/2009	6	dosage changed	10.994	65.964
Seroquel 25mg	25	pill	4/16/2009	4	medication discontinued	2.579333333	10.3173333
Trazodone		pill	4/16/2009	26	dosage changed	1.130333333	29.3886667
Phoslo Gelcap		pill	4/21/2009	30	medication discontinued		0
Lexapro 10mg	10	pill	4/22/2009	8	doseage changed	3.2387	25.9096
Seroquel		pill	4/23/2009	23	medication discontinued	2.579333333	59.3246667
Hydroxyzine		pill	4/24/2009	15	medication expired	1.070833333	16.0625
DOK 100mg	100	pill	4/25/2009	15	medication discontinued		0
Gabapentin		pill	4/25/2009	90	medication discontinued	0.5369	48.321
Citalopram	20	pill	4/28/2009	8	medication discontinued	2.456	19.648
Dilantin 100mg	100	pill	4/28/2009	50	medication discontinued	0.4148	20.74
Alubterol Sulfate		vials	4/28/2009	20	medication discontinued		0
Prilosec		pill	4/28/2009	26	medication discontinued	5.658333333	147.116667
Tramadol		pill	4/28/2009	43	medication discontinued	1.6287	70.0341
Gabapentin		pill	4/29/2009	13	medication discontinued	0.5369	6.9797
Ferrous Gluc		pill	5/1/2009	27	medication discontinued	0.075	2.025
Gabapentin	100	pill	5/1/2009	60	medication discontinued	0.5369	32.214
Nitrofur		pill	5/1/2009	11	medication discontinued	2.62	28.82
Tramadol		pill	5/1/2009	44	medication discontinued	1.6287	71.6628
Tramadol	50	pill	5/1/2009	34	medication discontinued	1.6287	55.3758
Carbamezapine		pill	5/2/2009	22	medication discontinued		0
Carbamezapine 100mg	100	pill	5/2/2009	22	medication discontinued	0.2311	5.0842
Carbamezapine 100mg	100	pill	5/2/2009	22	medication discontinued	0.2311	5.0842
Carbamezapine100mg	100	pill	5/2/2009	22	medication discontinued	0.2311	5.0842

Citalopram	40	pill	5/2/2009	6	medication discontinued	2.456	14.736
Ferrous Sulf 325mg	325	pill	5/2/2009	60	medication discontinued	0.0399	2.394
Ferrous Sulfate 325mg	325	pill	5/2/2009	60	medication discontinued	0.0399	2.394
Exelon		pill	5/4/2009	33	medication discontinued	3.988	131.604
Phospha Neutral		pill	5/6/2009	36	medication discontinued		0
Potassium Cl 20meq	20	pill	5/6/2009	15	medication discontinued		0
Prilosec		pill	5/6/2009	2	medication discontinued	5.658333333	11.3166667
Omeprazole		pill	5/7/2009	24	medication discontinued	4.152666667	99.664
Amlodipine		pill	5/8/2009	5	medication discontinued	1.729666667	8.64833333
Fosinopril		pill	5/8/2009	23	medication discontinued	1.193333333	27.4466667
Seroquel 25mg	25	pill	5/9/2009	9	medication discontinued	2.579333333	23.214
Seroquel 25mg		pill	5/9/2009	9	medication discontinued	2.579333333	23.214
Trazadone 50mg	50	pill	5/9/2009	26	medication discontinued		0
Celexa		pill	5/13/2009	5	medication discontinued	2.711666667	13.5583333
Cymbalta		pill	5/13/2009	1	medication discontinued	3.339	3.339
Estradiol		pill	5/13/2009	13	medication discontinued	0.2175	2.8275
Prednisone		pill	5/13/2009	6	medication discontinued	0.1943	1.1658
Vitamin E		pill	5/13/2009	24	medication discontinued		0
Vitamin E		pill	5/13/2009	24	medication discontinued		0
Lexapro 10mg	10	pill	5/16/2009	18	medication discontinued	3.2387	58.2966
Nystatin		cream	5/22/2009		medication discontinued		0
Atenolol 100mg	100	pill	5/23/2009	12	medication discontinued	1.2175	14.61
Citalopram 20mg	20	pill	5/26/2009	20	medication discontinued	3.097	61.94
Metronidazole 500mg	500	pill	5/26/2009	10	medication discontinued	0.407142857	4.07142857
Omeprazole	20	pill	5/27/2009	19	medication discontinued	4.152666667	78.9006667
NiFedipine		pill	5/28/2009	26	medication discontinued		0
Ferrous Sulfate	325	pill	6/8/2009	7	medication discontinued	0.0399	0.2793
Ferrous Sulfate	325	pill	6/8/2009	30	medication discontinued	0.0399	1.197
Gabapentin		pill	6/8/2009	30	medication discontinued	0.5369	16.107
Nasal Spray		liquid	6/8/2009		medication discontinued		0
Polyethylene Glycol		powder	6/9/2009		medication discontinued		0

Amlodipine		pill	6/11/2009	4	dose change	1.729666667	6.91866667
HCTZ 25mg		pill	6/11/2009	30	medication discontinued	0.07944	2.3832
Hyroxyzine		pill	6/11/2009	9	medication discontinued	1.070833333	9.6375
Lisinopril		pill	6/12/2009	30	dose change	0.374	11.22
Macrobid 100mg		pill	6/13/2009	30	family request	3.134666667	94.04
Clindamycin		pill	6/18/2009	6	medication discontinued	1.089333333	6.536
Calcium		pill	6/19/2009	90	discharged to hospital		0
Citalopram		pill	6/19/2009	13	wrong pharmacy	2.456	31.928
Furosemide		pill	6/19/2009	5	wrong pharmacy	0.0456	0.228
Glyburide		pill	6/19/2009	26	discharged to hospital	0.1244	3.2344
Lisinopril		pill	6/19/2009	5	wrong pharmacy	0.374	1.87
Mirtazapine		pill	6/19/2009	12	wrong pharmacy	1.677666667	20.132
Omeprazole		pill	6/19/2009	16	wrong pharmacy	4.152666667	66.4426667
Poly Iron		pill	6/19/2009	61	discharged to hospital		0
Simvastatin		pill	6/19/2009	26	discharged to hospital	4.904	127.504
Tramadol		pill	6/19/2009	28	discharged to hospital	1.6287	45.6036
Warfarin 2.5mg		pill	6/19/2009	15	discharged to hospital	0.6284	9.426
Warfarin 5mg		pill	6/19/2009	10	discharged to hospital	0.6368	6.368
Cetirizine		pill	6/22/2009	15	expired	0.3346	5.019
Warfarin 2mg	2	pill	5/12/2023	7	medication discontinued	0.6089	4.2623
Atenolol	25	pill		20	medication discontinued	0.8176	16.352
Citalopram 20mg	20	pill		5	doseage changed	3.097	15.485
Ferrous Sulfate	325	pill		27	medication discontinued	0.0399	1.0773
Ferrous Sulfate	325	pill		12	medication discontinued	0.0399	0.4788
Trazadone	100	pill		25	medication discontinued		0
	Cost 3/1/09-6/31/09		$ 4,242.00			Cost 3/1/09-6/31/09	$ 6,027.48
	Cost per year		$12,726.00			cost per year	$18,082.45

Calculation of Costs: Controlled Substances:

6/1/2009	Ativan	1	mg	26	tab		1.9165	49.829
6/1/2009	Ativan		mg	7	tab		1.9165	13.4155
6/1/2009	Vicodin	5/500	mg	28	tab		1.15	32.2
6/1/2009	Ambien	5	mg	7	tab		4	28
4/2/2009	Diphenoxylate/Atropinc	2.5	mg	31	tab			0
4/2/2009	Hydrocodone APAP	7.5/750	mg	2	tab		0.161667	0.323333333
4/2/2009	Hydrocodone APAP	5/500	mg	8	tab		0.145	1.16
4/2/2009	Zolipidem	5	mg	15	tab		2	30
4/2/2009	Hydrocodone APAP	5/500	mg	11	tab		0.145	1.595
4/2/2009	Hydrocodone APAP	5/500	mg	11	tab		0.145	1.595
4/2/2009	Lorazepam	1	mg	29	half tab		0.12111	3.51219
4/2/2009	Hydrocodone APAP	5/500	mg	29	tab		0.145	4.205
4/2/2009	Lorazepam	0.5	mg	31	tab		0.12111	3.75441
4/2/2009	Lorazepam	0.5	mg	18	half tab		0.12111	2.17998
4/2/2009	Lorazepam	0.5	mg	13	half tab		0.12111	1.57443
4/2/2009	Clonazepam	0.5	mg	14	half tab		0.35	4.9
4/2/2009	Lorazepam	0.5	mg	15	tab		0.12111	1.81665
4/2/2009	Hydrocodone APAP	7.5/750	mg	143	143 cc		0.161667	23.11833333
4/2/2009	Lorazepam	0.5	mg	78	tab		0.12111	9.44658
5/4/2009	Clonazepam	0.5	mg	9	tab		0.35	3.15
5/4/2009	Oxycodone APAP	5/325	mg	21	half tab	0.1312	0.13	2.73
5/4/2009	Morphine Sulfate	15	mg/ml	22	tab		1.041666	22.916652
5/4/2009	Hydrocodone APAP	5/500	mg	30	tab		0.145	4.35
5/4/2009	Oxycodone APAP	5/325	mg	60	tab	0.1312	0.13	7.8
5/4/2009	Hydrocodone APAP	5/500	mg	4	tab		0.145	0.58
5/4/2009	Diazepam	5	mg	4	tab		0.5	2
5/4/2009	Oxy 1R	5	mg	13	tab			0

5/4/2009	Lorazepam	1	mg	14	tab		0.12111	1.69554
5/4/2009	Hydrocodone APAP	5/500	mg	30	tab		0.145	4.35
5/4/2009	Propoxy NAP/APAP	100/650	mg	25	tab			0
5/4/2009	Lorazepam	0.5	mg	8	tab		0.12111	0.96888
5/4/2009	Lyrica	200	mg	6	tab			0
5/4/2009	Hydrocodone APAP	5/500	mg	21	tab		0.145	3.045
5/4/2009	Hydrocodone APAP	5/500	mg	25	tab		0.145	3.625
5/4/2009	Lorazepam	0.5	mg	3	half tab		0.12111	0.36333
5/4/2009	Lorazepam	0.25	mg	60	tab		0.12111	7.2666
5/4/2009	Hydrocodone APAP	5/500	mg	18	tab		0.145	2.61
3/2/2009	Lorazepam	0.5	mg	19	tab		0.12111	2.30109
3/2/2009	Lorazepam	0.5	mg	2	tab		0.12111	0.24222
3/2/2009	Lorazepam	0.5	mg	21	tab		0.12111	2.54331
3/2/2009	Lorazepam	0.5	mg	4	tab		0.12111	0.48444
3/2/2009	Lorazepam	0.5	mg	29	tab		0.12111	3.51219
3/2/2009	Ambien	5	mg	7	tab		2	14
3/2/2009	Lorazepam	0.5	mg	29	tab		0.12111	3.51219
3/2/2009	Lorazepam	0.5	mg	6	half tab		0.12111	0.72666
3/2/2009	Morphine Sulfate	15	mg/ml	28	tab		1.041666	29.166648
3/2/2009	Propoxyphene HCL	65	mg	57	tab			0
3/2/2009	Oxycodone APAP	5/325	mg	59	tab	0.1312	1.9165	113.0735
3/2/2009	Chlordiaz/CLND	5/2.5	mg	26	tab			0
3/2/2009	Zolpidem	10	mg	26	tab		2	52
3/2/2009	Methadone HCl	5	mg	28	half tab			0
3/2/2009	Lorazepam	0.5	mg	31	half tab		0.12111	3.75441
3/2/2009	Hydrocodone APAP	5/500	mg	16	half tab		0.145	2.32
3/2/2009	Diphenoxylate Atropine	2.5	mg	3	tab			0
3/2/2009	Acetaminophen/COD #3		mg	28	tab			0
3/2/2009	Vicodin	5/500	mg	18	tab		1.15	20.7
3/2/2009	Hydrocodone APAP	5/500	mg	16	tab		0.145	2.32
3/2/2009	Lorazepam	0.5	mg	1	half tab		0.12111	0.12111

