

Medication Storage Appropriateness in US Households

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Abstract

Background/Objective(s): Many people in the United States (US) store medications, both prescription and over-the-counter, in their households. They may store medications in a designated location which could pose some convenience for the ease of use and access. However, most people may not know if their medications are stored properly to maintain stability and sterility. The objective of this study is to assess the medication storage locations in US households and evaluate appropriateness for each reported stored medication based on the published literature and drug information databases.

Methods: 195 US Qualtrics panel members completed the National Household Medication Survey about medications stored at home and the number of residents in the household. This survey was a cross-sectional, self-administered, online survey completed through Qualtrics. The reported medications and their corresponding storage locations were categorized based on their appropriateness with moisture/humidity, temperatures and accidental exposure to children. The number of medications stored appropriately per household was recorded based on published literature, Lexicomp, Nature Made and Nature's Bounty were consulted.

Results: 154 (79%) households completed the survey. 75 (38.4%) households had at least one resident younger than 18 years old. 72 (46.8%) households stored at least one medication on a countertop. Only 28 (23.3%) households stored all their medications appropriately, while 92 (76.7%) households were storing at least one medication inappropriately. 34 (22%) households reported medications that were unidentifiable or no medications at all.

457 medications were reported by the 154 households. 13 of the households did not store any medications at home. 162-164 (~35%) of the medications were stored appropriately. 52 to 54 (~11%) medications had a moisture/humidity issue, 77 to 79 (~17%) had a temperature issue, and 42 to 44 (~9%) medications had both issues. 23 (5%) medications had an issue with a potential risk for accidental exposure to children, 6 (1.3%) had issues with both risk for accidental exposure to children and moisture/humidity, 8 (1.8%) had issues with both risk for accidental exposure to children and temperature, and 4 (0.9%) medications shared all three issues. Some numbers are reported with a range because certain medications have different storage recommendations based on formulation, so if a formulation wasn't specified, both storage recommendations were taken into consideration.

Conclusion: The findings suggest that many US households may be storing medications in inappropriate locations. In order to ensure medication stability and sterility and reduce the risk of accidental ingestion, pharmacists should proactively educate patients on proper storage of their medications and signs of degradation to avoid undesirable effects from the medications.

Background

Medications stored in households are either in use, unused, unwanted or expired. Law et al. found that every two in three prescription medications stored in United States (US) households were left unused due to side effects, forgetfulness or disease/condition improvement. The total cost of the unused medications in the 306 households studied was estimated to be \$150,000.^[1] Improper medication storage could be harmful to patients as the medication may have been degraded and can cause undesirable effects upon ingestion.

A few studies have been conducted to investigate how patients store medications at home. Hewson et al. recorded medication storage practices in different households across New Zealand. Along with medication storage, they checked the temperature and humidity of six different storage locations (two bathrooms, one bedroom and three kitchens) in households in two cities.

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Interviews were conducted to record medication storage locations. The bathroom, bedroom and kitchen were the most common locations to store medications. The bathroom had a temperature range of 13.8°C to 31.5°C (56.8°F-88.7°F), and a relative humidity range of 33% to 100%. An ideal storage location should have a temperature range for most medications is from 15°C to 30°C (59°F-86°F), and a humidity level below 60%.^[2,3] Bathrooms may be acceptable storage for temperature-sensitive medications in the proper temperature range but may not be good storage for moisture-sensitive medications. The kitchen had a temperature range of 16.0 to 36.3°C (60.8°F-97.3°F), and a relative humidity range of 27.2% to 85.2%. This finding implies kitchen storage may not be acceptable for both temperature- and humidity-sensitive medications. The bedroom temperatures also ranged from 18.8°C to 23.5°C (65.8°F-74.3°F), and the relative humidity ranged between 50.1% and 69.2%. A bedroom may be an appropriate location for temperature-sensitive medications but may not be for humidity-sensitive medications. Hence, long-term storage of temperature- and humidity-sensitive medications in kitchens or bathrooms should be avoided. Vlieland et al. observed drug storage compliance in 170 geriatric patients.^[4] They found that the temperatures in the kitchen ranged from 7.6°C to 30.3°C (45.7°F-86.5°F), in the bedroom ranged from 8.4°C to 28.6°C (47.1°F-83.5°F) and in the

bathroom ranged from 10.1°C to 24.4°C (50.2°F-75.9°F). This study can imply that temperature-sensitive medications may be at risk of degradation when stored in the kitchen, bedroom or bathroom. 76.4% of older patients that were evaluated stored all drugs according to recommended storage conditions and 13.6% of patients stored drugs in a humid or light-exposed location when the package insert recommended otherwise.

