

**PHARMACIES AND MEDICATION ADHERENCE:  
A CUSTOMER-ORIENTED OPPORTUNITY ANALYSIS**

by

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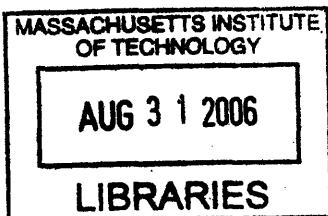
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**ABSTRACT**

Medication non-adherence is one of the most costly and difficult problems in healthcare today. In the United States alone, half of the 3.5 billion prescriptions dispensed are not taken as prescribed, costing our healthcare system an estimated \$100 billion. Ten percent of all hospitalizations and 125,000 deaths each year are attributable directly to non-adherence to medicines. Medication non-adherence is a complex, multi-faceted problem and potential ways to increase adherence to medications traditionally have focused on the physician – patient relationship. However, medication dispensing requires an additional interaction between the pharmacy and patient, and properly-incentivized pharmacies employing unique adherence programs may be capable of enhancing adherence above and beyond existing methods.

This thesis explores how traditional chain and independent drugstore pharmacies 1) prioritize medication adherence; and 2) may benefit from instituting medication adherence programs. The hypothesis tested was that pharmacies would benefit substantially from instituting adherence programs. Data from interviews, company financials and industry reports were used to quantify a value proposition for the drugstore pharmacy. Interviews revealed a strong disconnect in emphasis placed on medication adherence between pharmacy schools (strong emphasis) versus pharmacies (moderate to weak emphasis). Within subgroups of pharmacies, chain and independent drugstore pharmacies placed lower priority on medication adherence compared with specialty and hospital pharmacies. Data collected for this thesis also indicated that a 25% increase in medication compliance would increase a community drugstore's annual revenues by \$1.7 M and annual gross profits by over \$400,000. These findings indicate that an untapped opportunity exists for drugstore pharmacies to boost revenue by investing in technologies and services to increase medication adherence.

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## OVERVIEW OF MEDICATION NON-ADHERENCE

Medications represent one of the most important and widely used tools for the treatment and prevention of disease. Many medications, particularly those prescribed for chronic disease, require periodic doses on a scheduled basis. For example, a patient with hypertension may be instructed to take an antihypertensive tablet twice a day, without fail. Health care providers typically prescribe an allotment of each medication and then rely on the patient to purchase the medication and use it faithfully. Under these circumstances, the health care provider merely assumes that the patient will follow his or her instructions. In clinical parlance, the health care provider is said to assume the patient will demonstrate *compliance* or *adherence* to the prescribed therapy. A widely appreciated flaw in this system is that patients often fail to fill prescriptions or use them as directed. A particular problem is that patients miss scheduled doses. The phenomenon of failing to take medications as prescribed is called “noncompliance”, or more recently “nonadherence.”

Medication nonadherence is an enormous burden to the world’s health care system.

**Approximately half of the approximately 3.5 billion annual prescriptions dispensed in the United States are not taken as prescribed [1].** Poor adherence to medication schedules leads to a significant worsening of disease, death, and increased health care costs in the U.S. [2-4].

Between 33 and 69 percent of all medication-related hospital admissions (about 10% of all hospitalizations) in the U.S. are due to poor medication adherence, costing the health care system \$100 billion each year [1]. Most data on medication nonadherence have been collected from studies performed in the United States, although evidence suggests that these trends apply to the rest of the world as well.

The problem of medication nonadherence affects patients with all diseases but patients with chronic asymptomatic illnesses are especially vulnerable. This is because patients do not see an immediate benefit from taking their medications and in general feel no different day-to-day whether or not they adhere to their medication regimens. For example, half of patients taking a “statin” drug (hydroxymethylglutaryl-coenzyme A reductase inhibitor) for asymptomatic hypercholesterolemia will discontinue their medications entirely within six months of starting therapy [5]. Similar difficulties in medication adherence can be observed with hypertension. In addition to these and other chronic asymptomatic illnesses, patients with psychiatric diseases also have difficulty adhering to medication schedules. For example, nearly two-thirds of patients with bipolar disorder will not adhere to their prescribed dosing schedules [6]. Similar difficulties to medication adherence can be observed with children being treated for a variety of illnesses [7].

Given the personal, social, and economic costs of noncompliance, the reasons for this phenomenon have been studied in detail. An important aspect of medication nonadherence is that the majority of deviations from prescriptions occur through omissions of doses and delays in timing of the doses, rather than additions of doses [8]. Many patients exhibit “white-coat adherence,” which is an improvement in medication adherence in the 5 days before and after a doctor’s appointment [9]. In general, six distinct patterns of medication taking behavior have been observed. One-sixth of patients demonstrate nearly perfect adherence to a medication schedule; one-sixth have minimal irregularity of dose timing only; one-sixth miss an occasional daily dose as well as demonstrate irregularity of dose timing; one-sixth take 3-4 “drug holidays” (days to weeks without taking prescribed medication) per year and, in addition, occasionally

omit doses; one-sixth have drug holidays once every month or more and also frequently omit doses; and one-sixth take few, if any, of their prescribed doses despite giving the impression to healthcare providers that they are adhering to their medication schedules [10, 11]. Patients give one or more of the following reasons when asked why they did not adhere to a particular medication schedule: forgetfulness (30%), other priorities (16%), decision to omit doses (11%), lack of information (9%), emotional factors (7%), no reason given (27%) [1]. Race, gender, and socioeconomic status have not been consistently associated with medication nonadherence.

Clinicians and researchers generally group methods of improving adherence into four categories. The first category, patient education, involves teaching the patient the benefits of strict medication adherence and the harms of deviating from the schedule. The second category, improved dosing schedules, aims to have the patient take multiple medications at the same time each day, as well as to decrease the frequency of doses, since rates of adherence have been shown to increase with once daily schedules compared with more frequent dosing schedules [12]. The third category is to decrease the waiting times for patients to see physicians and also to pick up their medications from pharmacies. The fourth category is to improve overall communication between physicians and patients, thereby enhancing the overall relationship and trust that could lead to increased rates of medication adherence. All of these methods have shown only limited success in improving the rates of medication adherence. **Successful methods are often highly complex and require intense labor by the payer and health care professional.** Therefore, innovative and practical strategies need to be developed and put to routine clinical use [1].

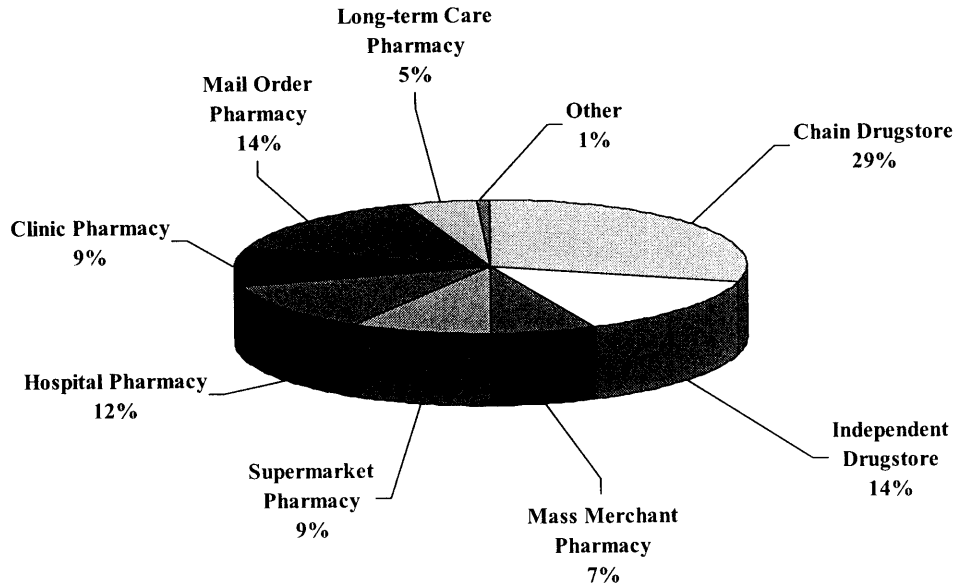
## OVERVIEW OF THE U.S. PHARMACY INDUSTRY

A patient interacts with many healthcare professionals before receiving medications. The final and common step in these interactions is that between the patient and pharmacist. An overview of the U.S. pharmacy industry therefore is essential in analyzing opportunities in enhancing adherence to medications.

Patients receive their prescribed medicines through a variety of pharmacy types (**Fig 1**). In general, the different pharmacies can be categorized as retail pharmacies (traditional chain drugstores, independent drugstores, mass merchant pharmacies, supermarket pharmacies and mail-order pharmacies), institutional pharmacies (clinic and hospital pharmacies), and specialty pharmacies (long-term care or home-health pharmacies).

**Retail pharmacies continue to be the most important source of prescriptions for most Americans.** In 2004, retail pharmacies dispensed 75% of all prescriptions and accounted for 94%, or \$221 billion, of the revenue generated through all pharmacies [13]. **Figure 2** shows the breakdown of retail prescription drug sales by store type. As evident from this figure, traditional chain and independent drugstores account for nearly 60% of all retail drug sales.