3/2/2009	Lorazepam	0.25	mg	21	half tab		0.12111	2.54331
3/2/2009	Hydrocodone APAP	5/500	mg	23	tab		0.145	3.335
3/2/2009	Oxycodone HCL	10	mg	7	tab		1.9165	13.4155
3/2/2009	Ativan	0.25	mg	28	half tab		1.9165	53.662
3/2/2009	Hydrocodone APAP	5/500	mg	25	tab		0.145	3.625
3/2/2009	Hydrocodone APAP	5/500	mg	26	tab		0.145	3.77
3/2/2009	Hydrocodone APAP	5/500	mg	15	tab		0.145	2.175
3/2/2009	Oxycontin	20	mg	10	tab		1.9165	19.165
3/2/2009	Oxycontin	10	mg	1	tab		1.9165	1.9165
3/2/2009	Hydrocodone APAP	5/500	mg	31	tab		0.145	4.495
3/2/2009	Hydrocodone APAP	5/500	mg	24	tab		0.145	3.48
3/2/2009	Hydrocodone APAP	5/500	mg	30	tab		0.145	4.35
3/2/2009	Loperamide	2	mg	31	tab			0
3/2/2009	Diphenoylate/Atropine		mg	23	tab			0
3/2/2009	Hydrocodone APAP	5/500	mg	31	tab		0.145	4.495
3/2/2009	Hydrocodone APAP	5/500	mg	22	tab		0.145	3.19
3/2/2009	Oxycodone APAP	5/325	mg	20	tab	0.1312	1.9165	38.33
3/2/2009	Zolpidem	5	mg	5	tab		2	10
3/2/2009	Lorazepam	1	mg	24	tab		0.12111	2.90664
3/2/2009	Oxycodone	5	mg	29	tab		1.9165	55.5785
3/2/2009	Oxycodone APAP	5/325	mg	25	tab	0.1312	1.9165	47.9125
3/2/2009	Acetaminophen/COD #3		mg	23	tab			0
3/2/2009	Hydrocodone APAP	5/500	mg	17	tab		0.145	2.465
3/2/2009	Hydrocodone APAP	5/500	mg	12	tab		0.145	1.74
3/2/2009	Morphine Sulfate	15	mg/ml	27	tab		1.041666	28.124982
3/2/2009	Lorazepam	0.5	mg	25	half tab		0.12111	3.02775
3/2/2009	Lorazepam	0.5	mg	30	half tab		0.12111	3.6333
3/2/2009	Lorazepam	0.25	mg	30	half tab		0.12111	3.6333
3/2/2009	Morphine Sulfate	20	mg/ml	30	tab		1.041666	31.24998
3/2/2009	Acetaminophen/COD #3		mg	11	tab			0
3/2/2009	Propoxy NAP/APAP	100/650	mg	13	tabs			0

3/2/2009	Diphenxylate Atropine		mg	17	tab		0
3/2/2009	Lorazepam	1	mg	9	tab	0.12111	1.08999
3/2/2009	Hydrocodone APAP	5/500	mg	19	tab	0.145	2.755
3/2/2009	Hydrocodone APAP	5/500	mg	23	tab	0.145	3.335
3/2/2009	Propoxy NAP/APAP	100/650	mg	23	tab		0
3/2/2009	Lorazepam	0.5	mg	15	tab	0.12111	1.81665
3/2/2009	Zolpidem	5	mg	10	tab	2	20
3/2/2009	Lorazepam	0.5	mg	30	tab	0.12111	3.6333
3/2/2009	Zolpidem Tartate	5	mg	29	tab		0
3/2/2009	Oxycontin	10	mg	21	tab	2	42
3/2/2009	Lorazepam	0.5	mg	60	tab	0.12111	7.2666
3/2/2009	Lorazepam	0.5	mg	31	tab	0.12111	3.75441
3/2/2009	Lorazepam	0.5	mg	87	tab	0.12111	10.53657
3/2/2009	Oxycontin	10	mg	36	tab	2	72
3/2/2009	Acetaminophen/COD #3			18	tab		0
3/2/2009	Clonazepam	0.5	mg	66	tab	0.35	23.1
3/2/2009	Hydrocodone APAP	5/500	mg	16	tab	0.145	2.32
3/2/2009	Hydrocodone APAP	5/500	mg	30	tab	0.145	4.35
3/2/2009	Hydrocodone APAP	5/500	mg	31	tab	0.145	4.495
3/2/2009	Risperidone	0.25	mg	15	half tab		0
2/6/2009	Lorazepam	0.5	mg	29	tab	0.12111	3.51219
2/6/2009	Lorazepam	0.25	mg	10	half tab	0.12111	1.2111
2/6/2009	Oxycontin	10	mg	1	tab	2	2
2/6/2009	Alprazolan	0.5	mg	31	tab		0
2/6/2009	Lorazepam	1	mg	27	tab	0.12111	3.26997
2/6/2009	Lorazepam	0.5	mg	28	tab	0.12111	3.39108
2/6/2009	Zolipidem	10	mg	10	tab	2	20
2/6/2009	Hydrocodone APAP	5/500	mg	12	tab	0.145	1.74
2/6/2009	Hydrocodone APAP	5/500	mg	26	tab	0.145	3.77
2/6/2009	Hydrocodone APAP	5/500	mg	24	tab	0.145	3.48
2/6/2009	Oxycodone	40	mg	18	tab	2	36

2/6/2009	Acetaminophen/COD #3		mg	27	tab		0
2/6/2009	Oxycontin	10	mg	20	tab	2	40
2/6/2009	Vicodin	5/500	mg	31	tab	1.15	35.65
2/6/2009	Vicodin	5/500	mg	11	tab	1.15	12.65
2/6/2009	Hydrocodone APAP	5/500	mg	10	tab	0.145	1.45
2/6/2009	Vicodin	5/500	mg	84	tab	1.15	96.6
2/6/2009	Clonazepam	0.25	mg	21	tab	0.35	7.35
2/6/2009	Hydrocodone APAP	5/500	mg	21	tab	0.145	3.045
2/6/2009	Lorazepam	0.5	mg	5	tab	0.12111	0.60555
2/6/2009	Propoxy NAP/APAP	100/650	mg	30	tab		0
2/6/2009	Lorazepam	0.5	mg	5	tab	0.12111	0.60555
2/6/2009	Lorazepam	0.5	mg	28	half tab	0.12111	3.39108
2/6/2009	Lorazepam	0.5	mg	23	tab	0.12111	2.78553
2/6/2009	Clonazepam	0.25	mg	10	half tab	0.35	3.5
2/6/2009	Lorazepam	0.5	mg	30	tab	0.12111	3.6333
2/6/2009	Lorazepam	0.5	mg	4	tab	0.12111	0.48444
2/6/2009	Vicodin	5/500	mg	0.5	tab	1.15	0.575
2/6/2009	Clonazepam	0.5	mg	2	half tab	0.35	0.7
2/6/2009	Clonazepam	0.5	mg	4	tab	0.35	1.4
2/6/2009	Clonazepam	0.5	mg	62	tab	0.35	21.7
2/6/2009	Acetaminophen/COD #3		mg	25	tab		0
2/6/2009	Clonazepam	0.25	mg	19	tab	0.35	6.65
2/6/2009	Hydrocodone APAP	5/500	mg	54	tab	0.145	7.83
2/5/2009	Hydrocodone APAP	5/500	mg	30	tab	0.145	4.35
12/5/2008	Vicodin	5/500	mg	52	tab	1.15	59.8
12/5/2008	Vicodin	5/500	mg	17.5	tab	1.15	20.125
12/5/2008	Ambien	5	mg	28	tab	4	112
12/5/2008	Ambien	5	mg	26	tab	4	104
12/5/2008	Propoxyphene	65	mg	24	tab		0
12/5/2008	Oxycodone	5	mg	56	tab	1.5	84
12/5/2008	Vicodin	5/500	mg	10	tab	1.15	11.5

12/5/2008	Percocet	5/325	mg	11	tab	4	44
12/5/2008	Tylenol #3		mg	20	tab		0
12/5/2008	Morphine	10	mg	5	tab	1.09	5.45
12/5/2008	Ativan	1	mg	27	tab	1.9165	51.7455
12/5/2008	Lomotil	2.5/.025	mg	31	tab		0
12/5/2008	Xanax	0.25	mg	14	half tab		0
12/5/2008	Ativan	0.5	mg	13	tab	1.9165	24.9145
12/5/2008	Ativan	0.5	mg	28	tab	1.9165	53.662
12/5/2008	Ativan	0.5	mg	60	tab	1.9165	114.99
10/31/2008	Vicodin	5/500	mg	10	tab	1.15	11.5
10/31/2008	Vicodin	5/500	mg	21	tab	1.15	24.15
10/31/2008	Ativan	0.5	mg	54	tab	1.9165	103.491
10/31/2008	Ativan	0.5	mg	31	tab	1.9165	59.4115
10/31/2008	Vicodin	5/500	mg	31	tab	1.15	35.65
10/31/2008	Vicodin	5/500	mg	10	tab	1.15	11.5
10/31/2008	Tylenol #3		mg	11	tab		0
10/31/2008	Vicodin	5/500	mg	16	tab	1.15	18.4
10/31/2008	Vicodin	5/500	mg	31	tab	1.15	35.65
10/31/2008	Vicodin	5/500	mg	30	tab	1.15	34.5
10/31/2008	Ativan	0.5	mg	40	tab	1.9165	76.66
10/31/2008	Tylenol #3		mg	31	tab		0
10/31/2008	Ativan	0.5	mg	13	tab	1.9165	24.9145
10/31/2008	Ativan	0.5	mg	120	tab	1.9165	229.98
10/31/2008	Hydrocodone APAP	5/500	mg	62	tab	0.145	8.99
10/31/2008	Ativan	0.5	mg	107	tab	1.9165	205.0655
10/31/2008	Ambien	10	mg	6	tab	4	24
10/31/2008	Vicodin	5/500	mg	6	tab	1.15	6.9
10/31/2008	Percocet	5/325	mg	19	tab	4	76
10/31/2008	Tylenol #3		mg	13	tab		0
10/31/2008	Ativan	0.5	mg	18	tab	1.9165	34.497
10/31/2008	Vicodin	5/500	mg	27	tab	1.15	31.05

10/31/2008	Ativan	0.5	mg	15	tab	1.9165	28.7475	
10/31/2008	Ativan	0.5	mg	17	tab	1.9165	32.5805	
10/31/2008	Valium	5	mg	15	tab	2.5	37.5	
10/31/2008	Ativan	1	mg	30	tab	1.9165	57.495	
10/31/2008	Ativan	0.5	mg	26	tab	1.9165	49.829	
	Number of tabs 10/31/08-6/1/09		5782.75			Cost 10/31/08-6/1/09		$ 5,192.27
	Number of tabs per year		8674.125			Cost per year		$ 7,788.41