Patients should be aware of medication storage recommendations in order to reduce accidental ingestion of a degraded product. A New Zealand study found that medications are stored in areas based on convenience or safety for children.^[2] This result shows that few people consider temperature, humidity and light exposure as primary factors for medication storage and may be concerned more with other factors when selecting a storage location.

Medication storage seems to have an impact if there is a minor present in the household. If a child accidentally ingests a medication due to negligence of the storage location, the ingestion could lead to life-threatening consequences. According to the National Capital Poison Center (NCPC), in 2018, children under 12 years of age had the highest rate of unintentional poison exposures.^[5] The highest percentage of fatalities of both intentional and unintentional medication exposures was most common in teenagers, nearly 20% of all exposures had this outcome. It is suspected that the medications are stored in locations that can be easily accessed by children.

If a patient is unsure of how to store their medications, a pharmacist is an easily accessible resource to use to answer questions about proper storage.^[6] Other healthcare personnel should develop knowledge about proper storage of medications as well. Many patients may have a nurse who visits their household to help them complete day-to-day activities, including administration of medications. A nurse or caretaker should be mindful of medication storage locations as well ensuring that the medications are properly stored with no signs of degradation.

Study Objective

The objective of this pilot study is to assess the medication storage locations in households in the United States and evaluate appropriateness for each reported stored medication based on the published literature and drug information databases.

Methods

The 2018 National Household Medication Inventory Survey was a cross-sectional, self-administered, online survey via Qualtrics.^[7] Qualtrics panel member volunteered to complete the survey. 220 households in the United States, between May 2018 to June 2018, were surveyed with 195 households responding to the survey. Each household was surveyed about demographic data, the number of medications being stored in their household, the locations of medication storage, the

medication names, and residents in the household (both under 18 years old and over 65 years old). This survey was deemed to be a non-human research and exempt from review by the University of Minnesota Institutional Review Board. The results of this study are based on the findings from the 2018 National Household Medication Survey. Based on the storage recommendations from Lexicomp, Nature Made and Nature's Bounty^[8,9,10], the reported medications were categorized into appropriate and inappropriate storage, unknown storage, not-applicable (NA). Inappropriate storage was categorized further into having a "moisture/humidity issue," "temperature issue," "temperature and moisture/humidity issue," "potential risk of accidental exposure to children," "potential risk of accidental exposure to children and temperature issue," "potential risk of accidental exposure to children and moisture/humidity issue" or all three issues. The reported households were also counted based on the number of inappropriately stored medications. Households reporting incomprehensible drug names for all their medications were recorded as "NA."

The kitchen, bathroom and garage are inappropriate storage facilities if a medication requires a tightly controlled temperature. It was assumed for the analysis that garages would undergo constant temperature changes that would be unsuitable for temperature-sensitive medications. If the storage area of an insulin or GLP-1 agonist (e.g., Victoza) was reported to be "other," it was assumed that they were refrigerated and correctly stored since storage recommendations are directly on the box and labeling typically has instructions to refrigerate. When storage was reported as "other," but medications were not accurately specified, the response was categorized as "unknown." Immediate-release (IR) and extended-release (ER) formulations of certain medications have different recommendations for storage and if not specified in the survey response, both formulations were evaluated. Any incomplete responses or unrecognizable names for medications were also recorded as "NA." Medications that should be protected from moisture should be stored in a location with humidity no more than 60% meaning the bathroom and kitchen were inappropriate for humidity/moisture-sensitive medications.^[3,2] 15°C to 30°C (59°F to 86°F) was considered to be adequate since this is the most common storage temperature recommendation based on the literature and Lexicomp.^[8] Medications without corresponding storage locations were coded as "unknown." Medications stored on a countertop were considered inappropriate when the household reported to have residents under 18 years old.

The current study assessed the storage location of medications in US households. This outcome was decided based on temperature and humidity recommendations according to the World Health Organization, Lexicomp and literature. While the risk of accidental exposures was evaluated, light exposure risk was not. Light exposure could have a negative impact on medications, but light exposure to medications was not collected in the survey and therefore could not be evaluated.

Appendix 1 shows the proper medication storage of each drug reported in the survey. The medication storage information was gathered from Lexi-Drugs on Lexicomp, and vitamin storage recommendations were taken from Nature Made or Nature's Bounty storage. **Appendix 2** contains the list of medications that lack storage recommendations, were indecipherable or were not specific enough to assign a proper storage recommendation.

Results

Of the 220 Qualtrics panel members contacted, 195 (89%) completed the survey, and 25 (11.4%) responses were incomplete. Of the 195, 3 (1.5%) were not able to accurately follow the survey directions and discontinued.

79% of households stored at least 1 medication and 6.7% of households had no medication stored at home. 79.9% of households stored 0 to 4 medications, 14.9% stored 5 to 9 medications and 5.2% stored over 10 medications. Households stored 3 medications on average, with a minimum of 0 medications and a maximum of 19 medications. A total of 46.8% households were storing medications on countertops in a bathroom, kitchen or bedroom.