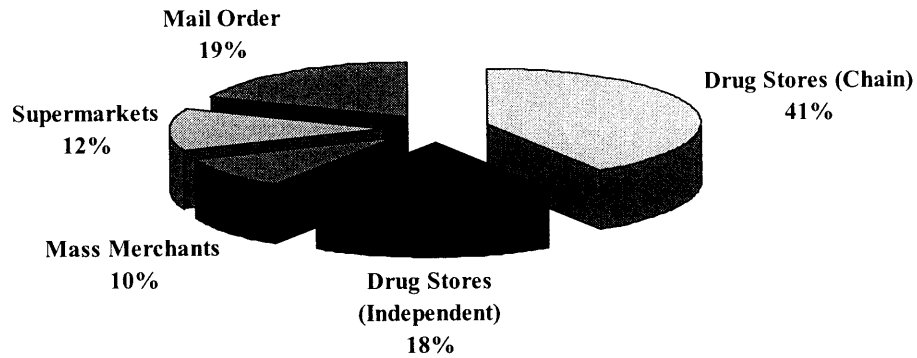
**Figure 1: Retail prescription drug sales by store type**



source: NACDS

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**Figure 2: Retail Pharmacy Prescription Drug Sales by type of Store (2004)**



sources: IMS HEALTH and NACDS Economics Department

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The United States retail pharmacy industry is a staple of the American culture with a rich history and rapid evolution throughout the past century. Today's retail pharmacy plays a key role in a dynamic retail environment. Pharmacies may be located within any store and one way to



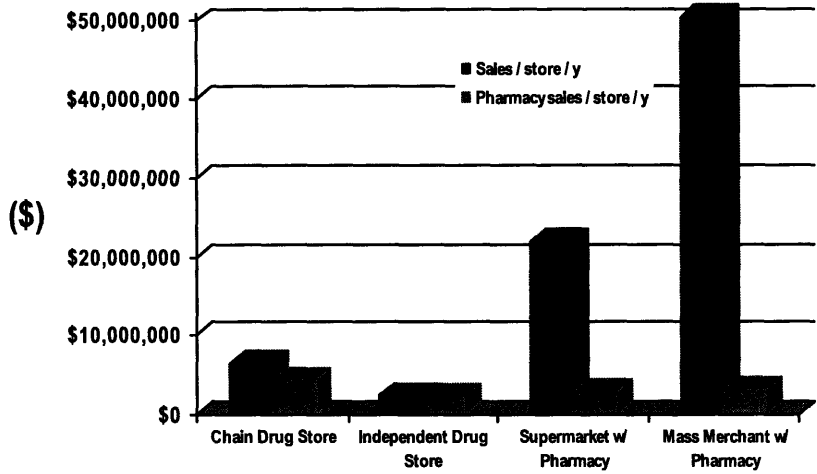
distinguish retail pharmacies is to differentiate drugstores from mail-order pharmacies. The term “drugstore” can be defined as any store where prescriptions are filled and drugs or other articles are sold [13]. For the purposes of this thesis, drugstores are further distinguished from Mass Merchants (e.g. Wal-Mart, Target) and Supermarkets whose main area of business is sales of non-pharmacy related merchandise. In contrast, **drugstore revenues are primarily derived from in-store pharmacies**. For traditional chain drugstores (e.g. CVS, Walgreens), the percent revenue generated from in-store pharmacies averages 70% [13-15]. For independent drugstores, pharmacy revenues account for over 90% of total revenues [14].

Given the significant medication adherence opportunity inherent within harnessing the pharmacist – patient relationship, this thesis further examines chain and independent drugstore pharmacies.

### *Drugstore Pharmacies*

The importance of the pharmacy to drugstores is underscored by comparing the average per store sales between traditional chain drugstores, independent drugstores, supermarkets with pharmacies, and mass merchants with pharmacies. As shown in **Figure 3**, pharmacy sales account for nearly 75% of all revenues generated by drugstores. Traditional chain drugstores generate 68.27% of their sales from the pharmacy, whereas independent drugstores generate nearly all (94.51%) of their sales from their pharmacies [13]. In contrast, supermarkets and mass merchants do offer pharmacy services in many of their stores but the pharmacy makes up only a small fraction of these stores’ overall sales.

**Figure 3: Average annual total and pharmacy sales per store type (2004)**

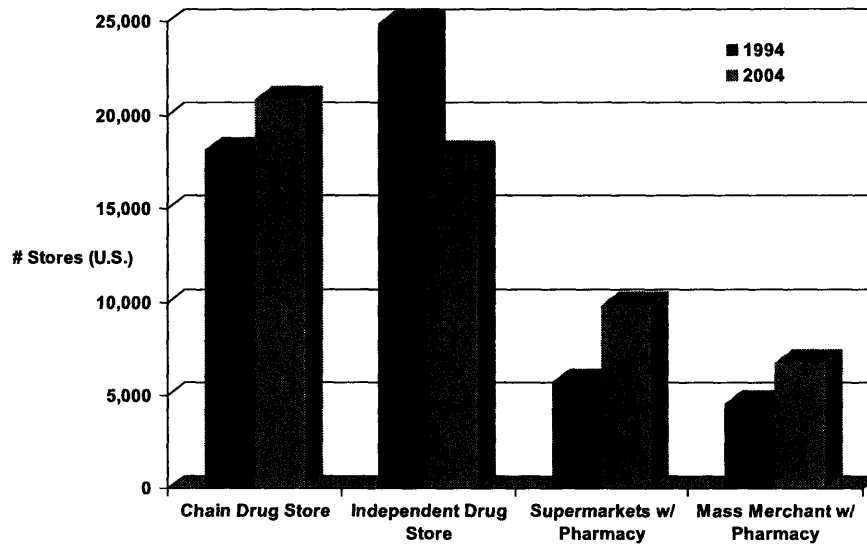


*Sources: United States Dept of Commerce, Retail Sales Data, and IMS HEALTH Manufacturer Sales plus Retail Margin*

The retail pharmacy industry has continued to consolidate over the past decade. Chain pharmacies, which include traditional chain drugstores as well as supermarket and mass merchant pharmacies, are increasing their total share of the retail pharmacy industry and now account for over 2/3 of all retail pharmacies in the United States [16]. There were approximately 55,000 retail pharmacy outlets in the United States in 2004. As evident in **Figure 4**, the number of independent drugstores has declined considerably from 1994 (24,862 stores) to 2004 (17,931 stores), a decline of over 30% in 10 years. During the same period, chain drugstores have continued to buy independent stores and open new stores. In 1994, the number of chain drugstores was 18,103, and this number has grown to 20,849 within 10 years. Note from the figure that the number of supermarkets and mass merchants with pharmacies has also grown considerably. This latter trend is an important competitive threat for traditional drugstores; mass merchants’ business model focuses chiefly on offering “everyday low prices” [17] – including in

their pharmacies – and **traditional drugstores cannot compete with mass merchants on price alone.**

**Figure 4: Community retail pharmacy outlets by store type (1994 and 2004)**



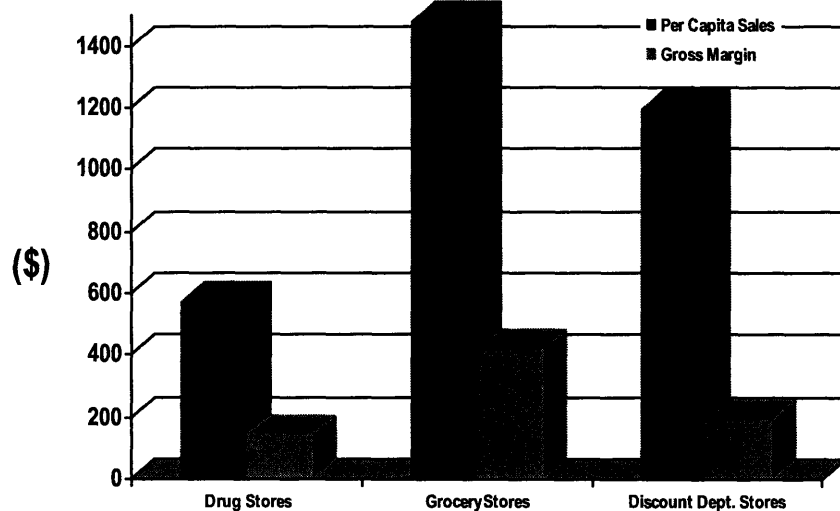
*Sources: NACDS estimates from IMS HEALTH and NCPDP data*

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As a result of continuing market share loss to mass merchants, one important trend in the drugstore industry continues to be the value placed on convenience: “a drugstore in every corner” [16]. Every effort is made by large chain drugstores to have a ubiquitous presence. There is a community pharmacy within 5 miles of nearly every American [13]. Most drugstores (over  $\frac{3}{4}$ ) are located in metropolitan areas, where the average distance to a retail pharmacy is 1.09 miles [13]. Chain drugstores are more concentrated in urban areas (over 80%) than are independent pharmacies (65%) [13].

In 2004, the average individual spent \$598 in drugstores, or approximately \$50 per month [15]. These per capita sales have increased over 90% from 1994 to 2004 at a rate of 6.7% per year [13, 15, 16]. Gross margins across all drugstores were approximately 25%, which have remained relatively flat since the early 1990s [15]. **Figure 5** compares 2003 per capita sales and gross margins as a percent of sales across drugstores, grocery stores and discount department stores. As evident from the Figure, drugstores have respectable sales and gross margins when compared with other retailers. However, the overall drugstore operating margins remain low (often 6% or less) compared with many other industries, especially the pharmaceutical industry, which enjoys margins of approximately 20% [18].

**Figure 5: Per Capita Sales and Gross Margin (in dollars / consumer / y) for select types of stores (2003)**

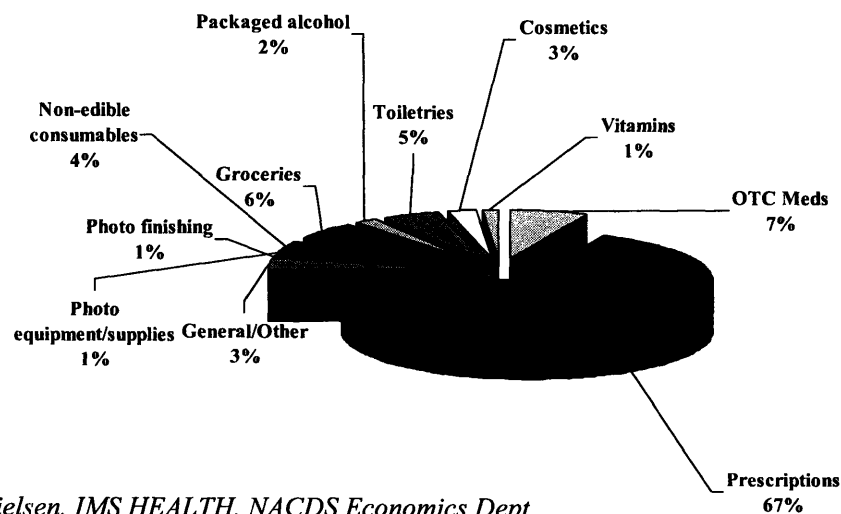


Sources: Annual Retail Trade Survey, U.S. Bureau of Census, and Dept. of Commerce retail sales data and Census Estimates

Prescription drugs are the most important revenue source of drugstores, generating nearly 70% of all revenue for the industry. However, **most stores, especially chain drugstores, rely heavily on front-end (non-pharmacy) sales to generate profit.** The reason is that, although the pharmacy continues to be an important revenue stream for drugstores, operating margins from pharmacy sales are exceedingly thin. For an average prescription sale of \$64, the pharmacy retains, on average, only \$2 for income [14]. These thin margins are therefore compensated in part by front-end sales, which generally have higher margins. Indeed, in the drugstore industry, while the pharmacy is viewed as a traffic driver, the front-end sales are responsible for generating profit.

Because front-end sales are important for overall drugstore margins, drugstores offer a mix of merchandise to their customers. The average “basket-size” of customers shopping the front-end is approximately \$22 [19-21]. Consumers purchase a variety of merchandise (**Figure 6**).