Calculation of Costs: Unused Medicare Tablets

Name of Item	Strength	Pill	Date	Quantity left	Cost per pill	Total cost
Loratadine 100mg	100	pill	2/7/2009	15		0
Seroquel 25mg	25	pill	2/20/2009	4	2.579333333	10.3173333
Seroquel 100mg	100	pill	2/20/2009	30	4.426	132.78
Lexapro 10mg	10	pill	2/25/2009	2	3.2387	6.4774
Lexapro 10mg	10	pill	2/25/2009	7	3.2387	22.6709
Trazadone 50mg	50	pill	2/26/2009	12		0
Gabapentin 100mg		pill	3/2/2009	20	0.5369	
Fluoexetine HCh		pill	3/5/2009	9	2.5983	23.3847
Fluoextine		pill	3/5/2009	9	2.5983	23.3847
Risperidone		pill	3/5/2009	8	3.893	31.144
Risperidone		pill	3/5/2009	8	4.214	33.712
Sertraline		pill	3/5/2009	24	2.682333333	64.376
Sertraline		pill	3/5/2009	24	2.682333333	64.376
Avapro		pill	3/6/2009	26	1.596333333	41.5046667
Avapro 150mg	150	pill	3/6/2009	26	1.596333333	41.5046667
Citalompram 10mg	10	pill	3/6/2009	90	2.456	221.04
Citalopram 20mg	20	pill	3/6/2009	90	3.097	278.73
Furosemide 20mg	20	pill	3/10/2009	23	0.0456	1.0488
Metaprolol 100mg		pill	3/10/2009	30		0
Omeprazaole 20mg		pill	3/10/2009	47	4.152666667	195.175333
Seroquel		pill	3/10/2009	8	2.579333333	20.6346667
Seroquel 25mg	25	pill	3/10/2009	8	2.579333333	20.6346667
Trazadone 50mg	50	pill	3/10/2009	24		0
Ocuvit		pill	3/11/2009	30		0
Levothyrox		pill	3/12/2009	14	0.2975	4.165
Cephalexin		pill	3/17/2009	13		0
Trazadone 100mg	100	pill	3/17/2009			0

Trazadone 50mg	50	pill	3/17/2009		20		0
Digoxin 125 mcg	125	pill	3/23/2009		54	0.2132	11.5128
Metoprololxl 100mg	100	pill	3/23/2009		20		0
Ondansetron 4mg	4	pill	3/23/2009		17	20	340
Pantoprazole 40mg	40	pill	3/23/2009		21	5.605666667	117.719
Warfarin 1mg	1	pill	3/23/2009		10	0.5834	5.834
Warfarin 2mg	2	pill	3/23/2009		11	0.6089	6.6979
Amlodipine 5mg	5	pill	3/24/2009		32	1.729666667	55.3493333
Humalog		liquid	3/24/2009	10 mL			
Nitroglycerin		patch	3/24/2009		28		0
Albuterol 5uL		ampule	3/24/2009		29		0
Chlorthalidone 25mg	25	pill	3/24/2009		8	0.0675	0.54
Citalopram 20mg	20	pill	3/24/2009		12	3.097	37.164
Gabapentin 100mg	100	pill	3/24/2009		382	0.5369	205.0958
Lasix 40mg	40	pill	3/24/2009		39	0.4207	16.4073
Metoprolol 50mg	50	pill	3/24/2009		52	0.442	22.984
Prednisone		pill	3/24/2009		3	0.1943	0.5829
Prilosec 20mg	20	pill	3/24/2009		35	5.658333333	198.041667
SPS Susp			3/24/2009				0
Terazosin		pill	3/24/2009		32	1.61	51.52
Tikosyn		pill	3/24/2009		48		0
Vitamin E		pill	3/24/2009		34		0
Trazadone		pill	3/26/2009		6		0
Enablex		pill	3/30/2009		20	4.647666667	92.9533333
Enablex		pill	3/30/2009		20	4.647666667	92.9533333
Namenda		pill	3/30/2009		32	3.130166667	100.165333
Namenda		pill	3/30/2009		32	3.130166667	100.165333
Citalopram 10mg	10	pill	3/31/2009		68	2.456	167.008
Metoprolol		pill	3/31/2009		41	0.442	18.122
Paroxetine 20mg	20	pill	3/31/2009		27	2.665	71.955
Aricept 10mg		pill	4/3/2009		14	0.434	6.076

Comtan		pill	4/3/2009	63	3.0724	193.5612
Effexor		pill	4/3/2009	3	2.42	7.26
Mirapex		pill	4/3/2009	43	2.986111111	128.402778
Mirtazapine		pill	4/3/2009	27	1.677666667	45.297
Potassium		pill	4/3/2009	75		0
Zyprexa		pill	4/3/2009	30	7.669333333	230.08
Gabapentin 300mg		pill	4/4/2009	109	1.3418	146.2562
levothyroxine 75mcg		pill	4/4/2009	21	0.2975	6.2475
Potassium 10mq		pill	4/4/2009	23		0
Torsemide 20mg		pill	4/4/2009	29	0.821	23.809
Levothyroxine		pill	4/6/2009	26	0.2975	7.735
Levotyhroxine		pill	4/6/2009	26	0.2975	7.735
Atenolol		pill	4/7/2009	9.5	0.8176	7.7672
Celexa 20mg	20	pill	4/7/2009	28.5	2.711666667	77.2825
Nexium 40mg	40	capsules	4/7/2009	6	6.05	36.3
Coumadin 2.5mg	2.5	pill	4/8/2009	11	1.0728	11.8008
Coumadin 2mg	2	pill	4/8/2009	11	1.0398	11.4378
Coumadin 5mg	5	pill	4/8/2009	11	1.1182	12.3002
DILT -XR 180mg	180	pill	4/8/2009	11	0.9999	10.9989
Famotidine 20mg	20	pill	4/8/2009	10	0.15	1.5
HCTZ 25mg	25	pill	4/8/2009	13	0.07944	1.03272
Lisinopril 20mg	20	pill	4/8/2009	11	1.0751	11.8261
Nexium 40mg	40	capsules	4/8/2009	11	6.05	66.55
Cetirizine	10	pill	4/9/2009	23	0.3346	7.6958
Clonidine	0.1	pill	4/9/2009	7	0.259	1.813
Glimepiride		pill	4/11/2009	33	0.1341	4.4253
Warfarin 3mg	3	pill	4/11/2009	7	0.6307	4.4149
Duoneb		vials	4/12/2009	30		0
Ranitidine 300mg	300	pill	4/14/2009	6	2.93	17.58
Ranitidine 300mg	300	pill	4/14/2009	6	2.93	17.58
Prevacid		pill	4/15/2009	27	5.950333333	160.659

Vitamin C		pill	4/15/2009	10		0
Zinc		pill	4/15/2009	10		0
Arilect		pill	4/16/2009	6		0
Azilect		pill	4/16/2009	6	10.994	65.964
Seroquel 25mg	25	pill	4/16/2009	4	2.579333333	10.3173333
Trazodone		pill	4/16/2009	26	1.130333333	29.3886667
Phoslo Gelcap		pill	4/21/2009	30		0
Lexapro 10mg	10	pill	4/22/2009	8	3.2387	25.9096
Seroquel		pill	4/23/2009	23	2.579333333	59.3246667
Hydroxyzine		pill	4/24/2009	15	1.070833333	16.0625
DOK 100mg	100	pill	4/25/2009	15		0
Gabapentin		pill	4/25/2009	90	0.5369	48.321
Citalopram	20	pill	4/28/2009	8	2.456	19.648
Dilantin 100mg	100	pill	4/28/2009	50	0.4148	20.74
Alubterol Sulfate		vials	4/28/2009	20		0
Prilosec		pill	4/28/2009	26	5.658333333	147.116667
Tramadol		pill	4/28/2009	43	1.6287	70.0341
Gabapentin		pill	4/29/2009	13	0.5369	6.9797
Ferrous Gluc		pill	5/1/2009	27	0.075	2.025
Gabapentin	100	pill	5/1/2009	60	0.5369	32.214
Nitrofur		pill	5/1/2009	11	2.62	28.82
Tramadol		pill	5/1/2009	44	1.6287	71.6628
Tramadol	50	pill	5/1/2009	34	1.6287	55.3758
Carbamezapine		pill	5/2/2009	22		0
Carbamezapine 100mg	100	pill	5/2/2009	22	0.2311	5.0842
Carbamezapine 100mg	100	pill	5/2/2009	22	0.2311	5.0842
Carbamezapine 100mg	100	pill	5/2/2009	22	0.2311	5.0842
Citalopram	40	pill	5/2/2009	6	2.456	14.736

Ferrous Sulf 325mg	325	pill	5/2/2009	60	0.0399	2.394
Ferrous Sulfate 325mg	325	pill	5/2/2009	60	0.0399	2.394
Exelon		pill	5/4/2009	33	3.988	131.604
Phospha Neutral		pill	5/6/2009	36		0
Potassium Cl 20meq	20	pill	5/6/2009	15		0
Prilosec		pill	5/6/2009	2	5.658333333	11.3166667
Omeprazole		pill	5/7/2009	24	4.152666667	99.664
Amlodipine		pill	5/8/2009	5	1.729666667	8.64833333
Fosinopril		pill	5/8/2009	23	1.193333333	27.4466667
Seroquel 25mg	25	pill	5/9/2009	9	2.579333333	23.214
Seroquel 25mg		pill	5/9/2009	9	2.579333333	23.214
Trazadone 50mg	50	pill	5/9/2009	26		0
Celexa		pill	5/13/2009	5	2.711666667	13.5583333
Cymbalta		pill	5/13/2009	1	3.339	3.339
Estradiol		pill	5/13/2009	13	0.2175	2.8275
Prednisone		pill	5/13/2009	6	0.1943	1.1658
Vitamin E		pill	5/13/2009	24		0
Vitamin E		pill	5/13/2009	24		0
Lexapro 10mg	10	pill	5/16/2009	18	3.2387	58.2966
Nystatin		cream	5/22/2009			0
Atenolol 100mg	100	pill	5/23/2009	12	1.2175	14.61
Citalopram 20mg	20	pill	5/26/2009	20	3.097	61.94
Metronidazole 500mg	500	pill	5/26/2009	10	0.407142857	4.07142857
Omeprazole	20	pill	5/27/2009	19	4.152666667	78.9006667
NiFedipine		pill	5/28/2009	26		0
Ferrous Sulfate	325	pill	6/8/2009	7	0.0399	0.2793
Ferrous Sulfate	325	pill	6/8/2009	30	0.0399	1.197
Gabapentin		pill	6/8/2009	30	0.5369	16.107
Nasal Spray		liquid	6/8/2009			0
Polyethylene Glycol		powder	6/9/2009			0
Amlodipine		pill	6/11/2009	4	1.729666667	6.91866667

HCTZ 25mg		pill	6/11/2009	30	0.07944	2.3832
Hyroxyzine		pill	6/11/2009	9	1.070833333	9.6375
Lisinopril		pill	6/12/2009	30	0.374	11.22
Macrobid 100mg		pill	6/13/2009	30	3.134666667	94.04
Clindamycin		pill	6/18/2009	6	1.089333333	6.536
Calcium		pill	6/19/2009	90		0
Citalopram		pill	6/19/2009	13	2.456	31.928
Furosemide		pill	6/19/2009	5	0.0456	0.228
Glyburide		pill	6/19/2009	26	0.1244	3.2344
Lisinopril		pill	6/19/2009	5	0.374	1.87
Mirtazapine		pill	6/19/2009	12	1.677666667	20.132
Omeprazole		pill	6/19/2009	16	4.152666667	66.4426667
Poly Iron		pill	6/19/2009	61		0
Simvastatin		pill	6/19/2009	26	4.904	127.504
Tramadol		pill	6/19/2009	28	1.6287	45.6036
Warfarin 2.5mg		pill	6/19/2009	15	0.6284	9.426
Warfarin 5mg		pill	6/19/2009	10	0.6368	6.368
Cetirizine		pill	6/22/2009	15	0.3346	5.019
Warfarin 2mg	2	pill	5/12/2023	7	0.6089	4.2623
Atenolol	25	pill		20	0.8176	16.352
Citalopram 20mg	20	pill		5	3.097	15.485
Ferrous Sulfate	325	pill		27	0.0399	1.0773
Ferrous Sulfate	325	pill		12	0.0399	0.4788
Trazadone	100	pill		25		0
		Tabs 3/1/09-6/31/09		4242	Cost 3/1/09-6/31/09	$ 6,027.48
		Tabs returned per year		12726	Cost per year	$18,082.45