A total of 457 medications were reported with the majority of medications being stored in the kitchen (32.2%), bathroom

(28.7%) and bedroom (21.4%). **Table 1** reviews the data overall on storage locations and the number of medications that were being stored in households.

38.4% of households had residents under 18 years old and 34.7% of those households had medications inappropriately stored on countertops where children could easily access them (**Table 2**).

23.3% of households were storing all medications appropriately 76.7% were storing at least one medication inappropriately. 0.7% of households were storing 17 medications inappropriately, which was the highest reported number reported in a household. 34 medications' storage was unable to be determined, either due to misspelling or unreadable data (**Table 3**).

A total of 457 medications were reported. Out of the 457 medications, 35.4% to 35.9% medications were stored appropriately. 17.2% of the medications were either unknown or not applicable in terms of storage. This indicates that the remaining 46.9% to 47.4% of medications were stored inappropriately (**Table 4**). The counts for each category fluctuate due to the difference in storage recommendations between medication formulations.

Table 1. Overview Table

Total households	154
Total medications	457
Total households not storing medications	13
Household storage locations	
Kitchen	147
Bathroom	131
Bedroom	98
Utility room	14
Garage	5
Hallway closet	19
Other	42
No storage location specified	1
Medication totals per household	
Households with 0-4 medications	123
Households with 5-9 medications	23
Households with 10+ medications	8
Household storage	
All medications appropriate	28
1-4 inappropriately stored medications	75
5-9 inappropriately stored medications	14
10+ inappropriately stored medications	3
Mean medication amount	2.97
Minimum medications stored	0
Maximum medications stored	19

Table 2. Households with Minors	
Inappropriately Stored	Number of Households
Households with residents ≤18 years old	75
Households storing on countertops (kitchen/bathroom/bedroom)	72
Households with keep out of reach of children issues	26

Table 3. Storage by Household Medication	
Inappropriately Stored	Number of Households
All appropriately stored	28
1 inappropriately stored	36 (+1)*
2 inappropriately stored	22 (+1)*
3 inappropriately stored	9
4 inappropriately stored	7
5 inappropriately stored	4 (+1)**
6 inappropriately stored	5 (+1)**
7 inappropriately stored	2
9 inappropriately stored	2
10 inappropriately stored	1
13 inappropriately stored	1
17 inappropriately stored	1
NA	34
Total Households Surveyed	154
Total Households Surveyed (excluding "NA")	120
*Oxybutynin was not specified if IR or ER. IR = appropriate; ER = moisture/humidity issue	
**Venlafaxine was not specified in IR tablet, ER tablet or ER capsule. IR tablet/ER capsule = appropriate; ER capsule = moisture/humidity issue	

Table 4. Storage by Individual Medication

Medication Issue	Number of Medications
Appropriate	162 (+2)*/***
Moisture/humidity issue	52 (+2)*/***
Temperature issue	77 (+2)**
Temperature & moisture/humidity issue	42 (+2)**
Keep out of reach of children issue	23
Keep out of reach of children & moisture/humidity issue	6
Keep out of reach of children & temperature issue	8
Keep out of reach of children, temperature & moisture/humidity issue	4
Unknown	50
NA	29
Total Medications Counted	457
<p>*Oxybutynin was not specified if IR or ER. IR = appropriately; ER = moisture/humidity issue **Lovastatin and glipizide were not specified if IR or ER. IR = temperature issue; ER = temperature & moisture/humidity issue ***Venlafaxine was not specified in IR tablet, ER tablet or ER capsule. IR tablet/ER capsule = appropriate; ER capsule = moisture/humidity issue</p>	

Discussion

The results show that many of the medications were stored incorrectly in many US households. Frequently fluctuating temperatures and humidity in kitchens are not optimal storage conditions for either temperature- or humidity-sensitive medications. The current study showed that 147 medications were stored in the kitchen, and most medications have temperature specifications and humidity warnings. It is important for patients to realize the potential risks storing medications in the kitchen and possible negative effects on medication stability. Frequently fluctuating humidity in bedrooms and bathrooms is not ideal for medication storage of humidity-sensitive medications as well. Exposure to high temperatures or humidity should be avoided for long-term storage of medications. Roughly, 30% of the reported medications had an issue with storage temperatures. Almost a

quarter of medications presented with a moisture/humidity issue. Improper medication storage can affect the stability and sterility of a drug, decreasing its potency and effectiveness. Patients should be able to recognize the signs of medication degradation, such as changes in physical appearance or odor. For instance, when aspirin is exposed to excessive humidity it will breakdown into vinegar and salicylic acid. If the degraded tablets are consumed by the patient, it could cause stomach distress, potentially impacting the patient's health.^[6]

Medications stored on a counter can be easily accessed by children, and susceptible to their accidental ingestion. In this current study, about 35% of the households with a minor resident had at least one medication stored on a countertop. Accidental ingestions of medications by children can lead to hospitalizations and possible fatalities. Approximately 60,000 children are brought in to the emergency department each year

due to medications being stored in reach.^[11] The most common medications can be toxic to children if taken incorrectly and in higher amounts than recommended.