**Figure 6. Chain Drugstore Merchandise Mix (2004)**



Source: ACNielsen, IMS HEALTH, NACDS Economics Dept.

The pharmacy remains the backbone of the drugstore industry, driving 70% of the revenues in large chains and 90% of the revenues in independent drugstores [14]. In 2004, traditional chain drugstores dispensed 1.51 billion prescriptions for a total of \$90.6 billion in sales, whereas independent drugstores dispensed 728 million prescriptions for a total of \$40.5 billion in sales [13].

In 2004, approximately 115,000 pharmacists worked at chain community pharmacies, whereas only 24,000 pharmacists worked at independent drugstores [13]. California (13,610) and New York (8,122) had the largest number of pharmacists [13]. Massachusetts had 3000 pharmacist jobs in 2004 [13]. The median hourly wage of pharmacists was approximately \$40 in 2004 [13, 16].

In conclusion, **drugstore pharmacies are low-margin, high-volume “traffic-drivers” that make up the core of a drugstore’s business.** They operate in an increasingly competitive environment and are threatened by discount pharmacies within large mass-merchant stores and supermarkets. In order to stay competitive, drugstore pharmacies have turned to convenience as their key value proposition for their customers.

### *Pharmacies and prescription medications*

Prescription drugs account for approximately 10% of all healthcare costs in the United States [22]. The NACDS estimates that the number of prescriptions to be dispensed will increase by

over 20% over the next 4 years to 4.1 billion in 2010 [13]. Prices for prescriptions dispensed at drugstore pharmacies continue to climb. **The average prescription price in 2004 was \$63.59**, up from \$59.52 in 2003 [13]. There was a large price gap between brand and generic drugs sold in pharmacies. The average brand drug prescription price was \$95.54 in 2004, up 11.7% from 2003 [23]. In contrast, the average generic drug prescription price was \$28.71 in 2004, up only 3.5% from 2003 [24]. This 70% gap in prescription prices between brand and generic prescriptions puts pharmacists at the heart of a heated debate about the substitution of generics for brand name drugs, a change that has the potential to drive down prescription-related healthcare costs. A 1996 survey indicates that only 21% of chain drugstore pharmacists and 31% of independent pharmacists chose “least expensive generic available” as the deciding factor to stock or administer a drug [25], suggesting that most pharmacists do not prioritize generic substitution highly. In general, decisions about which drugs to stock are made without engaging the individual pharmacist. However, as discussed below, pharmacies have a financial incentive to substitute generics for brand-name drugs and may play a more active role in generic substitution in the years to come.

For a typical prescription paid for in cash (average 2004 price of \$63.59), the manufacturer receives the majority of the price (\$48.65, or 76.5%). The wholesaler receives \$2.18 (3.4%) and the retail pharmacy receives \$12.77 (20.1%) [14]. However, the example does not take into account the dispensing cost of the pharmacy, which is often \$7 or more per prescription [26]. With the dispensing cost taken into account, the gross profit margin is less than 10% [26, 27].

**The retail pharmacy often obtains a significantly higher gross profit percent for generic medicines compared with brand prescriptions, due in part to being able to charge a higher percentage dispensing fee for generics and in part to receiving a higher discount from the manufacturer for ingredient cost. Table 1 illustrates this point for a typical 30 day, \$30 generic prescription versus a \$100 brand prescription. The average wholesale price (AWP) is the base price used to calculate payer reimbursement to pharmacies.**

**Table 1: Comparison between generic and brand drug gross margins for retail pharmacies**

	<u>Generic</u>	<u>(% AWP)</u>	<u>Brand</u>	<u>(% AWP)</u>
Average Wholesale Price (AWP)	\$30.00	100%	\$100.00	100%
Collected Dispensing Fee (\$)	\$6.00	20%	\$5.00	5%
Discount from Payer (\$)	-\$9.00	-30%	-\$15.00	-15%
Ingredient Cost	-\$15.00	-50%	-\$75.00	-75%
<b>Gross Profit / Rx</b>	<b>\$12.00</b>	<b>40%</b>	<b>\$15.00</b>	<b>15%</b>
Dispensing Costs	-\$8.00	-27%	-\$8.00	-8%
<b>Gross Profit / Rx (after disp. Cost)</b>	<b>\$4.00</b>	<b>13%</b>	<b>\$7.00</b>	<b>7%</b>

*Sources: First DataBank & Thomson Medical Economics reports, and Deutsche Bank estimates*

*(November 2004 report on Retailing/Food & Drug Chains)*

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As evident from this example, the percentage gross profits for generic prescriptions are considerably greater than for brand medications. Because retail pharmacies can obtain higher margins from generic versus brand prescriptions, they have a greater incentive to fill generics and substitute generics for brand prescriptions. In addition to legal and payer mandates regarding generic substitution, these financial incentives for pharmacies may have accounted for the brand/generic mix breakdown to move from 60% / 40% in 1994 to nearly 50% / 50% in 2004 (Table 2).



**Table 2: Brand/Generic mix of prescription drug prices and dispensing frequency**

<i>Year</i>	<i>Average Rx price (\$)</i>	<i>Brand Rx price (\$)</i>	<i>% Brand of all Rx</i>	<i>Generic Rx Price (\$)</i>	<i>% generic of all Rx</i>
<b>1994</b>	\$28	\$37	61.2%	\$14	38.8%
<b>2004</b>	\$64	\$96	52.2%	\$29	47.8%

*Sources: IMS HEALTH, NDCHealth, NACDS Economics Department*

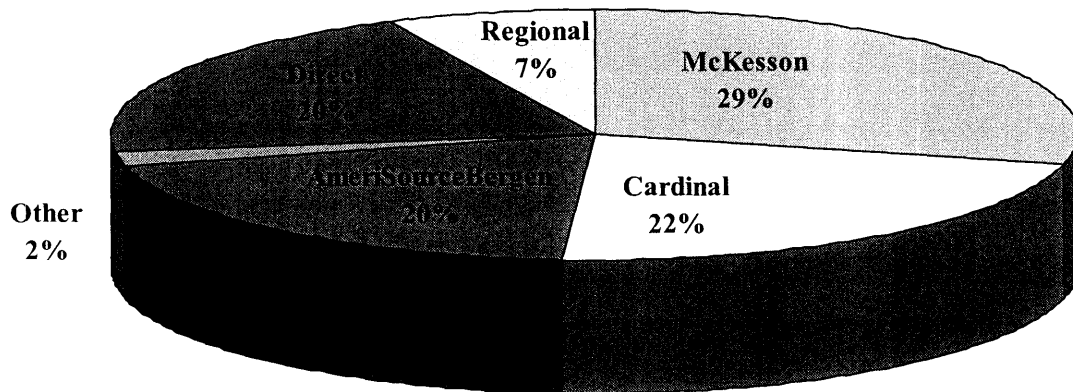
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**In sum, drugstore pharmacies receive discounts to substitute generics for brand drugs; even when not required to substitute, they are increasingly likely to do so in order to maximize their thin margins.**

### *Pharmacy drug suppliers*

Pharmacies receive medications either directly from manufacturers or from wholesalers. Only 20% of medications that arrive at pharmacies are shipped directly from pharmaceutical manufacturers [28]. The rest arrives through both regional and national distributors, which compete in a \$235 B pharmaceutical wholesaling marketplace. Three main distributors take over 70% of the market share in the industry: McKesson, Cardinal Health and AmeriSourceBergen (**Figure 7**). These “big three” account for 90% of the national pharmaceutical wholesaling marketplace [28].

**Figure 7: Market share of pharmacy suppliers**



Source: Deutsche Bank

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Large distributors contract with multiple chain and independent pharmacies and provide a myriad of services to automate pharmacy operations (e.g. robotic dispensers), streamline inventory management, and re-package medications to fit the pharmacy's needs (e.g., compliance packaging) [28].

**Chain pharmacies provide relatively low margins to distributors** but also make up the bulk of the large distributors' business. For example, CVS pharmacy accounted for 18% of Cardinal Health's revenue in 2004 [28].

In contrast, **distributors extract high margins from independent pharmacies**, which do not have sufficient purchasing leverage to negotiate aggressively with distributors. Furthermore, many independent pharmacies use other value-added services that are offered by distributors, such as automation tools and inventory management systems [28].

## **DRUGSTORE PHARMACIES AND MEDICATION ADHERENCE**

Traditional chain and independent drugstore pharmacies directly interact with millions of patients each year in order to hand-deliver prescriptions. The pharmacist might be able to help improve patients' compliance. Therefore, in an effort to evaluate the attractiveness of opportunities to enhance medication adherence, interviews with a spectrum of pharmacists were conducted to better understand the priority that pharmacists place on medication adherence.

### *Methodology*

The HealthNet Pharmacy Directory [29] was used to identify all Massachusetts Pharmacies and 45 pharmacies in the Greater Boston Metropolitan area were contacted by phone with interview requests. In addition, business colleagues and interviewees were asked to identify individuals with a background or experience in the pharmacy industry. Seventeen structured interviews, either by phone or in person, were conducted between February 15, 2006 and April 15, 2006 with pharmacists representing a diverse number of specialties. The length of the interviews ranged between 15 minutes and 2 hours. Most interviews were conducted in person at the pharmacy in order to observe store layout, dynamics and overall environment that may impact medication adherence programs. The locations included independent, chain, specialty, hospital, university campus and long-term care pharmacies (i.e., those pharmacies servicing nursing homes, chronic mental care facilities, and other institutions caring for individuals on a long-term basis). When relevant, web searches and industry reports confirming or rejecting assertions made by the interviewees are also included and referenced.

**Table 3: Interviews conducted for this thesis**

<b>Title</b>	<b>Work environment</b>	<b>Type</b>	<b>Length</b>
Pharmacist	Independent	In-person	1 h
Pharmacist and Owner	Independent	In-person	1 h
Pharmacist and Owner	Independent	In-person	15 min
Pharmacy Manager	Specialty Pharmacy	In-person	1.5 h
Pharmacist	Hospital Pharmacy	Phone	30 min
Pharmacist	Hospital Pharmacy	In-person	15 min
Pharm. manager/MBA	Chain	In-person	2 h
Pharmacist	Former Chair, Mass. Pharmacy Association	In-person	30 min
Pharmacist & Manager	Chain	Phone	10 min
Pharmacist	Specialty Pharmacy and Pharma. Industry	Phone	1.5 h
Pharmacist	School of Pharmacy/Residency director	Phone	45 min
Pharmacist/former owner	Director of the Board of Pharmacy	In-person	1 h
Pharmacy Owner	Independent	Phone	45 min
Pharmacist	Independent	In-person	1 h
Pharmacy manager	Specialty	In-person	15 min
Pharmacist, Director of Pharmacy	University Campus	In-person	1 h
Pharmacist	Chain	Phone	15 min

### *General Work Environment*

It was found that **pharmacists, pharmacy managers and store owners have little control over their daily schedules** and in general work non-stop throughout the day in an effort to fill prescriptions on time. Very little down-time was observed. With the exception of a meeting with one independent pharmacy owner, all interviews were scheduled during off hours. Most pharmacists reported being frustrated with the lack of additional flexibility in their work schedules but did note that their week usually did not exceed 50 h of work. The shortage of pharmacists was the main reason given for the busy work schedules. Nearly half of the pharmacists reported that they were at least one “pharmacist short”; this was the most common reason for declining an interview request. Few pharmacists had time to take lunch breaks.