Appendix H: Potentially Hazardous Pharmaceutical Waste at Oak Hills

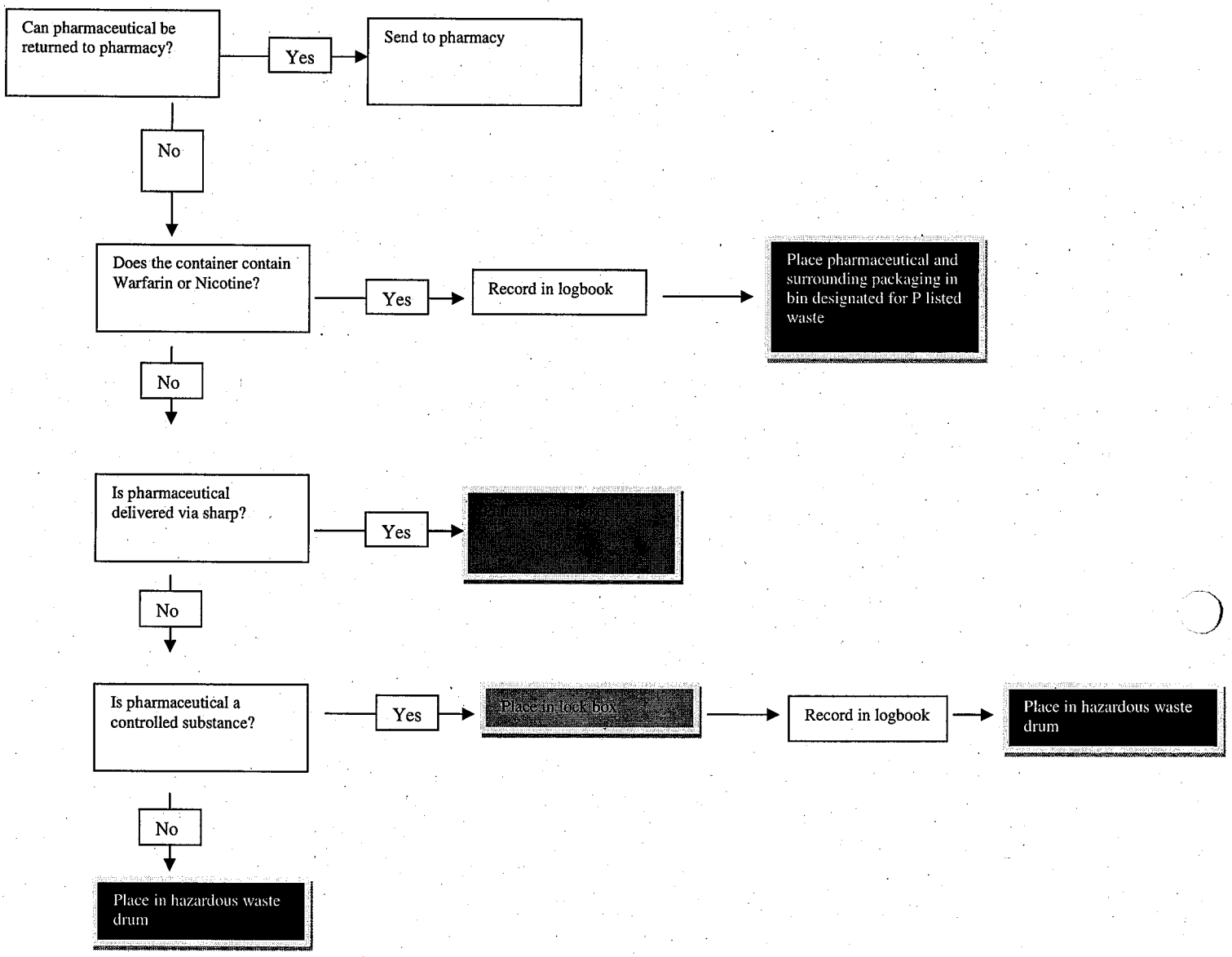
Brand Name	Generic Name	Federal Hazardous	MN Hazardous	Reason*	Narcotic
AVODART CAP 0.5MG	Dutasteride		X	T	
COLCHICINE TAB 0.6MG	Colchicine		X	T	
FINASTERIDE TAB 5MG	Finasteride		X	T	
LANTUS INJ 100/ML	Insulin Glargine	X			
WARFARIN TAB 5MG	Warfarin Sodium	X			
Acetaminophen/COD #3			X		III
Alprazolam			X		IV
Ambien			X		IV
Ativan			X		IV
Atrovent HFTA AER 17mcg	Ipratropium Bromide HFA		X	I	
AVODART CAP 0.5MG	Dutasteride		X	T	
BYETTA INJ 5MCG	Exenatide	X			
CELLCEPT CAP 250MG	Mycophenolate Mofetil		X	T	
CEROVITE ADV TAB FORMULA	Multiple Vitamins w/ Minerals (Chromium)	X			
Cerovite Tab Silver	Multiple Vitamins w/ Minerals		X	T	
CERTAGEN TAB	Multiple Vitamins w/ Minerals		X	T	
CERTA-VITE TAB SR/LUTEN	Multiple Vitamins w/ Minerals		X	T	
Clonazepam			X		IV
CLOTRIM/BETA CRE DIPROP	Clotrimazole w/ Betamethasone		X	T	
CLOTRIMAZOLE CRE 1%	Clotrimazole (Topical)		X	T	
COLCHICINE TAB 0.6MG	Colchicine		X	T	
COMBIVENT AER	Ipratropium-Albuterol		X	I	
Diazepam			X		IV
DILANTIN CAP 100MG	Phenytoin Sodium Extended		X	T	
Diphenoxylate Atropine			X		V
ESTRADIOL TAB 0.5MG	Estradiol		X	T	
EVISTA TAB 60MG	Raloxifene HCl		X	T	

*Abbreviations
T = Toxic
I = Ignitable

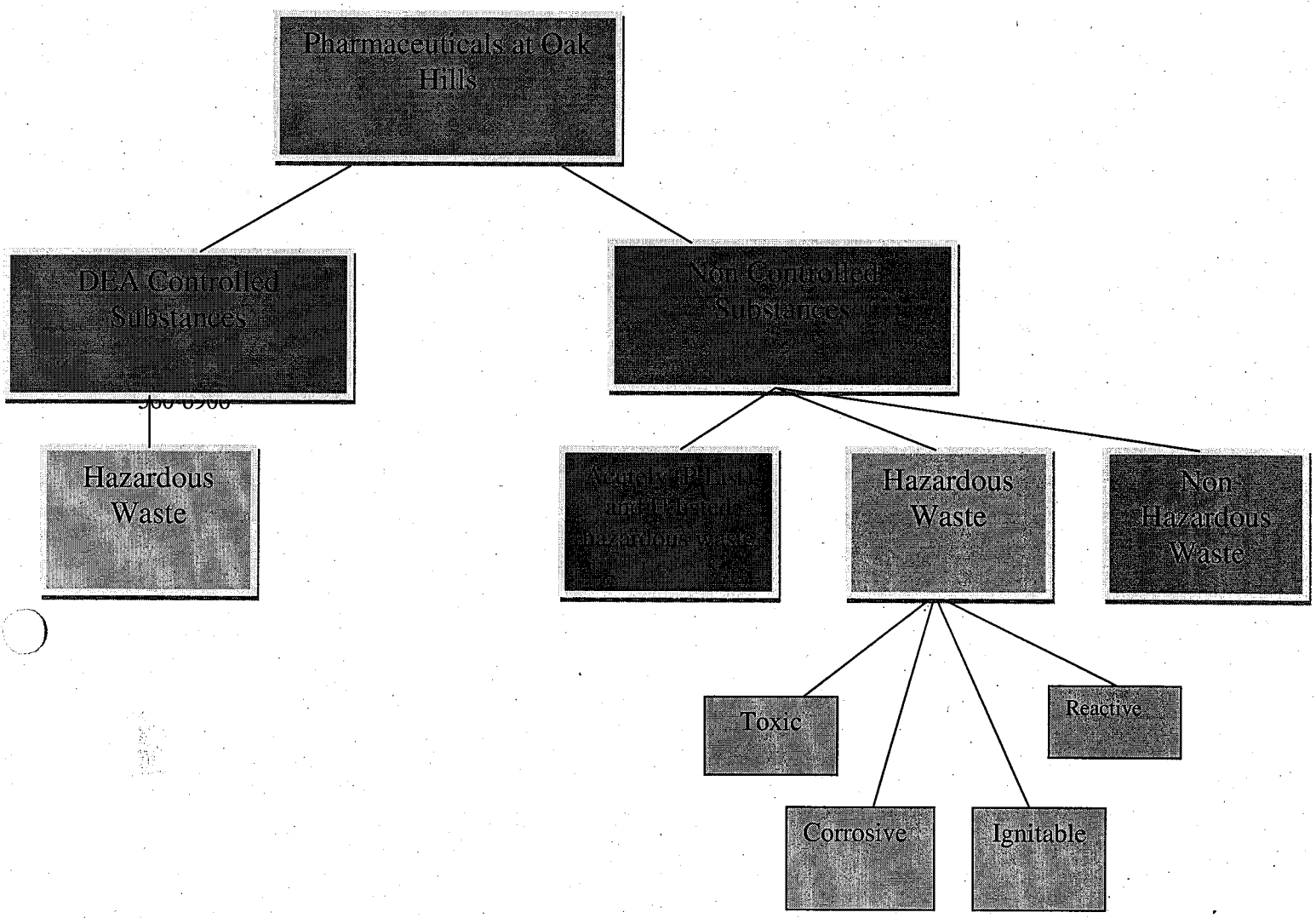
Fentanyl			X		II
FINASTERIDE TAB 5MG	Finasteride		X	T	
FLOVENT HFA AER 220MCG	Fluticasone Propionate HFA		X	I	
FLUOROURACIL CRE 5%	Fluorouracil (Topical)		X	T	
FML OIN 0.1% OP	Fluorometholone (Ophth)	X			
Forteo Sol	Teriparatide	X			
Guiatuss AC			X		V
HUMALOG INJ 100/ML	Insulin Lispro	X			
HUMALOG MIX SUS	Insulin Lispro Protamine & Lispro (Human)	X			
HUMALOG MIX SUS 75/25	Insulin Lispro Protamine & Lispro (Human)	X			
Hydrocodone APAP			X		III
LANTUS INJ 100/ML	Insulin Glargine	X			
LEVEMIR INJ FLEXPEN	Insulin Detemir	X			
Lomotil			X		V
Lorazepam			X		IV
Lorazepam Intensol			X		IV
Lyrica			X		V
MAXAIR AUTOH AER 200MCG	Pirbuterol Acetate		X	I	
MEGESTROL AC SUS 40MG/ML	Megestrol Acetate		X	T	
Methadone HCl			X		II
METROGEL GEL 1%	Metronidazole (Topical)		X	T	
METRONIDAZOL TAB 500MG	Metronidazole		X	T	
METRONIDAZOL TAB 500MG	Metronidazole		X	T	
Morphine Sulfate			X		II
NICOTINE DIS 14MG/24H	Nicotine	X			
NOVOLIN INJ 70/30	Insulin Isophane & Reg (Human)	X			
Novolin INJ U-100		X			
NOVOLOG INJ 100/ML	Insulin Aspart	X			
NOVOLOG INJ FLEXPEN	Insulin Aspart	X			

Novolog Mix INJ 70/30		X			
NOVOLOG MIX INJ FLEXPEN	NOVO NORDISK	X			
Oxycodone			X		II
Oxycodone APAP			X		II
Oxycodone HCL			X		II
Oxycontin			X		II
Oxyir			X		II
Percocet			X		II
PERMETHRIN CRE 5%	Permethrin		X	T	
PHENAZOPYRID TAB 200MG			X	T	
PROAIR HFA AER	Albuterol Sulfate		X	I	
Propoxy NAP/APAP			X		IV
Propoxyphene			X		IV
Propoxyphene HCL			X		IV
PROTOPIC OIN 0.03%	Tacrolimus (Topical)		X	T	
Risperidone					
SELSUN BLUE SHA 1%		X			
TAMOXIFEN TAB 20MG	Tamoxifen Citrate		X	T	
THEREMS M TAB	Multiple Vitamins w/ Minerals		X	T	
Tylenol #3			X		IV
Valium			X		IV
VENTOLIN HFA AER	Albuterol Sulfate		X	I	
Vicodin			X		III
WARFARIN TAB 2.5MG	Warfarin Sodium	X			
WARFARIN TAB 2MG	Warfarin Sodium	X			
WARFARIN TAB 3MG	Warfarin Sodium	X			
WARFARIN TAB 4MG	Warfarin Sodium	X			
WARFARIN TAB 6MG	Warfarin Sodium	X			
WARFARIN TAB 7.5MG	Warfarin Sodium	X			
Xanax			X		IV
Zolpidem			X		IV

Appendix I: Flow chart for pharmaceutical waste



Appendix J: Types of pharmaceutical waste at Oak Hills



P list waste – Waste includes the pharmaceutical and the immediate surrounding container. If over 1kg (2.2 lbs) of P-listed waste is generated per month, the facility generating the waste is considered as large quantity generator (LQG) of waste. Oak Hills is currently producing about 1.25 pounds per month. P-list waste must be disposed of by a hazardous waste incinerator.

Hazardous waste - Waste includes only the pharmaceutical, not the immediate surrounding packaging. Hazardous waste includes any controlled substance, or a substance that is "characteristically hazardous," i.e. the substance fails the toxic, corrosive, ignitable, or reactive tests. Federally listed wastes and characteristically hazardous wastes need to be incinerated by a hazardous waste incinerator. Prior to sending any waste to the sewer, the local wastewater plant must be notified. It is a best management practice to incinerate rather than flush these wastes.

Non-hazardous waste – All pharmaceuticals that are not used for their intended purpose but are not listed on the hazardous waste are considered non hazardous. For example, an Omeprazole tablet that has been punched out of the blister pack, but has been rejected by the resident would be considered non-hazardous pharmaceutical waste. Best management practices dictate non hazardous pharmaceutical waste be incinerated.

Appendix K : Safety Stock for Supply Room

Product\Date	Standard Deviation	Average	z factor corresponding t0 99% assurance	Stocking Quantity	Measurement
Small Pull Ups	0	0	2.33	1	each
Med. Pull Ups	1.17	1.18	2.33	4	each
Large Pull Ups	1.69	2.36	2.33	6	each
Extra Large Pull Ups	2.57	4.73	2.33	11	each
Isolation Gown	0	0	2.33	1	Box
Goggles/Masks	0	0	2.33	1	Box
Sterile gloves	0	0	2.33	1	Box
Razors	0	0	2.33	1	Box
Straws	0.4	0.18	2.33	1	Box
Gripper socks	0	0	2.33	1	Box
Saline	0	0	2.33	1	Box
Stretch Bandages	0	0	2.33	1	Box
ABD Pads	0	0	2.33	1	Box
Gauze 4x4	0	0	2.33	1	Box
Gauze 3x3	0.3	0.09	2.33	1	Box
Gauze 2x2	0.3	0.09	2.33	1	Box
Gauze Non-Sterile	0	0	2.33	1	Box
Sterile Saline Wipes	1.2	0.9	2.33	4	Box
Band Aids	0.4	0.18	2.33	1	Box
Paper Tape	0.3	0.09	2.33	1	Roll
Plastic Tape	0	0	2.33	1	Roll
Alcohol Prep	0.81	0.36	2.33	2	Bottle
Q tips	0	0	2.33	1	Box
Red bags	0	0	2.33	1	Box
Large Sharps	0.65	0.27	2.33	2	Box
Small Sharps	1.41	1	2.33	4	Box
Probe Covers	0.87	0.82	2.33	3	Each
Stock Catheters	5.07	7.09	2.33	19	Each
10 CC Trays	0.6	0.18	2.33	2	Each
30 CC Trays	0.3	0.09	2.33	1	Each
Irrigation trays	0	0	2.33	1	Each
60ml syringe	0	0	2.33	1	Each
Leg Bags	0	0	2.33	1	Each
Drain Bags	0	0	2.33	1	Each
Hats	0	0	2.33	1	Each
Graduates	2.77	2.36	2.33	9	Each
Food Bags sm/lg.	0	0	2.33	1	Each
Facial Tissue	7.48	9.91	2.33	27	Box

Large Gloves	5.07	6.64	2.33	18	Box
Small Gloves	0.6	0.18	2.33	2	Box
Souffle Cups	0	0	2.33	1	Box
Plastic Cups	0	0	2.33	1	Box
Medium Gloves	11.11	14.18	2.33	40	Box
Foaming Body Wash	2.04	2.18	2.33	7	Each
Hand/Body Lotion	1.37	1.55	2.33	5	Each
Moisture Cream	1.03	0.64	2.33	3	Each
Baza Clear	2.11	1.55	2.33	6	Each
Isagel Small	0.47	0.27	2.33	1	Each
Sani Wipes	1.14	0.91	2.33	4	Each
Isagel Large	0.65	0.27	2.33	2	Each
Digisan	0.67	0.36	2.33	2	Each
Gentle Rain Gal.	0.3	0.09	2.33	1	Each
Neb. Masks	1.81	0.55	2.33	5	Each
Gentle Rain Sm.	4.06	5.45	2.33	15	Each
Lemon Glycon Swabsticks	0	0	2.33	1	Box
Mouthwash	1.81	0.55	2.33	5	Each
Toothpaste	4.85	2.18	2.33	13	Each
Oral Swabs	0	0	2.33	1	Box
Denture Containers	0	0	2.33	1	Each
Large Super Briefs	1.1	1.27	2.33	4	Each
Large Briefs	0.98	0.82	2.33	3	Each
Extra Large Briefs	3.98	5.73	2.33	15	Each
Large pads	1.1	1	2.33	4	Each
Medium Super Briefs	0	0	2.33	1	Each
Medium Briefs	0.6	0.18	2.33	2	Each
Light Briefs	1.42	1.73	2.33	5	Each
Disp. Washcloths	0	0	2.33	1	Each
Senerity Pads	0.5	0.36	2.33	2	Each
Disp. Underpads	0.3	0.09	2.33	1	Each

Quantities should be stocked to the amount given in the "Stocking Quantity" column. Once levels are below this determined quantity, supplies should be replaced with stock from the storage room. Only one package of each supply should be kept in the storage room because of the high amount of safety stock built into the supply quantities of the supply rooms, and the ability to get most ordered items with next day delivery.

Appendix L: Blueprint for implementation of Talyst InSite

Find a pharmacy willing to use the Talyst InSite with Oak Hills.

Machines like the Talyst InSite cannot be implemented without pharmacy oversight. Oak Hills should contact its current pharmacies and any prospective pharmacies it feels appropriate to notify them of Oak Hills' desire to implement a Talyst InSite. I have drafted a document expressing this desire; it may be used as a proposal to send to the pharmacies, or as a document to draft a more specific proposal.

A pharmacy should be made aware of the costs savings Oak Hills and the pharmacy may experience with implementation of a machine. The pharmacy should also be told that the InSite will be used to hold all the Oak Hills' residents medications, and that the InSite will be the primary mechanism for distribution of oral tablet medications. After initial contact, Oak Hills should also inform the interested pharmacies that the Talyst InSite is not currently approved by the Minnesota Board of Pharmacy, and that Oak Hills would like the pharmacy's assistance in challenging the Board's current position. Payment for the machine should also be discussed. It is sensible and reasonable for Oak Hills as well as the pharmacy to pay for the machine, as both parties will experience cost savings through its use. The Talyst contact person, Dave Doane, would be more than willing to talk to prospective pharmacies.

Gain approval from Minnesota Board of Pharmacy

The Minnesota Board of Pharmacy does not currently approve of the use of a machine like the Talyst InSite in long term care facilities. The Board believes that the machine would conflict the Board's definition of "dispensing," as well as Minnesota regulations 6800.3200 and 6800.3400. Oak Hills, MnTAP, and the pharmacy working with Oak Hills can either argue that the Talyst InSite does meet these statues, or they can use economic data, reduction of medical error data, and increased resident care time to convince the Board of the projects favorability.

This process may be time consuming and will require many policies and procedures to be drafted in cooperation with the pharmacy and Talyst to ensure proper use of the InSite.

Create a formulary

Residents at Oak Hills currently use more 400 different types of oral tablet medications. The InSite can only hold up to 240 of these (33 of which are controlled substances). Therefore, the number of oral tabs being used at Oak Hills needs to decrease to store the majority of the oral tabs in the machine. The first step to limiting the different types of oral tablets at Oak Hills is to work with Jay Vancura or a consultant pharmacist to determine a theoretical formulary. Creation of a formulary would eliminate the presence of drugs that perform the same function, such as Lisinopril and Monopril (both ACE inhibitors), reduce the number of drugs based on dose size (use two 25mg tabs instead of one 50mg tab), and eliminate redundant generic and brand name drugs (Prilosec and Omeprazole, for example).

At this point, it may seem that Oak Hills' is limiting the type of medications that can be given to its residents. However, this is not the case. Formularies are kept at every hospital, and they eliminate excessive amounts of inventory. Many types of drugs all serve the same purpose, and stocking redundant drugs increases costs and management fees. From my pharmacy contacts, I have been told that as a long as a physician has a medicine available to serve a particular purpose, the physician does not usually care what particular type the medicine. Rather, the physician only cares that it will perform the necessary task.

Once a list is formed[2], Oak Hills' staff should continue to work with the consultant pharmacist to bring this information to the attention of the physicians that serve Oak Hills' residents. The physicians should be made aware of the advantages the InSite would bring to the residents, such as increased nursing time spent with the residents, possible reduction in medical errors, and should be made aware of the potential cost savings that could be realized for the residents, facility, and pharmacy.

Physicians and the consultant pharmacist should then consolidate drugs on the list to get the total number of medications in the machine below 240. From talks I've had with other pharmacists, I recommend that all oral tablet controlled substances are placed in the machine, and that higher volume drugs should be placed in the machine. It should be realized that the machine may not have room for all oral tablets. This is ok, medicines with low volumes can still be administered via blister pack, and stored in the residents room or med cart with other topical, ointment, or liquid pharmaceuticals.

Work with pharmacy and Talyst to set up the resident profiles
An electronic resident profile will need to be made by the pharmacy to link to the Talyst InSite. The electronic profile limits what resident can receive which medication, and allows for instant pharmacy updating of the InSite machine once in use at the facility.

During this stage, the facility and pharmacy should also draft policies and procedures on appropriate use of the machine. For example, policies should be put in place to describe what to do in case of a loss of power or a failure of the machine. Other day-to-day operation policies should also be scripted to ensure the machine will work as part of a functional and efficient medication distribution system. These operational policies should include policies addressing questions such as where medication packets should be stored after it has been distributed by the machine, but not yet given to a resident, or how a controlled substance should be stored before it is administered to a resident.

Set up a test environment
The system should be tested to ensure it is working correctly before it goes "live." A test environment should be set up on the Medicare wing. The Medicare wing should be used because of its higher use of controlled substances and because of its high turnover. This will provide a rigorous test for the system and ensure procedural problems are addressed before the machine is used throughout the entire system

Use the system in a live environment.
Use the InSite to administer medications to the entire facility. During the first few months of use, pay particular attention to the usage of different medicines in the machine. If nurses find that they are often giving a certain medicine out that is not contained in the machine, try placing that medicine in the machine in place of a less commonly used medicine. Also pay particular attention to administrative details. If communication with the pharmacy is slow, confusing, or difficult, develop new ways in which to communicate the residents' needs. Common nursing problems on the floor should also be taken into consideration. Case managers should ask for input from those passing medications on the floor, discuss amongst each other, and discuss with the pharmacy if necessary.