Pharmacists were observed to **work and maneuver around a relatively small space**.

Relatively little space was dedicated to dispensing and filling medications, whereas the majority of space was taken up by storage areas for medications. Employees were also frustrated by the lack of space, especially during peak hours when multiple pharmacists and pharmacy technicians were present within the same common space. Few or no chairs were found in the work spaces. The one exception to the crowded feel was found at a long-term care pharmacy, which enjoyed large tables and ample walking room. The owners of this long-term pharmacy noted that its large space was an attractant for freshly-minted pharmacists who had the option of signing up with larger chains for more lucrative salaries but a less “user-friendly work environment”.

Despite the hectic schedule and cramped work environments, most pharmacists tended to be **relatively happy with their career decisions** and noted that the high demand for pharmacists

had accounted for excellent salaries. A veteran pharmacist and store owner noted that “some of the large chains are offering new pharmacists a starting salary of \$110,000 plus a new BMW”. This comment was confirmed by conversations with young pharmacists, who reported overall that they had little to no difficulty in landing jobs, especially at chain drugstores. However, they did note that the downside was to work a “more-or-less monotonous day” filling prescriptions and calling doctor’s offices to confirm orders.

### *Key business drivers*

Pharmacy owners and managers were asked about how the pharmacy aims to extract more value from customers. All interviewees initially responded that the primary goal of the pharmacy was to educate the patient but on further questioning listed several important value drivers:

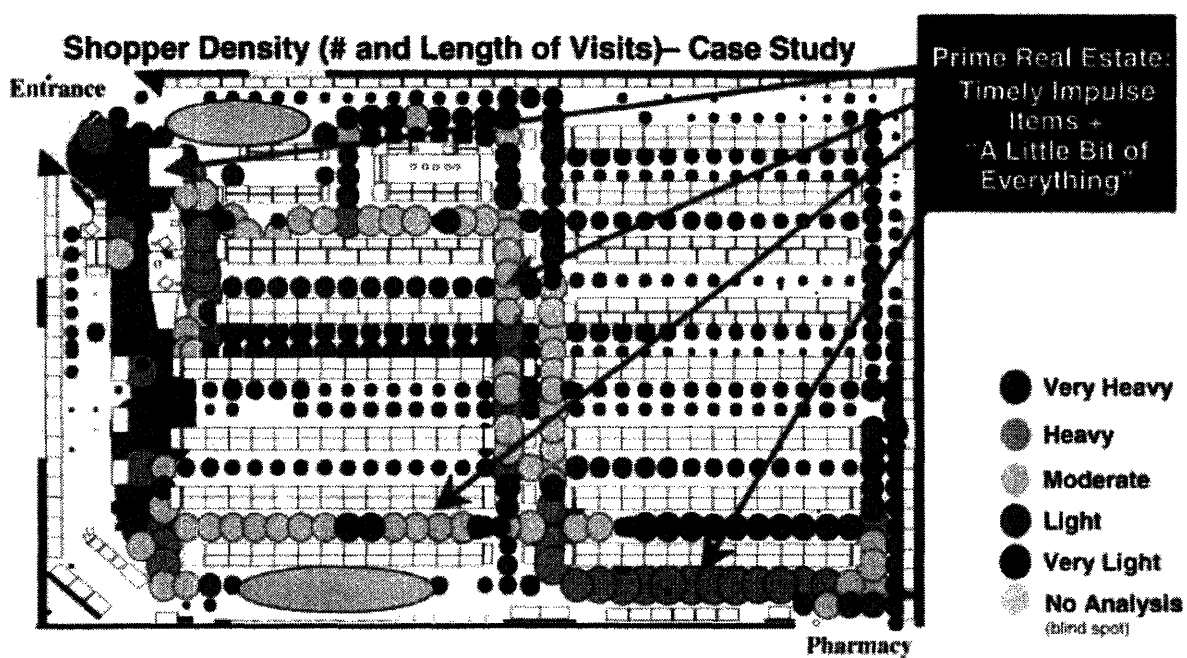
- **Increasing store traffic** – Both chain and independent drugstores valued increased store traffic but chain pharmacies placed considerably more emphasis on methods to increase store traffic. For example, large chain drugstores placed weekly promotional advertisements distributed by newspaper, radio, television, front-store flyers, website, and email to the general public. In contrast, few or no promotions were advertised by independent pharmacies. One reason for this difference, given by owners and managers of independent pharmacies, was that independent pharmacies often lacked the resources and cash necessary for promotions. Instead, as explained below, independent pharmacies focused on harnessing their relationships with their communities in order to increase store traffic. Both chains and independents acknowledged that in large chains, the primary role of the pharmacy was as a low-

margin “traffic-driver” so that customers who entered the store had an opportunity to shop the higher-margin front-end of the store. In contrast, independent pharmacies relied primarily on their pharmacies for both margin and traffic.

- **Increasing spend per customer** – Independent pharmacies placed little priority on increasing spend per customer per visit. In contrast, chain pharmacies used considerable resources to enhance spend per customer. Chains often used the pharmacy as a traffic-driver. The in-store pharmacy was placed strategically at the back-end of the store in order to give each patient the maximum “front-store exposure” on his/her way to the pharmacy. The large chains invested heavily in research to better understand shopping habits per customer. For example, **Figure 8** shows the frequency of customers visiting different parts of one traditional chain drugstore. As evident from this analysis, it is possible for chain drugstores to display high-margin items strategically alongside those that shoppers frequently buy [30]. Increasing spend per customer was a central theme adopted by the National Association of Chain Drug Stores (NACDS) in its 2002 “Selling One More Thing” report and campaign [31], which instructs drugstores how best to generate revenue by encouraging shoppers to buy one more thing before they leave. For example, the report showed that placing candies by the pharmacy counter increased candy sales by 30%. It encouraged chain stores to use the traffic-driving pharmacy in order to sell just “one more thing” [31]. Independent drugstore owners and managers noted that their stores did not benefit from such strategies, nor did they think about ways to increase spend per customer. Owners of independent pharmacies noted that one reason was that, unlike large chain drugstores, the front-store of independent

pharmacies was not a primary source of revenue. Less than 10% of the entire revenue for the independent drugstore came from front-end merchandise. Respondents from independent pharmacies said there was not a large difference in margin between front-end sales and pharmacy sales for their stores.

**Figure 8: An example of a drugstore shopping frequency analysis**



*Source: Storeboard Media, Sorensen Associates Pathtracker Research*

- **Retaining existing customers** – Independent pharmacies placed considerable emphasis on retaining existing customers. Independents felt that their primary competitive advantage was their ability to harness their existing relationship with their communities and “being part of the community”. Several independents contributed small prizes to raffles run by high school sports teams, Little League, and



community churches. They also placed ads in community newspapers and the local high school yearbook and were overall more involved in community activities than their chain counterparts. One owner was a part of the local Rotary Club in part for this reason. Often, pharmacists and store owners knew many of their customers by their name. In one independent store, the store owner struck up conversations with several of his customers. He later noted that he personally valued these relationships and felt that his customers felt the same way. Respondents in chain drugstores also said it was important to retain their customers but they approached doing so using “loyalty cards”, such as the ExtraCare card used by CVS pharmacies [32]. Customers who used an ExtraCare card when making a purchase received an immediate discount on some items purchased at the store and also received additional perks when shopping at the drugstore. Other large chains implemented similar loyalty programs. Promotional advertisements by chains also emphasized that they place priority on the patient – pharmacist relationship. However, interviews conducted with both chain drugstore pharmacists and independent drugstore pharmacists with experience working at chains revealed that in reality chains placed relatively little emphasis on harnessing the pharmacist – customer relationship. One common reason given for this situation was that chain pharmacies were often “too busy filling prescriptions” compared with independent stores. In addition, several pharmacy managers and owners pointed out that the financial incentives for a chain pharmacist were not structured in a way to promote the pharmacist – patient relationship. Chain store managers and owners were incentivized by the number of prescriptions filled per day and no incentive structure existed that rewarded a conversation with a patient. One

chain pharmacist lamented that the pharmacy profession has moved away from being a “guide and healer” harnessing fulfilling interactions with the patient in order to dispense accurately, to being a “mechanic” filling a high number of prescriptions throughout the day.

In conclusion, **chain pharmacies placed more emphasis on using their pharmacies to drive store traffic, whereas independent pharmacies prioritized building relationships with their patients in order to retain loyal customers.** Chain pharmacies also placed a high priority on increasing cross-shopping to increase spend per customer visit.

### *Attitude towards Medication Adherence*

All pharmacists, pharmacy managers and owners were familiar with the concept of medication adherence. However, there were vastly differing views on its importance. A director of education and residency at a pharmacy college placed a very high value on the importance of medication adherence. Indeed, this person said that promoting medication adherence should be “one of the top priorities for any pharmacist”, adding that the pharmacy school dedicated a significant portion of its curriculum to teaching pharmacists-in-training about medication adherence. Pharmacy students are taught that improving the pharmacist-patient relationship is a proven way to increase medication adherence rates and they are encouraged to make every effort possible to spend the “extra few minutes” counseling the patients to take their medicines on time. However, when this interviewee was asked if he thought his graduating students did so, he admitted that they probably did not.

In fact, interviews with practicing pharmacists and pharmacy managers revealed that most **interviewees did not believe that medication non-adherence was a significant problem.**

Among independent drugstore interviewees, the majority of those who were interviewed indicated that, on average, patients were “only 3-4 days late” in filling their prescription. More importantly, the interviewees indicated that “this was not a big problem” and that improving medication adherence would not impact their bottom-line significantly. They added that if one of their patients was more than 1-2 weeks late, then this lateness would trigger a flag on the computer and prompt them to call the patient to remind him or her. Chain pharmacy employees also indicated that they did not often think about medication non-adherence but suggested that, in their experience, it was “less of a problem than what we were taught”. Most employees identified specific groups of patients who were more likely to be non-compliant, including HIV-infected patients and chronic disease patients such as those with diabetes and hypertension. Most employees felt comfortable with their abilities to identify non-compliant patients, either by refill records or, in the case of independent pharmacists, because they “know the patient”.