[2] Currently (as of August 5), a formulary has been created with the help of Jay Vancura's interns. This list is attached in the appendices of the technical report. However, there has been no discussion about which drugs to pick from this list.

Appendix M: Decision Matrix: Medication Distribution System

Characteristics of Medicine Distribution		System of Medicine Distribution		
Characteristic	**Description**	**Current Med Cart System**	**Talyst InSite**	**Med Dispense ADS**
Pharmacy oversight	ability for pharmacy to put constraints on the system and ability to limit which resident is getting which medication, and the ability to view in real time the number of medicines at the facility	1	3	3
Human Error	Chance for human error to occur from the time a nurse starts looking for medication until the time the nurse gives the residents medication	1	3	2
Controlled Substances -	constraints placed on controlled substances to decrease diversion; ability for the system to monitor who accesses the pharmaceuticals, and how many they can take	1	3	2
Time of Med Distribution	time of finding and preparing the medication for resident use	1	3	2
Face time with Residents	nursing time spent with residents for reasons other than medication distribution or treatment	1	3	2
Learning Curve	amount of time required to get accustomed to a system of medication distribution and work efficiently and independently in the system	1	2	3
Pharmacist time spent at facility	time for pharmacist to spend time at the facility monitoring medicine distribution.	3	2	1
Cost effectiveness	economic favorability	2	3	1
Approved by Board of Pharmacy	Board of Pharmacy approval or comfortablness with the system	3	1	2
Pharmaceutical Waste	tendency of system to produce pharmaceutical waste	1	3	2
Pharmacy courier trips	trips the pharmacy needs to make to the facility for first dose, medications, change in medications, or to bring more medications	1	3	2
Downtime	time to refill the system	2	3	2
TOTAL		**20**	**38**	**28**
3= most favorable option	2= next most favorable option	1= least favorable option		

Appendix N: Medication Distribution System Capabilities

Capability	Med Cart	Med Dispense™	Talyst InSite ™
Pharmacy profile mode	No	Yes	Yes
Resident name printed on medication	Yes	No	Yes
Medication organized by time	No	Yes	Yes
Access to only one type of medication	No	Yes	Yes
Access to only one dose of medication	No	No	Yes
Real time inventory	No	Yes	Yes
Automatic billing	No	Yes	Yes
Just in time distribution	No	Yes	Yes
Fingerprint user identification	No	Yes	Yes
Unit dose distribution	No	Yes	Yes
Reduces waste	No	Yes	Yes
Only pharmacy access to controlled substances	No	No	Yes
Automatic medication pass capability	No	No	Yes
Filled by pharmacist	No	Yes	Yes
Packaged by pharmacist	Yes	Yes	No
Electronically recorded transactions	No	Yes	Yes
Pharmacy Board Approval	Yes	Yes	No

Appendix M: Oak Hills' Drug Usage April-June 2009

This table has been created by consultant pharmacist Jay Vancura and his staff. Drugs are classified by type. If implementation of an ADS or Talyst InSite were to take place, this table should be used to help determine a formulary. Appropriate staff from Oak Hills, the consultant pharmacist, and the physicians that service Oak Hills's residents should use this table to help inform them about what medications to stock in the machine (see Appendix L for more information). High use pharmaceuticals should be placed in the machine, pharmaceuticals that serve the same purpose should be consolidated if possible, multiple doses should be eliminated if possible (use two 25mg doses instead of one 50mg dose), and generics should be used in favor of brand name medicines where possible.

The farthest right column contains numbers that correspond to how many times per day the medication was to be taken per day. It is time consuming and difficult to count how many PRN medications were taken. Therefore, PRN medications were counted as taken once daily. The larger the numbers in this column, the more often the medicine was to be taken.

Example calculation of a number in the farthest right column:

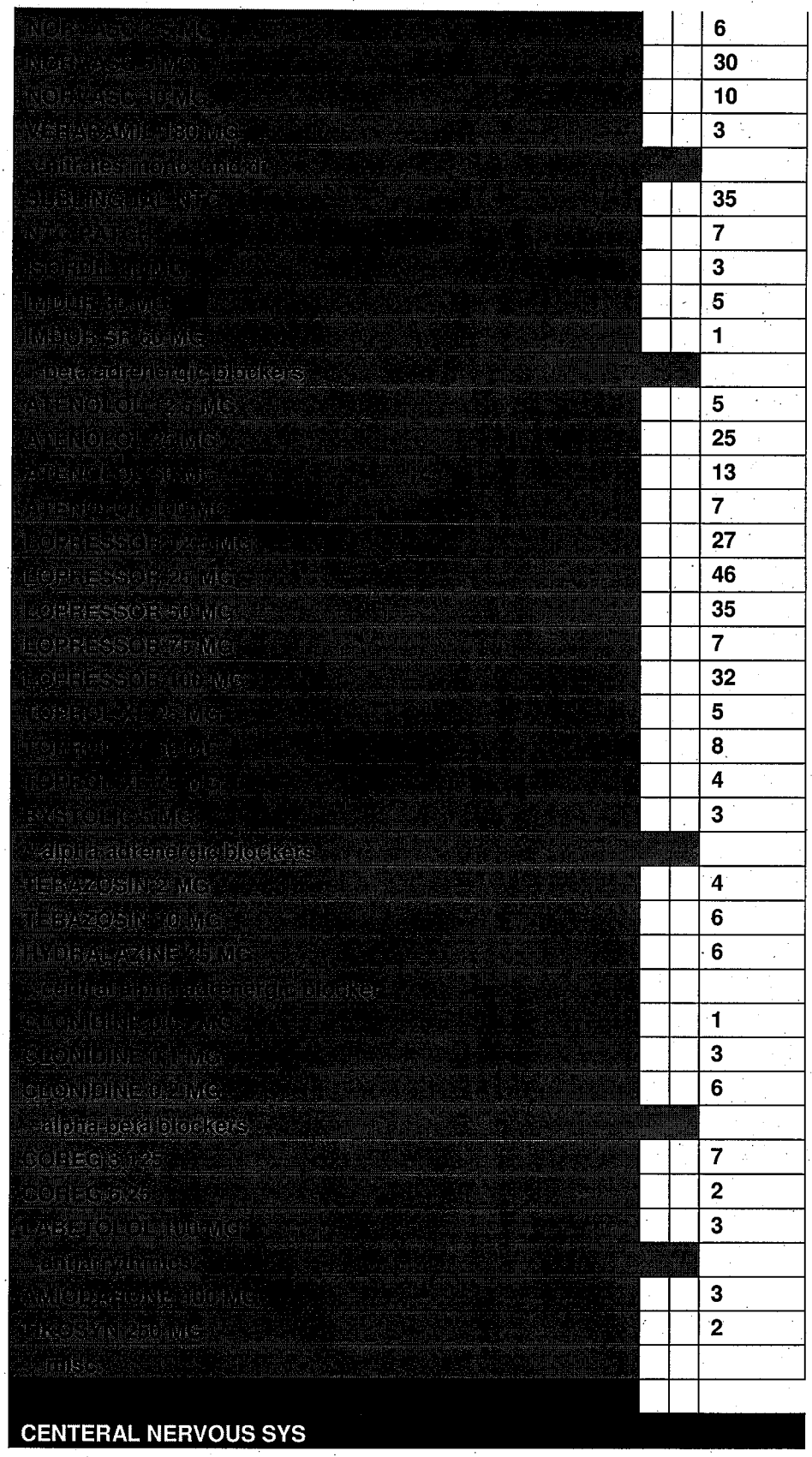
Percocet: **Resident A** takes the medicine BID, **Resident B** takes the medicine QD, and **Resident C** has a PRN prescription.

2 + 1+1 = 4. "4" would appear in the column to the right of Percocet

Drug Usage April 2009 to June 2009

Number of Residents			**276**
E.E.N.T. DRUGS			
-prostaglandin Inhibitor gtt			
-carbonic anhydrase Inhibitor gtt			
-alpha or beta blocker gtts			
-cholinergic gtts			
-ophthlamic corticosteroids			
-nasal corticosteroids			
-antibiotic gtts or oint			
Opthalmic Vitamins Oral			
OCUVITE			**21**
EYE VITAMIN			**3**
-tearing solutions / lubricants			
- misc.			
CARDIOVASCULAR DRUGS			
digitalis			
DIGOXIN 125			**13**
DIGOXIN 250			**3**
Diuretics - Loops			
LASIX 10 MG			**6**
LASIX 20 MG			**36**
LASIX 40 MG			**75**

LASIX 80 MG			18
BUMEX 0.5 MG			3
BUMEX 2 MG			3
DEMADEX (TORSEMIDE) 5 MG			3
DEMADEX 10 MG			2
DEMADEX 20 MG			15
-diuretics - Thiazides & Other			
ZAROXOLYN (METOLAZONE) 2.5 MG			12
ZAROXOLYN 5 MG			1
ALDACTONE (SPIRONOLACTONE) 25 MG			10
DYAZIDE			8
TRIAM/HCTZ 37.5/25 MG			3
TRIAM/HCTZ 75/50 MG			1
HYDROCHLOROTHIAZIDE 12.5 MG			8
HYDROCHLOROTHIAZIDE 25 MG			6
HYDROCHLOROTHIAZIDE 50 MG			3
-angiotensin coverl enzyme inhib			
LISINOPRIL 2.5 MG			3
LISINOPRIL 5 MG			11
LISINOPRIL 10 MG			20
LISINOPRIL 20 MG			27
LISINOPRIL 30 MG			3
LISINOPRIL 40 MG			11
MONOPRIL 20 MG			6
MONOPRIL 40 MG			3
BENAZAPRIL 40 MG			3
ENALAPRIL 20 MG			3
RAMIPRIL 1.25 MG			1
-angiotensin receptor blockers			
DIOVAN 40 MG			5
DIOVAN 80 MG			9
DIOVAN 320 MG			3
COZAAR 50 MG			11
-calcium channel blockers			
DILACOR XR 120 MG (DILTIAZEM)			4
DILACOR XR 240 MG (DILTIAZEM)			4
CARDIZEM LA 300 MG (DILTIAZEM)			3
CARDIZEM CD 240 MG			2
DILTIAZEM CD 240 MG			1
DILTIAZEM 180 MG			6
DILTIAZEM 240 MG			4
NIFEDIPINE 30 MG			2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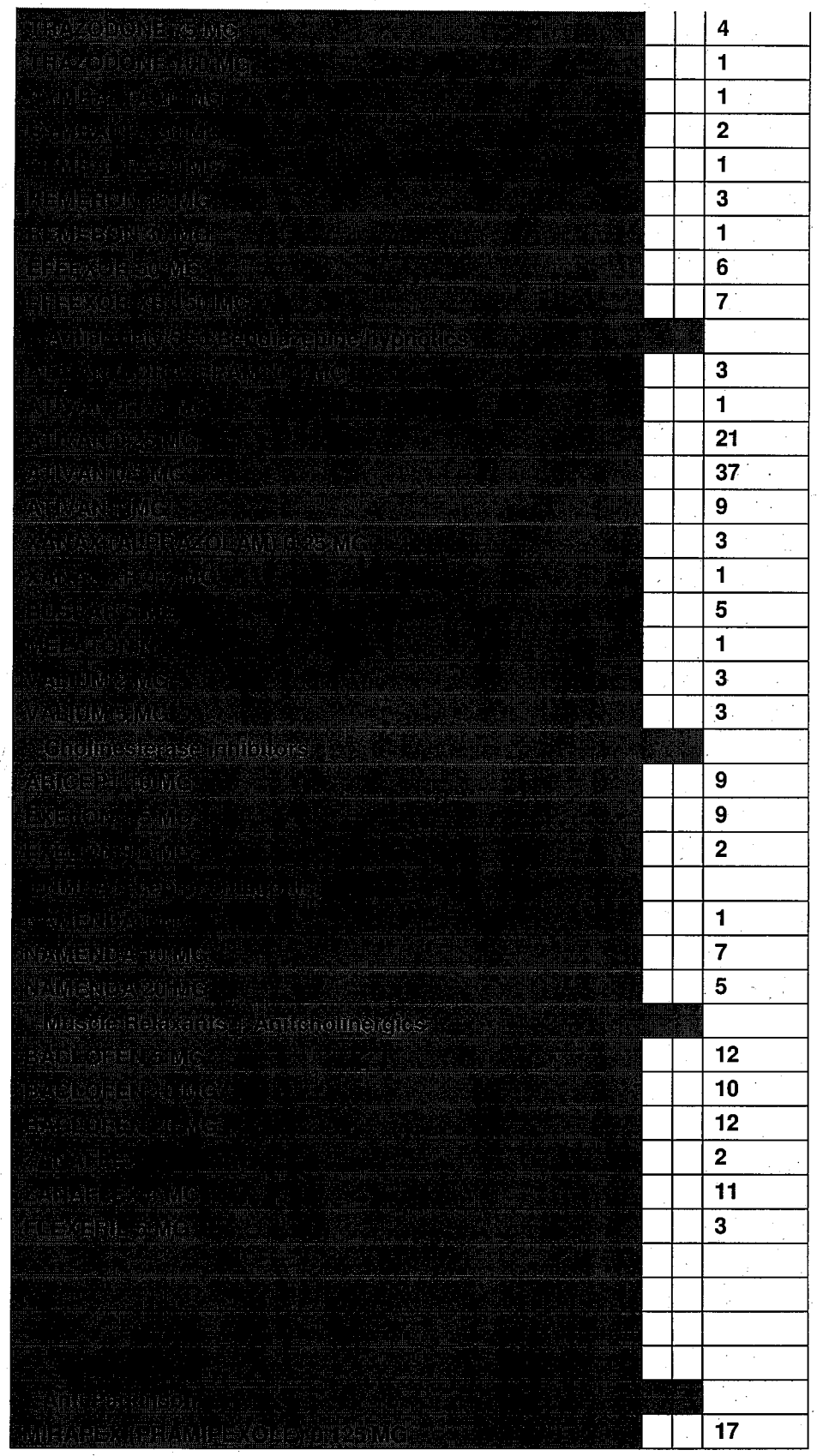
4
6
6
1
3
6
7
2
3
3
2
CENTERAL NERVOUS SYS

-Atypical Antipsychotics			
SEROQUEL 12.5 MG			12
SEROQUEL 25 MG			16
SEORQUEL 50 MG			0
SEROQUEL 100 MG			1
ZYPREXA 2.5 MG			4
ZYPREXA 10 MG			2
RISPERIDONE 0.25 MG			4
RISPERIDONE 0.5 MG			9
-Typical antipsychotics			
HALDOL 0.5 MG			6
HALDOL 2 MG			2
HALDOL 2.5 MG			1
-Antidepressant Tricyclic			
DOXEPIN 5 MG			3
DOXEPIN 100 MG			2
ELAVIL (AMITRIPTYLINE) 50 MG			3
NORTRIPTYLINE 100 MG			4
-Antidepressants SSRI			
ZOLOFT 12.5 MG			3
ZOLOFT 25 MG			3
ZOLOFT 50 MG			17
ZOLOFT 75 MG			3
ZOLOFT 100 MG			7
ZOLOFT 150 MG			6
CELEXA 5 MG			1
CELEXA 10 MG			7
CELEXA 20 MG			13
CELEXA 30 MG			1
CELEXA 40 MG			24
CELEXA 60 MG			6
PROZAC 5 MG			1
PROZAC 10 MG			3
PROZAC 20 MG			7
PROZAC 40 MG			2
PAXIL 10 MG			1
PAXIL 20 MG			4
LEXAPRO 10 MG			2
LEXAPRO 20 MG			4
-Antidepressants Other			
TRAZODONE 50 MG			7
TRAZODONE 150 MG			12



[redacted]			4
			1
			1
			2
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			1
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			1
			3
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			9
			9
			2
			1
			7
			5
			12
			10
			12
			2
			11
			3
			17

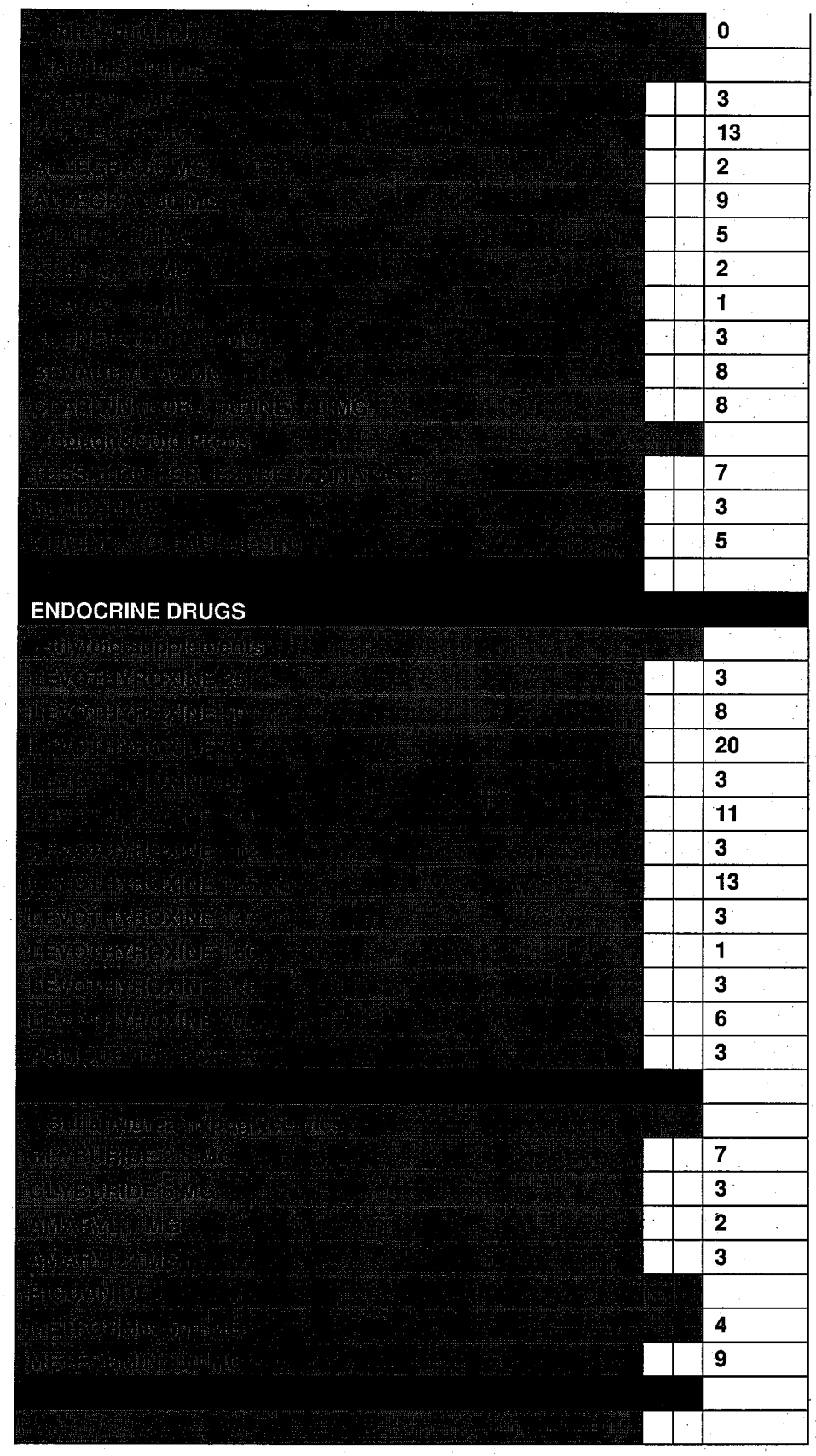
MIRAPEX (PRAMIPEXOLE) 1 MG			12
SINEMET CR 25/100 MG			12
SINEMET CR 50/200 MG			18
SINEMET 10/100 MG			6
SINEMET 25/100 MG			72
SINEMET 37.5/150 MG			13
SINEMET 50/200 MG			3
SINEMET 75/300 MG			3
COMTAN (ENTACAPONE) 200 MG			27
REQUIP 0.5 MG			7
REQUIP 1.5 MG			9
AMANTADINE 100 MG			5
AZILECT 0.5 MG			3
AZILECT 1 MG			3
Anti Seizure			
KEPPRA 500 MG			4
KEPPRA 1000 MG			6
KEPPRA 1500 MG			3
DILANTIN 200 MG			6
DILANTIN 300 MG			1
DILANTIN 500 MG			3
DILANTIN 250 MG			3
NEURONTIN 100 MG			3
NEURONTIN 300 MG			14
NEURONTIN 600 MG			6
PRIMIDONE 100 MG			1
BENZTROPINE 0.5 MG			1
DEPAKOTE 500 MG			3
DEPAKOTE SPRINKLES 125			4
DEPAKOTE SPRINKLES 250			2
LAMICTAL 100 MG			2
Analgesics - Opiate Cpds			
VICODIN 5/500 MG			81
VICODIN 7.5/750			2
MORPHINE 20			2
MORPHINE SOL 20 MG/5 ML			1
MORPHINE [illegible] MG			6
MORPHINE 30 MG			1
MORPHINE SR 15 MG			2
ROXANOL			5
ROXANOL 20 MG			2
MS CONTIN 30 MG			7

			14
			2
			4
			6
			6
			4
			4
			3
			3
			3
			1
			26
			4
			3
			1
			5
			2
			2
			4
			4
			12
			481
			85
			5
			7
			9
			14
			8
			1
GASTROINTESTINAL/ URINARY TRACT			
			0
			258
			18
			67
			5

BENEFIBER			3
--Laxative / Stool Softner			
COLACE 100 MG			59
PERI-COLACE			10
SURFAK 240 MG			5
--Antacids/Antidiarrheals/Antigas			
TUMS			39
ANTACID			14
IMODIUM (LOPERIMIDE)			8
GAS-X			2
--H2 blockers			
ZANTAC 75 MG			9
ZANTAC 150 MG			25
PEPCID 20 MG			2
--Proton Pump Inhibitors			
PRILOSEC (OMEPRAZOLE) 20 MG			74
PRILOSEC 40 MG			5
PROTONIX 40 MG			5
NEXIUM 40 MG			5
PREVACID 30 MG			1
--Peristaltic Stimulants			
REGLAN 2.5 MG			6
REGLAN 5 MG			6
--Urinary anticholinergics			
OXYBUTYNIN 5 MG			8
DITROPAN XL 5 MG			3
VESICARE 10 MG			3
SANCTURA XL 60 MG			2
ENABLEX 7.5 MG			2
--Urinary Alpha Antagonists			
FLOMAX 0.4 MG			8
PROSCAR 5 MG			5
CRANBERRY URINE ACIDIFIERS			19
--Other Antitestoterone			
AVODART 0.5 MG			3
ANTIEMETICS			
TIGAN 300 MG			3
ZOFRAN			3
COMPAZINE 10 MG			1
COMPAZINE 25 MG			4
COMPAZINE SUPP			3
MECLIZINE 12.5 MG			1