### *Medication Adherence versus Medication Dispensing Errors*

While patient adherence to medications received a low to moderate priority for independent and chain drugstore pharmacies, **medication dispensing errors were highly prioritized.** The “error rate” was defined as the frequency of dispensing a wrong medication, schedule or dosage. A variety of systems were adopted by pharmacies in order to reduce the error rate. Automation was given a top priority by chain pharmacies, in part because these systems were shown not only to reduce error rates but also to increase efficiency and prescription turnover rates. Even pharmacies with very low rates of medication errors were interested in further reducing their

error rates. One reason for this interest was that dispensing errors could lead to serious health consequences for the patient, especially if the wrong medicine or dosage was dispensed. It was noted that many such incidents were publicized widely and even minor errors could be disastrous to the reputation of the pharmacy. In fact, when the topic of the thesis was introduced, several pharmacists and pharmacy managers assumed that it had to do with medication error rates rather than medication adherence. A Director of the Pharmacy Board even classified medication non-adherence as a subtype of medication dispensing error.

### *Medication labeling for increased patient compliance*

Clear labeling on prescription bottles potentially may increase patient compliance. Large-font, easy-to-read labels containing prescription name, dose and schedule theoretically could increase medication compliance rates. Consequently, pharmacy employees, managers and owners were interviewed on their medication labeling practices.

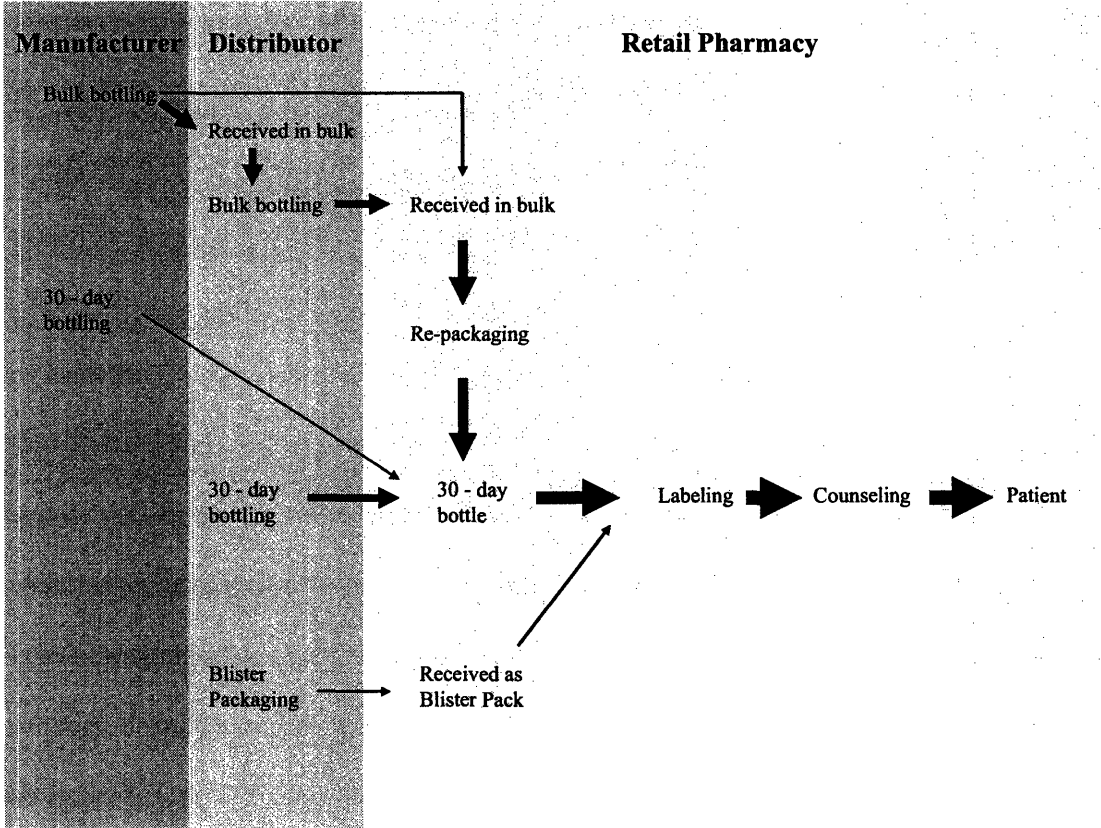
**No standardized labeling system** was found amongst the pharmacies visited and employees interviewed. Some pharmacists chose to provide as much information as possible on the label and others chose to print very little information. Font size also varied widely, with some pharmacies printing in <8 point and others printing >12 point. Interviews with the State Board indicated that no specific regulation existed for labels that were adhered to the outside surface of the bottle. Most everyone was aware of a new labeling system designed by Target (“ClearRx Prescription System”), which uses large, boldfaced fonts in labeling a colorful prescription bottle. However, few pharmacists and pharmacy managers were impressed with this new labeling system and they responded that their stores would choose to keep the current, traditional

system. When asked if improvements in labeling could improve patient adherence, **most interviewees responded that they did not think that it would make a significant impact.**

*The Journey of the pill from Manufacturer to Patient*

Pharmacies were asked to walk through what happens from the time a drug is manufactured to the time it reaches the patient. The following sequence was reported by most of those interviewed (**Figure 9**):

**Figure 9: The Journey of the Pill from Manufacturer to the Patient**



1. **Drug is manufactured**
  
2. **Drug is bottled** – interviewees categorized medications into two types: those received in bulk and those pre-packaged in single monthly prescriptions. Bulk prescriptions were bottled in containers of 100, 500 or more pills. Pre-packaged prescriptions usually were placed in containers of 30 (for once a day formulations) or 60 (for twice a day formulations). A small but growing number of drugs were blister-packaged in monthly prescriptions at the pharmaceutical company or wholesaler.
  
3. **Drug is distributed** – interviewees indicated that most manufacturers used distributors in order to reach a large number of pharmacies nationwide.
  
4. **Drug arrives at the pharmacy** – most pharmacies had contracts with several distribution companies and received their shipments on a rolling basis. Pharmacists felt comfortable in their ability to receive medications on an “as-needed” basis provided that there was at least a 1-2 day lead-time. Medications arrived either in bulk (100+ pills per large bottle) or in individual monthly or three-monthly bottles.
  
5. **Drug is stored** – arriving medications were put on shelves for later repackaging or dispensing. Shelf space was found to be limited for almost all pharmacies visited. Pharmacies preferred receiving their most frequently dispensed medications in large bottles which they found saved shelf space. Both pharmacy technicians and pharmacists were involved in shelving prescription bottles. Both chain and independent pharmacies

used a coding system that enabled the pharmacist to quickly identify the prescriptions.

For example, one independent pharmacy used a sophisticated color labeling system on its shelves in order to differentiate medications by how in-demand the drugs were, to ensure that each medication was adequately stocked. Price (to pharmacy) of each prescription was clearly visible on the shelf label of several pharmacies. Larger pharmacies tended to use an automated reader in order to scan the information provided on the shelf label.

This information was then exported directly onto the computer and label in order to facilitate dispensing and further automated the dispensing process to reduce errors.

6. **Drug is repackaged** – if the drug arrived in bulk, then the pills would be counted and placed in smaller containers before being delivered to the patient. Most large pharmacies, usually operating as part of chains, used automated pill-counters in order to quickly count and load large numbers of prescriptions for their most in-demand drugs. Most independent pharmacies used pharmacy technicians and pharmacists to count and repackage medications. Pharmacies preferred UV-resistant orange “vials” as the final bottles to be dispensed to patients and they kept hundreds of those bottles them stored in various places. Respondents seemed to prefer maintaining stocking space of these orange vials over maintaining stocking space for similarly-sized monthly (or three-monthly) drug bottles sent directly from the manufacturer. If the drug arrived as a single monthly prescription from the manufacturer, then the pharmacist (or pharmacy technician) would skip the counting and repackaging step and simply put a label on the bottle and dispense it to the patient.

7. **Drug bottle is labeled** – although automated labelers do exist and are used by some pharmacies, the pharmacies visited for this thesis labeled bottles by hand. Labels were printed by laserjet printers and put directly onto the surface of the bottle. Most labels occupied less than half the available surface area of the bottle. Some pharmacies used commercially available labeling software, whereas others modified word processor files for labels.
  
8. **Bottle is held for patient** – in some instances, prescriptions were dispensed immediately for patients present in the waiting area. Pharmacists or technicians usually called waiting patients by name to complete the transactions. In many instances, however, labeled bottles containing medications were placed in small paper bags and held for patients near the pharmacy counter. These bags were also labeled with the patient's name and were often sorted alphabetically for easy access by the pharmacist.
  
9. **Prescription is given to the patient** – the Massachusetts Board of Pharmacy required that only registered pharmacists (R.Ph.) physically handed the prescription to patients. However, it was noted that pharmacy technicians often performed this task instead of registered pharmacists. In addition, pharmacists are strongly encouraged by the Board to instruct their patients verbally on proper dosing, scheduling, indication and side-effects of the medication. Some pharmacists did spend a considerable amount of time counseling their patients in this manner. However, it was noted that a few pharmacists (or pharmacy technicians) sometimes spent little time on this task, even for new customers. The



study's small sample size prevented accurate comparisons of the length and quality of patient counseling between chain and independent pharmacies.

10. **Completion of transaction** – the patient verified his or her insurance information with the pharmacist (or pharmacy technician) and handed the pharmacist a co-pay in order to complete the transaction. Co-pays varied widely between brand and generic prescriptions and between health insurance carriers but usually ranged from \$5 to \$20 per prescription.

For the most part, pharmacists and pharmacy technicians preferred dispensing 30- or 90-day prescriptions that arrived pre-packaged from the manufacturer. “It’s easier to just grab the bottle from the shelf and slap a label on it”, said one pharmacist, “instead of having to count the pills and put them into another vial first”. However, the fraction of “ready-to-dispense” prescriptions was often less than 25% of the total in-store inventory. Pharmacy owners and managers preferred to order in bulk when possible. Interviewees stated two advantages of ordering in bulk for commonly-used medications. The first was that the pharmacy could potentially (but not always) receive a small discount on the medication for ordering in bulk. The second was that “a few large bottles occupy less shelf space than a lot of small bottles” and bulk orders were viewed as conserving precious shelf space. In general, popular antihypertensives and cholesterol lowering medications were bought and stored in bulk, whereas more expensive and uncommon medications such as antiretroviral medicines for HIV and immunosuppressive drugs for transplant were bought and stored in 30-day prescriptions.

**In sum, most medications arrived at the pharmacy in bulk and were then re-packaged manually or by automated counters into smaller vials before being dispensed to patients.**

Most pharmacists received medications from national distributors rather than directly from manufacturers.

### *Blister-packaging for increased patient compliance*

Blister packages are cards in which pills reside in small plastic bubbles backed with foil. In order to retrieve the pill, a patient pushes on the bubble to extrude the pill through the foil. In addition, the card often has room to print important information about the proper use of the medication.

Pharmacies had the option of either blister-packaging medications themselves, ordering pre-blister packaged medications, or not using blister packaging for their medications. While some short term medications were found to be pre-packaged in blister packs (e.g., Z-pak, or azithromycin, from Pfizer), most chronic medications were not blister packaged. One exception to this rule was birth-control medications.

Blister packaging is an accepted and widely used method of dispensing medications worldwide. In fact, European pharmacies routinely dispense blister packs to their patients. However, in the United States, blister packaging is relatively uncommon, in part because compliance with U.S. Federal laws required that prescription drugs intended for household use are shipped from the manufacturer (or distributor) in formats that are both ‘child-resistant’ and ‘senior-friendly’ [33]. The basis for this law is the Poison Prevention Packaging Act of 1970 (PPPA), which requires rigorous testing to ensure that medication containers meet these dual criteria. Importantly, the

law also specifies that manufacturers do not have to use child-resistant/senior-friendly formats for packages that are not intended for household use [33]. This law explains why the **overwhelming majority of prescriptions in the United States are shipped in bulk rather than bottles of 30 pills or blister packs.**

**Only a few pharmacies were found to carry blister-packaging capabilities.** One pharmacy that specialized in long-term care for servicing hospice and nursing homes utilized blister-packaging heavily. This service was billed an additional packaging fee, usually a \$1 to \$5 / weekly package. The pharmacy manager felt that this was a good source of additional revenue that also increased patient adherence to medication. However, he noted that this service was only in demand from certain nursing homes and long-term care facilities servicing mentally ill patients and that users of the service were often trained staff rather than the patients. He therefore indicated that most community pharmacies would probably have little demand for such a service. Conversations with community pharmacy employees confirmed his suspicion – in fact, few pharmacies offered a blister packaging service. Those that did offer the service indicated that revenues generated from blister packaging made up a small fraction of the overall revenue generated from the pharmacy.

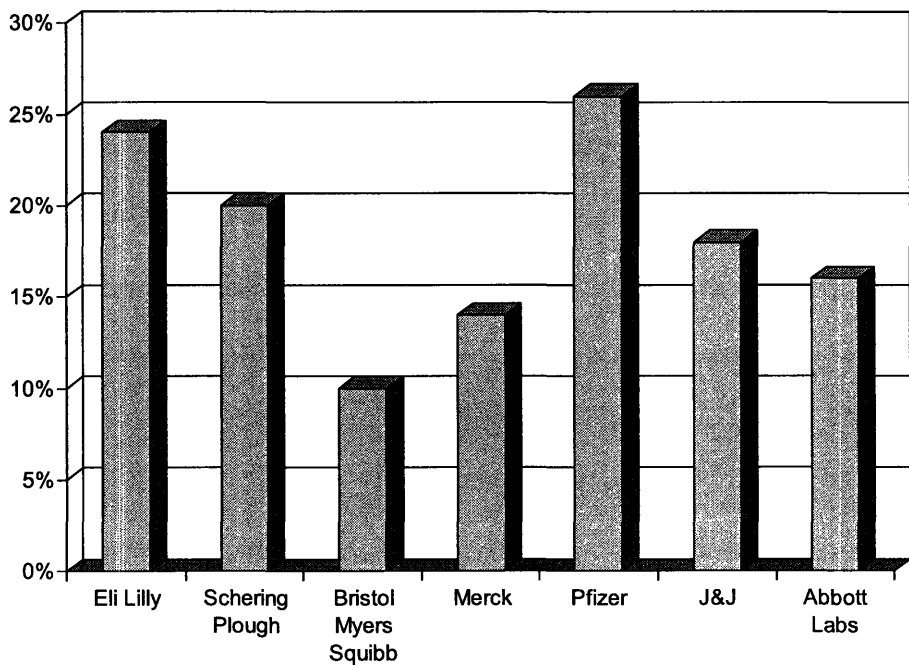
Most interviewees indicated that blister-packaging more medications would probably increase medication adherence rates. Some were aware of a study from Ohio State University's Philip Schneider and colleagues [34], which showed that re-packaging a common antihypertensive medication (lisinopril) increased medication adherence by 14% over a span of 2 years. However, for the most part and despite the increased compliance that may result, interviewees did not

believe that the added cost of repackaging translated into a favorable profit margin for the pharmacy. “Pharmacies are incentivized by how many prescriptions they dispense and, for the chains, how much ‘front-end’ sales they bring”, stated one chain drugstore interviewee. “Why would they be motivated to spend extra cash on compliance packaging?”

### *Paying for increased medication adherence*

Interviewees were asked, “if there was a way to increase medication adherence rates to 100% for all of your customers, would you pay for it, and how much?” All interviewees responded that the pharmacy should not pay for increasing medication adherence. When asked, “who should pay for it?”, the majority of respondents answered that pharmaceutical companies would have the most to gain from increasing adherence. When asked “why?”, one of these interviewees responded that “increased compliance means increased consumption”, implying that the pharmaceutical manufacturers would have an opportunity to sell many more medications by increasing adherence rates. Some interviewees indicated that the insurance company should take on the burden of paying for programs to increase medication adherence rates. **When asked if the pharmacy should pay any part of the cost to implement medication adherence programs, the vast majority of pharmacy owners and managers responded that they did not think so.** A primary reason given was the difference in operating margins between the pharmaceutical and pharmacy industries, as shown in **Figure 10**. The 20% operating margins seen regularly in the pharmaceutical industry were looked upon enviously by both chains (4-6% margins) and independents (<5% margins).

**Figure 10: Operating profit margins for leading pharmaceutical companies**



Source: Business Insights

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### *Conclusions from interviews*

Although pharmacists-in-training and pharmacy schools placed considerable emphasis on medication adherence, **the retail drugstore pharmacy industry did not highly prioritize medication adherence.** Independent pharmacies placed more emphasis on increasing adherence through building relationships with patients, whereas chain pharmacies placed more emphasis on increasing adherence through investing more heavily in automation to reduce overall error rates. All pharmacists and pharmacy managers prioritized reduction of medication dispensing error rates more than increasing medication adherence rates.

*Caveats of the interview-based analysis:* Data collected from these interviews have several shortcomings. First, the number of individuals interviewed for this study was small, which could introduce an opinion bias to the study. Second, the sample of individuals agreeing to an interview may have had inherently similar opinions about medication adherence compared with those that declined a request for an interview, although there is no particular reason to believe that this may have been the case. Third, interviewees were not all selected at random; several interviewees were referred by other interviewees, which could have introduced an additional bias of opinion. Fourth, while the number of owners, managers and executives interviewed from independent drugstores was respectable, only one manager (and no current owners) of a chain pharmacy were interviewed. In addition, no senior executives at the large chain drugstores (e.g. CVS, Walgreens) were interviewed due to the difficulty in scheduling appointments with these individuals. Finally, interviews were conducted within and around the Greater Boston area and may have introduced a location-bias to the data. For these reasons, data collected from all subjects should be interpreted with caution and may not necessarily apply to the industry as a whole.

# **WHAT INCREASING MEDICATION ADHERENCE WOULD MEAN TO PHARMACIES: A QUANTIFIED VALUE**

## **PROPOSITION**

The value of increased medication adherence for drugstores was calculated by quantifying the impact that enhanced patient compliance may have on prescription sales and front-store sales.

Both prescription sales and front-store sales were named as important considerations driving growth for drugstore pharmacies. However, the higher-margin front-store sales were considerably more important for chains (30%+ store revenues) compared with independents (<10% of store revenues). Two models were constructed in order to assess the impact of increased medication adherence on drugstore sales and gross profits (**Tables 4 and 5**).

For constructing the chain drugstore model, the following were assumed:

1. Adherence to medications could be increased by 25%;
2. The average number of prescriptions filled by all customers frequenting a given pharmacy was 10 / customer [13];
3. The average prescription price was \$64 [13]. This number is based on data provided by the NACDS for 2004;
4. The gross margin for incremental pharmacy sales was 23% [24, 26];
5. The average customer visited a chain drugstore 15 times / year [20, 21];

6. The “basket size” per trip for non-prescription drug items (“front-store” items) was \$15 / trip [20, 21]. That is, the average customer visiting a drugstore spent \$15 per trip on non-prescription related items;
7. The fraction of pharmacy sales compared with overall store sales ranged between 60% and 80% [13];
8. The number of prescriptions filled per day was 300 [13, 15, 16, 18, 26];
9. The number of stores in a given large chain drugstore was 2500 [13, 32];
10. The number of chain drugstores in the industry was 20,000 [13];
11. For the purposes of this model, increased medication adherence was defined solely as increased prescriptions dispensed by the pharmacy. In other words, the impact of medication adherence on store loyalty, increased store traffic unrelated to pharmacy visits, new customers, and other variables were not included in this model.

Based on these assumptions, the model shown in **Table 4** indicates that if an average chain drugstore could increase medication adherence by 25%, it could extract **an additional \$160 / customer / year from pharmacy sales** and an additional \$4.95 / customer / year from front-end sales. These increases translate into an additional \$36.80 / customer / year in gross profit from pharmacy sales and an additional \$1.58 / customer/ year in gross profit from front-end sales. **The total increase in revenue would be \$164.95 (19% increase)**, with increased gross profit of \$38.38 per customer per year (17.5% increase). **Over the course of a year, a single store can generate an additional \$1.78 M in revenue** and a large chain with 2500 stores would generate an additional \$4.4 billion in revenue.