[redacted]			14
SUPPLEMENTS			
[redacted]			3
			3
			31
			62
			7
			5
			35
			7
			73
			74
			3
			10
			1
			3
			9
			5
			4
			11
			6
			3
			7
			4
			2
			2
			2
			1
BLOOD			
			114
			30
			27
			6

-hemmatinnic Iron, B12, Folic Acid			
FE GLUCONATE 324			19
FE SULFATE 325			22
IRON COMPLEX 150			5
IRON 50			1
SLOW FE			2
FOLIC ACID			2
VITAMIN B12 500 MCG			1
VITAMIN B12 1000 MCG			4
anticoagulant			
WARFARIN			44
-antineoplastic			
METHOTREXATE 7.5 MG			3
-HMG Co A Inhibitors			
LIPITOR 10 MG			12
LIPITOR 40 MG			3
SIMVASTATIN 10 MG			3
SIMVASTATIN 20 MG			14
SIMVASTATIN 40 MG			12
PRAVACHOL 20 MG			3
PRAVACHOL 40 MG			3
MEVACOR 20 MG			2
MEVACOR 40 MG			2
-Fibrates			
LOPID 600			14
-Fish Oil			3
-Bile Acid Sequestrants Chole Inhibitor			0
-Antigout			
ALLOPURINOL 100 MG			3
ALLOPURINOL 200 MG			7
ALLOPURINOL 250 MG			3
COLCHICINE 0.6			20
-Blood Misc. -erythropoietin			
PHOSLO 667			7
ANAGRELIDE 0.5			8
ZETIA 10 MG			4
RESPIRATORY DRUGS			
-Leucotriene Inhibitors			0
-beta agonist rapid acting			0
-beta agonist long acting			0
-Inh. Steroids			0


0
3
13
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ENDOCRINE DRUGS
3
8
20
3
11
3
13
3
1
3
6
3
7
3
2
3
4
9

-oral corticosteroids			
-disease modifying anti RA			
DECADRON			2
PREDNISONE 1 MG			2
PREDNISONE 5 MG			5
PREDNISONE 4 MG			3
-oral estrogens: antiestrogen			0
EVISTA 60 MG			1
-antirheumatoid drugs			0
-calcitonin			2
-biphosphonates			0
ACTONEL 35 MG			3
FOSAMAX 70 MG			6
-other			
ANTIBIOTICS			
-sulfonamide			
SEPTRA			1
BACTRIM			1
-macrolides			0
-penicillin			0
-cephalosporin			
CEPHALEXIN			1
-fluroquinolones			
LEVAQUIN			1
AVELOX			1
-nitrofurantoin			
MACROBID 50 MG			1
-tetracyclines			
DEMECLOCYCLINE 150 MG			1
-other			
TRIMETHOPRIM 100 MG			2

Appendix O: Relevant Minnesota Administrative Rules: Chapter 6800, Pharmacies and Pharmacists

151.01 DEFINITIONS
Subd. 30.**Dispense.**

"Dispense or dispensing" means the preparation or delivery of a drug pursuant to a lawful order of a practitioner in a suitable container appropriately labeled for subsequent administration to or use by a patient or other individual entitled to receive the drug.

6800.3100 COMPOUNDING AND DISPENSING.

Subpart 1.

Duties.

The practice of compounding and dispensing a prescription includes, but is not limited to, the following acts, which shall be performed only by a pharmacist, practitioner, or pharmacist-intern under the immediate and personal supervision of a pharmacist:

6800.3110 PATIENT MEDICATION PROFILES.
Subpart 1.
System required.

A patient profile record system must be maintained in all pharmacies for persons for whom prescriptions are dispensed. The patient profile record system must be designed for the immediate retrieval of information necessary for the dispensing pharmacist to identify previously dispensed medication at the time a prescription is presented for dispensing. One profile record may be maintained for all members of a family living at the same address and possessing the same family name.

Subp. 2.
Minimum information required; generally.

A reasonable effort must be made by the pharmacy to obtain, record, and maintain at least the following information regarding individuals obtaining prescription services at the pharmacy:

A.name, address, telephone number, date of birth or age, and gender;
B. individual history where significant, including disease state or states, known allergies and drug reactions, and a comprehensive list of medications and relevant devices being used showing the prescription number, the name and strength of the drug or device, the quantity and date received by the patient, and the name of the prescriber; if this information is obtained by someone other than the pharmacist, the pharmacist must review the information with the patient; and
C. pharmacist comments relevant to the individual's drug therapy, including, where appropriate, documentation of the following for each prescription:
(1) the pharmaceutical care needs of the patient;
(2) the services rendered by the pharmacist; and

(3) the pharmacist's impression of the patient's drug therapy.

This documentation is not required for residents of a licensed nursing home where a consultant pharmacist is performing regular drug regimen reviews.

Subp. 3.
Drug interactions, generally.

Upon receiving a prescription, a pharmacist shall examine the patient's profile record before dispensing the medication to determine the possibility of a harmful drug interaction or reaction.

Upon recognizing a potentially harmful interaction or reaction, the pharmacist shall take appropriate steps to avoid or resolve the problem which shall, if necessary, include consultation with the prescriber.

Subp. 4.
Drug use review for patients.

Upon receiving a prescription, prescription drug order, or prescription refill request for a patient, a pharmacist shall examine the patient's profile record and conduct a prospective drug review to identify:

A. overutilization or underutilization;
B. therapeutic duplication;
C. drug-disease contraindications;
D. drug-drug interactions;
E. incorrect drug dosage or duration of drug treatment;
F. drug-allergy interactions; or
G. clinical abuse or misuse.

Upon recognizing any of these drug-related problems, the pharmacist shall take appropriate steps to avoid or resolve the problem which shall, if necessary, include consultation with the prescriber.

For the purpose of meeting the requirements of this subpart, a pharmacist may rely on computerized medication profile review. The review must scan all prescriptions received by the patient at the pharmacy during the previous six months and conduct the prospective review required in this subpart. The pharmacist-in-charge must develop procedures restricting "override" decision making regarding computer-identified drug problems at the pharmacy and include these procedures in the written procedures required under part 6800.3950.

6800.3200 PREPACKAGING AND LABELING.
Subpart 1.
Prepackaging.
Pharmacies may prepackage and label drugs in convenient quantities for subsequent complete labeling and dispensing according to United States Pharmacopeia, chapter 1146. Such drugs shall be prepackaged by or under the direct supervision of a pharmacist. The supervising pharmacist shall cause to be prepared and kept a packaging control record containing the following information:
A. date;
B. identification of drug: name, dosage form, manufacturer, manufacturer's lot number, strength, and manufacturer's expiration date if any;
C. container specification;
D. copy of the label;

E. initials of the packager;
F. initials of the supervising pharmacist;
G. quantity per container; and
H. internal control number or date

6800.3400 PRESCRIPTION LABELING.

Subpart 1.

Requirements applicable to all drugs.

All drugs dispensed to or for a patient, other than an inpatient of a hospital shall be labeled with the following information:

A. name, address, and telephone number of pharmacy, central service pharmacies shall use the name, address, and telephone number of the pharmacy distributing the medication to the patient;
B. patient's name;
C. prescription number;
D. name of prescribing practitioner;
E. directions for use;
F. name of manufacturer or distributor of the finished dosage form of the drug;
G. auxiliary labels as needed;
H. date of original issue or renewal;
I. generic or trade name of drug and strength, except when specified by prescriber to the contrary. In the case of combining premanufactured drug products, the names of the products, or a category of use name shall suffice. In the case of compounding basic pharmaceutical ingredients, the common pharmaceutical name, if such exists, the names and strengths of the principle active ingredients or a category of use label shall suffice;
J.prescriptions filled as part of a central service operation shall bear a unique identifier to indicate that the prescription was filled at a central service pharmacy; and
K. after July 1, 2008, any dispensed prescription medication shall be labeled with its physical description, including any identification code that may appear on tablets and capsules.

Subp. 2

Small container labeling.

In cases where the physical characteristics of the immediate container of the medication do not permit full labeling, a partial label containing, at a minimum, the patient name and the prescription number may be placed on the container and the complete labeling applied to an appropriate outer container.

Subp. 3

Customized patient medication packages.

In lieu of dispensing two or more prescribed drug products in separate containers, a pharmacist may, with the consent of the patient, the patient's caregiver, or the prescriber, provide a customized patient medication package as defined in the United States Pharmacopeia (USP), chapter 661, standards.

PREMNUM	ADDRESS	Xcel's premise description	My Descrip	POSTALZONE	METERNUM	INVOICE $	THERMS	total	Therms
303566410	130 MACALESTER ST	HEATING PLANT		55105	000000198483	$1,544,779	1,822,352	79.3%	801,479
304105969	125 SNELLING AVE S		Rec Ctr	55105	000010001766	$71,118	62,595	2.7%	62,434
303600033	1600 GRAND AVE	CAMPUS CTR		55105-1801	000000700495	$81,579	82,361	3.6%	28,643
303335822	130 MACALESTER ST	ART DEP KILN		55105	000000710318	$108,051	103,899	4.5%	25,041
302390951	77 MACALESTER ST	ADMINISTRATIVE BLDG		55105-1956	000001002184	$27,890	24,647	1.1%	9,342
302744930	37 MACALESTER ST	RESIDENCE HALL	(Cultural House)	55105-1966	000000883965	$19,474	17,845	0.8%	5,026
303850176	1644 SUMMIT AVE	ALUMNI HOUSE		55105-1830	000000465174	$19,032	17,322	0.8%	4,852
303126247	179 SNELLING AVE S	STADIUM		55104	000000908149	$12,979	11,989	0.5%	3,763
303553403	1632 SUMMIT AVE	WALLACE RES HALL		55105-1828	000000967137	$10,244	9,691	0.4%	3,390
302208988	85 SNELLING AVE S	KIRK RES HALL		55105	000000594820	$7,725	6,868	0.3%	2,792
302911397	1607 GRAND AVE	DOTY RESIDENCE HALL		55128-4224	000000594732	$5,644	4,940	0.2%	2,433
302548403	1605 GRAND AVE		Health Center	55105	000000941942	$7,804	6,198	0.3%	2,182
303210581	16 CAMBRIDGE ST	DENTON RES HALL		55105-1803	000000649990	$5,240	4,402	0.2%	1,339
303104314	21 SNELLING AVE S	KAGIN COMMONS		55105	000000950210	$4,231	2,383	0.1%	881
303193957	1594 SUMMIT AVE	DUPRI RES HALL		55105-1828	000000594806	$3,060	1,657	0.1%	194
Off main campus									
303528146	36 SNELLING AVE S	1968020734/LAMPERT BLDG		55105-1802	000000480966	$41,786	38,007	1.7%	10,513
303054377	1679 GRAND AVE	2ND&3RD FL APARTMENTS		55105-1805	000000882109	$37,931	32,972	1.4%	8,592
303433001	1798 ASHLAND AVE	HALLS	(house - off Campus)	55104-6041	000000361240	$30,600	26,508	1.2%	7,905
303487307	1595 GRAND AVE	HEALTH CTR	???	55105	000000611938	$12,364	10,875	0.5%	3853
302188057	9550 INVER GROVE TRL	ORDWAY NATURE CENTER/IGH		55076-3816	000000396078	$9,196	8,382	0.4%	3,232
304161792	1595 GRAND AVE	This looks different from the previous Health Center	???		000020172488	$8,126	7,591	0.3%	
302760179	1579 GRAND AVE	SCOTSDALE	???	55105-2229	000000582813	$2,586	1,587	0.1%	487
Grand Total						$2,071,440	2,305,071		987,886

I defined the Main campus as area bounded by Snelling, Summit, St Clair and Cambridge – I assume steam lines do not run outside of this area.

Yellow indicates partial consumption data – generally 10/05-9/08, light yellow is 10/08-2/09
Pink indicates different premise and meter numbers for the same street address
Tan indicates meters that have a space heating profile
Blue indicates meters that are for summer water heating or cooking uses only