**Table 4: The impact of a 25% increase in medication adherence to chain drugstores**

<b>Target:</b>		<b>25%</b>		
	<b>Current</b>	<b>Increased adherence</b>	<b>Target</b>	<b>% Increase</b>
<b>Annual Pharmacy Sales / Customer</b>				
<b>Prescriptions</b>	10	2.5	12.5	25.00%
<i>Average Rx Price</i>	\$64.00		\$64.00	
<b>Revenue</b>	\$640.00	\$160.00	\$800.00	25.00%
<i>Gross margin</i>	23%		23%	
<b>Gross profit</b>	\$147.20	\$36.80	\$184.00	25.00%
<b>Annual Front-end Sales / Customer</b>				
<b>Total trips / y</b>	15	2.5	17.5	16.67%
<i>Non-Rx Basket Size / trip</i>	\$15.00		\$15.00	
<i>Impulse Buying Rate</i>	-		33%	
<i>Additional Impulse purchase</i>	-		\$4.95	
<b>Revenue</b>	\$225.00	\$4.95	\$229.95	2.20%
<i>Gross Margin</i>	32%		32%	
<b>Gross Profit</b>	\$72.00	\$1.58	\$73.58	2.20%
<b>Annual Combined Sales / Customer</b>				
<i>Store revenue (%) from Pharmacy</i>	73.99%		73.99%	
<b>Revenue</b>	\$865.00	\$164.95	\$1,029.95	19.07%
<b>Gross Profit</b>	\$219.20	\$38.38	\$257.58	17.51%
<b>Annual Single Store sales</b>				
<i># scripts filled / day</i>	300	75	375	
<i># scripts filled/ year</i>	108,000	27,000	135,000	
<i># customers / year</i>	10,800		10,800	
<b>Single Store Sales</b>	\$9,342,000	\$1,781,460	\$11,123,460	19.07%
<b>Single Store Gross Profit+B30</b>	\$2,367,360	\$414,517	\$2,781,907	17.51%
<b>Annual Chain-wide store sales</b>				
<i># stores in chain</i>	2,500		2,500	
<b>Chain-wide Store Sales</b>	\$23,355,000,000.00	\$4,453,650,000	\$27,808,650,000	19.07%
<b>Chain-wide Gross Profit</b>	\$5,918,400,000.00	\$1,036,368,000	\$6,954,768,000	17.51%
<b>Annual Industry-wide store sales</b>				
<i># stores in industry</i>	20,000		20,000	
<b>Industry-wide Store Sales</b>	\$186,840,000,000	\$35,629,200,000	\$222,469,200,000	19.07%
<b>Industry-wide Gross Profit</b>	\$47,347,200,000	\$8,290,944,000	\$55,638,144,000	17.51%

A similar analysis was conducted for independent drugstores, with the assumptions revised to reflect the lower dependence on front-end sales (Table 5). Based on this analysis, it was found that if an average independent drugstore could increase medication adherence by 25%, it could extract an additional \$160 / customer / year from pharmacy sales and an additional \$1.65 /

**customer / year from front-end sales.** These increases translate into an **additional \$36.80 / customer / year in gross profit from pharmacy sales** and an additional \$0.53 / customer/ year in gross profit from front-end sales. **The total increase in revenue would be \$161.65 (23% increase),** with increased gross profit of \$37.33 per customer per year (23% increase). **Over the course of a year, a single store can generate an additional \$1.74 M in revenue.**

**Table 5: The impact of a 25% increase in medication adherence to independent drugstores**

<b>Target:</b>		25%		
	<b>Current</b>	<b>Increased adherence</b>	<b>Target</b>	<b>% Increase</b>
<b>Annual Pharmacy Sales / Customer</b>				
<b>Prescriptions</b>	10	2.5	12.5	25.00%
<i>Average Rx Price</i>	\$64.00		\$64.00	
<b>Revenue</b>	\$640.00	\$160.00	\$800.00	25.00%
<i>Gross margin</i>	23%		23%	
<b>Gross profit</b>	\$147.20	\$36.80	\$184.00	25.00%
<b>Annual Front-end Sales / Customer</b>				
<b>Total trips / y</b>	10	2.5	12.5	25.00%
<i>Non-Rx Basket Size / trip</i>	\$5.00		\$5.00	
<i>Impulse Buying Rate</i>	-		33%	
<i>Additional Impulse purchase</i>	-		\$1.65	
<b>Revenue</b>	\$50.00	\$1.65	\$51.65	3.30%
<i>Gross Margin</i>	32%		32%	
<b>Gross Profit</b>	\$16.00	\$0.53	\$16.53	3.30%
<b>Annual Combined Sales / Customer</b>				
<i>Store revenue (%) from Pharmacy</i>	92.75%		92.75%	
<b>Revenue</b>	\$690.00	\$161.65	\$851.65	23.43%
<b>Gross Profit</b>	\$163.20	\$37.33	\$200.53	22.87%
<b>Annual Single Store sales</b>				
<i># scripts filled / day</i>	300	75	375	
<i># scripts filled/ year</i>	108,000	27,000	135,000	
<i># customers / year</i>	10,800		10,800	
<b>Single Store Sales</b>	\$7,452,000	\$1,745,820	\$9,197,820	23.43%
<b>Single Store Gross Profit</b>	\$1,762,560	\$403,142	\$2,165,702	22.87%
<b>Annual Chain-wide store sales</b>				
<i># stores in chain</i>	1		1	
<b>Chain-wide Store Sales</b>	\$7,452,000.00	\$1,745,820	\$9,197,820	23.43%
<b>Chain-wide Gross Profit</b>	\$1,762,560.00	\$403,142	\$2,165,702	22.87%
<b>Annual Industry-wide store sales</b>				
<i># stores in industry</i>	20,000		20,000	
<b>Industry-wide Store Sales</b>	\$149,040,000,000	\$34,916,400,000	\$183,956,400,000	23.43%
<b>Industry-wide Gross Profit</b>	\$35,251,200,000	\$8,062,848,000	\$43,314,048,000	22.87%

Several conclusions can be drawn from this analysis. For one, the increase in sales and gross profits could be substantial in an industry when the operating profits are often so thin (<5-6%). Indeed, any store that adopts measures to increase medication adherence could enjoy a significant profit increase based on increased pharmacy prescriptions alone. Second, it is evident

from this analysis that the impact of increased medication adherence on additional front-end revenue would be small. The majority of sales gain comes from prescription sales. On first glance, the lower-margin pharmacy is seen by the industry as a “traffic-driver” instead of a profit center. When this analysis was first begun, it was expected that the gains in profits resulting from increased medication adherence would come chiefly from the higher-margin front-end sales due to the resultant increased store traffic. However, analysis of the current model indicates that increasing medication adherence would have a significantly larger impact on pharmacy revenues (and profits) compared with sales of non-prescription items. Finally, **these data suggest that both chain and independent drugstores could benefit significantly from instituting medication adherence programs.**

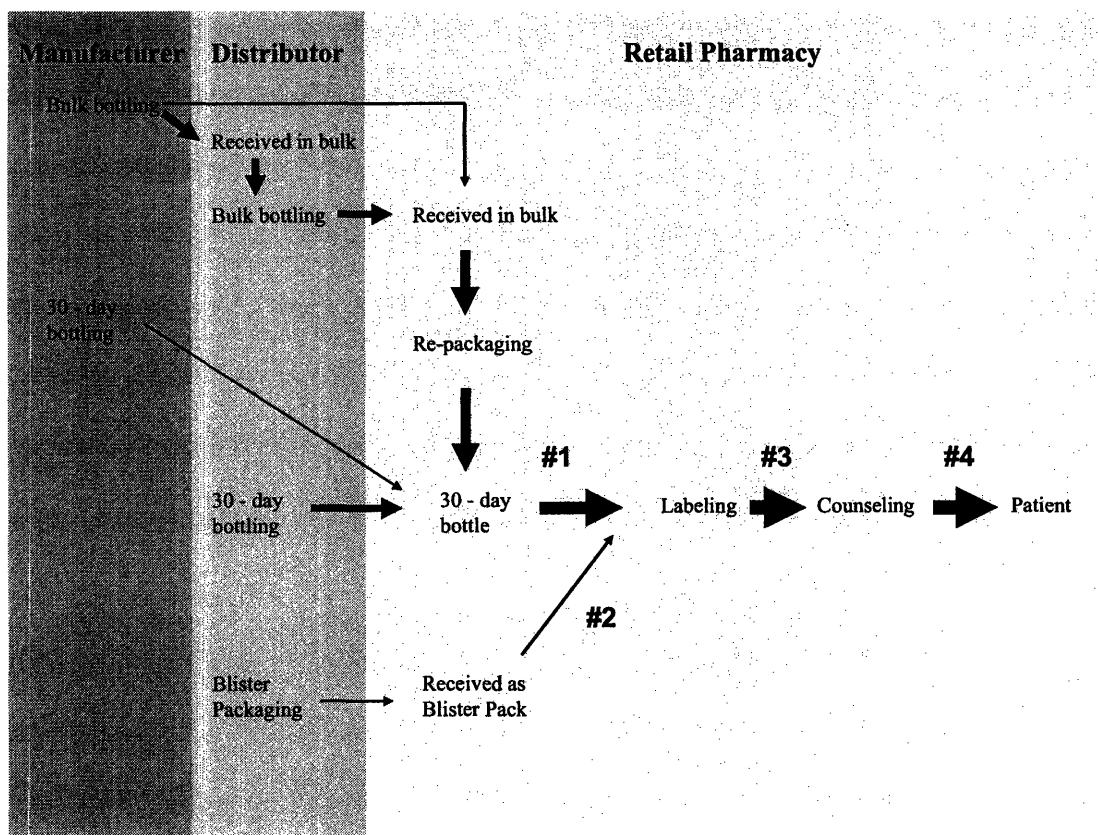
## CONCLUSIONS

Non-adherence to medications is a major healthcare problem. The drugstore pharmacy, which physically delivers the prescription medication to the hands of the patient, is at the epicenter of the non-adherence problem. Pharmacies present a unique and potentially very powerful opportunity to increase medication adherence. Indeed, data provided in this thesis lends credence to the notion that increasing medication adherence would have a positive impact on pharmacy sales. Unfortunately, interviews with pharmacists, owners, managers and regulators in the pharmacy industry indicate that, **while a significant emphasis on medication adherence is given at pharmacy training programs, the community pharmacy puts a relatively low priority on increasing medication adherence.** This disconnect between pharmacy training programs and community pharmacies results in large part from the day-to-day schedules that plague most chain and independent pharmacies: the busy workday, high demand for (and low supply of) registered pharmacists, and lack of appropriate financial incentives that could properly motivate increased time spent on patient counseling or other patient compliance services.

Examining the journey of a pill from manufacturer to patient may give clues to the most effective ways that a pharmacy can increase medication adherence rates (**Fig. 11**). One way that pharmacies may increase medication adherence is to **use bottles specifically designed to remind or motivate patients to take their pills (#1)**. For example, the bottles could be designed to capture and dispense one pill at a time or could have a built-in alarm to remind the patient at appropriate times. Several reminder devices are commercially available but in general they are marketed directly to the consumer and require the patient to first remove the medication from its original bottle and place it in the pill organizer. In addition, only a few pharmacies are

experimenting with innovative bottle designs specifically designed to improve medication adherence (e.g. Target’s ClearRx Prescription System), in part because cash-strapped pharmacies are not incentivized to invest in expensive, unproven technologies. Therefore, any pharmacy-oriented solution that uses innovative bottles must be 1) inexpensive; and 2) proven to increase adherence by a reasonable amount (e.g., >10-15%).

**Figure 11: Possible Pharmacy interventions to enhance medication adherence rates**



A second way that pharmacies could increase medication adherence rates is to **dispense more medicines in blister packs (#2)**. Experimental evidence suggests that blister, or “single unit”, packaging could increase medication adherence rates [35-37] and pharmacies could potentially

boost patient compliance by dispensing more blister-packaged medicines. In addition to requesting more blister-packaged medications from manufacturers (or distributors), pharmacies may also blister package medications themselves. Blister packaging increases dispensing time but only by about 10 seconds; during research for this thesis, it was observed that a pharmacist could dispense 30 pills into a blister pack in approximately 20-25 seconds, as opposed to about 10-15 seconds for dispensing into a traditional orange vial. Blister packaging at pharmacies does require a capital investment, however, and in general only specialty or long-term care pharmacies can justify the added cost for blister packaging. Large-scale randomized trials that demonstrate a clear adherence benefit for blister packages over traditional bottles will probably be necessary for traditional drugstore pharmacies to change to blister packs.

A third way that pharmacies could increase adherence is to **improve labeling (#3)**. Research for this thesis revealed that a standardized labeling method does not exist amongst pharmacies.

Some labels are so cramped with information that the patient might feel overwhelmed and unable to read the drug name, dose or schedule, and therefore may not adhere to the prescription.

Bottles were found to have ample free space remaining after labeling; if this additional space was used to increase font size, then it might be possible to avoid confusion for most patients. In addition, since the majority of medication users are elderly individuals with a variety of visual problems (e.g., presbyopia and age-related macular degeneration), large-font labeling could be expected to enhance adherence rates. Finally, since labeling is not strictly regulated by the pharmacy Board, it is possible to use colored fonts to make the labels more “catchy”. This change could serve as an additional reminder or motivator for the patient to adhere to their medications. In addition, label changes are not time consuming and one-time modifications

could be instituted throughout the pharmacy to enhance patient adherence rates. However, printing labels in color fonts would require color printers, which may be an excessive cost to most pharmacies competing in the low-margin industry.

Finally, pharmacists can enhance medication adherence simply by **counseling patients longer on the importance of compliance to the prescribed regimen (#4)**. A large body of evidence strongly supports the notion that direct pharmacist counseling can increase medication adherence rates, reduce complications from chronic diseases, and reduce hospitalizations [38-45].

Unfortunately, pharmacies operate within an intensely pressured landscape that demands a high volume of dispensed prescriptions per day; in this regard, pharmacies are incentivized to spend less, not more, time with their patients. Any additional time that the pharmacist spends with the patient translates into less time dispensing medication, which could lead to longer waiting times and less overall daily volume of dispensed prescriptions. If pharmacies are to institute increased time counseling patients, then they must be incentivized to do so. Several options exist. One possibility is that pharmacies could receive government subsidies if they are able to demonstrate proof of increased time counseling. Proof could come in the form of the patient's signature on a "patient compliance form", which indicates that the pharmacist has discussed at length (e.g., at least 5 minutes) the consequences of non-compliance to a medication regimen. Pharmacies that generate 100 such signatures per day, for example, would be eligible for a sizeable medication compliance subsidy. This is but one of many possibilities that could be explored to incentivize pharmacies to counsel patients on medication adherence.



Any solution that will have a significant impact on patient adherence to medications must consider these very real difficulties that pharmacy employees deal with on a routine basis. **Any product or service that aims to increase medication adherence must be an inexpensive, easy-to-implement, and minimally-time-consuming solution.** Furthermore, the solution must either make the pharmacist's busy schedule more streamlined or at the very least not add additional burden to his or her workday. An innovative solution with these attributes could have a significant impact on patients, healthcare providers, and also on both the top- and bottom-line of the community drugstore pharmacy.

## REFERENCES

1. Osterberg L, Blaschke T. Adherence to medication. *N Engl J Med* 2005;353:487-97
2. McDonnell PJ, Jacobs MR. Hospital admissions resulting from preventable adverse drug reactions. *Ann Pharmacother* 2002;36:1331-6
3. Schiff GD, Fung S, Speroff T and McNutt RA. Decompensated heart failure: symptoms, patterns of onset, and contributing factors. *Am J Med* 2003;114:625-30
4. Senst BL, Ahusim LE, Genest RP, et al. Practical approach to determining costs and frequency of adverse drug events in a health care network. *Am J Health Syst Pharm* 2001;58:1126-32
5. Benner JS, Glynn RJ, Mogun H, Neumann PJ, Weinstein MC and Avorn J. Long-term persistence in use of statin therapy in elderly patients. *JAMA* 2002;288:455-61
6. Lacro JP, Dunn LB, Dolder CR, Leckband SG and Jeste DV. Prevalence of and risk factors for medication nonadherence in patients with schizophrenia: a comprehensive review of recent literature. *J Clin Psychiatry* 2002;63:892-909
7. Jay S, Litt IF and Durant RH. Compliance with therapeutic regimens. *J Adolesc Health Care* 1984;5:124-36
8. Paes AH, Bakker A and Soe-Agnie CJ. Impact of dosage frequency on patient compliance. *Diabetes Care* 1997;20:1512-7
9. Feinstein AR. On white-coat effects and the electronic monitoring of compliance. *Arch Intern Med* 1990;150:1377-8
10. Urquhart J. The electronic medication event monitor. Lessons for pharmacotherapy. *Clin Pharmacokinet* 1997;32:345-56

11. Urquhart J. The odds of the three nons when an aptly prescribed medicine isn't working: non-compliance, non-absorption, non-response. *Br J Clin Pharmacol* 2002;54:212-20
12. Claxton AJ, Cramer J and Pierce C. A systematic review of the associations between dose regimens and medication compliance. *Clin Ther* 2001;23:1296-310
13. National Association of Chain Drug Stores Foundation. The Chain Pharmacy Industry Profile, 2005:1-72
14. National Association of Chain Drug Stores. Industry Facts-at-a-glance, 2005
15. IMS Health. Year In Review: Trends, Issues and Forecasts, 2004
16. Deutsche Bank. Food and Drug Retailing - Industry Focus, 2004:1-129
17. ATKearney. "No Insult" Pricing and Promotions, 2005:1-20
18. IMS Health. U.S. Pharmaceutical Market: Trends, Issues and Forecasts, 2004
19. Lin S. Shop Therapy. *American Demographics*, 2003
20. Sansolo M. Desperate Shoppers. Facts, Figures and the Future, 2005
21. Warshaw S. It's 10 pm - do you know where your buyers are? Facts, Figures and the Future, 2005
22. Cutler DM. Your money or your life: strong medicine for America's health care system. New York: Oxford University Press, 2004
23. National Association of Chain Drug Stores. Retail Prescription Prices for Generic Drugs, 2004:1-2
24. James R. Generically speaking...the hidden key to drug channel profits, 2005:1-24
25. Speert M. Pharmacist survey says trust counts most: Generics Annual Report. *Drug Store News*, 1997
26. Deutsche Bank. Drug Retailers - Industry Focus, 2005:1-146

27. Touch Briefings. U.S. Pharmacy Review, 2004
28. Deutsche Bank. Cardinal Health - Company Focus and Industry Report, 2005:1-46
29. Health Net. Pharmacy Directory, 2005:1-289
30. Storeboard Media and Sorensen Associates Pathtrack Research. Understanding the Drug Store Shopper, 2002
31. National Association of Chain Drugstores, and American Greetings Research Council. Selling One More Thing - Proven Ways to Build the Market Basket, 2002:1-28
32. Deutsche Bank. CVS Corporation - Company Focus. 2005:1-39
33. Mayberry P. Current trends in pharmaceutical packaging and distribution practices - US versus the EU. Touch Briefings: US pharmacy review, 2004:1-4
34. Schneider PJ, Pedersen C and Murphy J. Blister Packaging of Lisinopril for Hypertension. In: Scientific Forum on Quality of Care and Outcomes Research in Cardiovascular Disease and Stroke - American Heart Association. Washington, D.C., 2005
35. Wong BS, Norman DC. Evaluation of a novel medication aid, the calendar blister-pak, and its effect on drug compliance in a geriatric outpatient clinic. J Am Geriatr Soc 1987;35:21-6
36. Huang HY, Maguire MG, Miller ER, 3rd and Appel LJ. Impact of pill organizers and blister packs on adherence to pill taking in two vitamin supplementation trials. Am J Epidemiol 2000;152:780-7
37. Shwe T, Lwin M and Aung S. Influence of blister packaging on the efficacy of artesunate + mefloquine over artesunate alone in community-based treatment of non-severe falciparum malaria in Myanmar. Bull World Health Organ 1998;76 Suppl 1:35-41

38. MacLaughlin EJ, Raehl CL, Treadway AK, Sterling TL, Zoller DP and Bond CA. Assessing medication adherence in the elderly: which tools to use in clinical practice? *Drugs Aging* 2005;22:231-55
39. Lee PR. Prescription drug use and patient education--the critical role of the pharmacist. *Am J Pharm Educ* 1979;43:354-7
40. Lipton HL. The graying of America: implications for the pharmacist. *Am J Hosp Pharm* 1982;39:131-5
41. Rogers PG. How pharmacists can boost patient compliance re: prescription drugs. *Pharm Times* 1984;50:89-94
42. Hammarlund ER, Ostrom JR and Kethley AJ. The effects of drug counseling and other educational strategies on drug utilization of the elderly. *Med Care* 1985;23:165-70
43. Harvey JL, Plumridge RJ. Comparative attitudes to verbal and written medication information among hospital outpatients. *Dicp* 1991;25:925-8
44. Lewis RK, Lasack NL, Lambert BL and Connor SE. Patient counseling-a focus on maintenance therapy. *Am J Health Syst Pharm* 1997;54:2084-98; quiz 2125-6
45. Yuan Y, Hay JW and McCombs JS. Effects of ambulatory-care pharmacist consultation on mortality and hospitalization. *Am J Manag Care* 2003;9:45-56