To ensure stability and sterility of medications, it is important to be mindful of the three factors of medication storage locations. For example, tablets and capsules that are susceptible to heat and moisture should be stored in a location with low heat and moisture and little fluctuations in these factors. Another tip for patients is keeping medications in the original containers, as they provide light resistance and better protection for medications. Pharmacists should educate patients on proper storage of their medications and signs of degradation to avoid sickness and unwanted effects. Pharmacists are one of the most accessible healthcare providers and, according to Gallup's annual survey, are the fourth most trusted profession in 2019.^[12] They also have the resources and knowledge about proper medication storage, and can instruct patients on how to properly dispose their unwanted medications. Therefore, pharmacists must intervene and play a larger role in patient medication safety, storage, and disposal education. Some services pharmacists could offer would be free drug disposal services at pharmacies, educating patients about the DEA Drug Take Back Day of drug repository programs or list medications that are on the FDA "flush" list. Medication storage should be a counseling point in every session, even though it may seem like an unimportant point when compared with medication uses, directions and side effects. Improper storage can still pose a negative patient outcome.

Based on the current study, future studies with a larger sample size assessing patient's understanding of medication storage are suggested to be completed. The studies may evaluate the reasons for medication storage location choices and number of expired medications stored at home. Also, a similar study could be conducted with more options for storage locations to ensure more accurate and precise analysis of medication storage locations.

The results from this study don't hold up with what was reported in the article by Vlieland, et al. The study by Vlieland et al., found that more than half of the patients that were evaluated were storing their medications appropriately, however only elderly patients were evaluated. They did not however, have as many options for storage locations as there were in the National Household Medication Survey.

Limitations

Many participants in this study incorrectly reported the names, formulations and dosages of the medications in their households. If the dosage of the medication was listed in the survey and was specific to one formulation, then that formulation was evaluated. If the formulation could not be determined from the survey response and different formulations had different storage recommendations, both formulations were recorded and included in the analysis. Many

people may not realize that storage recommendations vary for each type of formulation and may have assumed that reporting the formulation is unnecessary. Some participants reported whether the medication was a tablet or a cream under the "dose" section, which also hindered deciphering the formulation. Some medications were reported as their nicknames. For instance, "oxy" can mean oxybutynin or oxycodone. Some reported names did not have enough letters to decipher the medication being referring to. Therefore, these medications could not be assessed and were categorized as "NA" (**Appendix 2**). Survey instructions should be more clear, so they can't be interpreted in different manners. This clarity will ensure patients give the exact information that the researchers are seeking.

In the survey, some other likely storage locations were not available as an option to the participant, such as the refrigerator, living room, car and purse. Medication storage methods, such as prescription bottles, unit dose packs or pill organizers, could have been surveyed, and would be helpful in determining if light-sensitive medications were stored correctly. Light exposure is a major factor to be considered when storing medications, as too much exposure can lead to degradation.

This study generalized the conditions of the storage locations, based on the literature that reported the average temperatures and humidity of certain locations. It is important to note that not all households have the same temperature and humidity levels as others. These variables can change depending on the size of the house, household location, outside weather and number of people in the household. This information could be evaluated and taken into account in future studies to accurately decide if medications are being stored safely and properly.

Conclusion

Less than half of the patients who participated in the survey were storing their medications appropriately. The fact that many patients are exposing their medications to unacceptable and unstable storage conditions, could implicate a gap where pharmacists could play a large role in which they would have a huge impact. Utilizing the extensive medication knowledge of a pharmacist, accurate storage recommendations could be made to a patient during counseling to ensure the medications are safe from untimely degradation and no undesirable effects are exhibited.

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Appendix 1

Medication	Proper Storage
Abilify/Aripiprazole	Store at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Do not store in conditions where tablets are exposed to humid conditions.
Acetaminophen/Phenylephrine/Dextromethorphan	Store at room temperature. Protect from excessive heat and moisture.
Acetazolamide	Store at controlled room temperature.
Adderall	Extended-release capsules: Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F); protect from light.
Advair	Store at 20°C to 25°C (68°F to 77°F). Store in a dry place out of direct heat or sunlight.
Advil /Motrin/Ibuprofen	Store at 20°C to 25°C (68°F to 77°F).
Advil PM/Ibuprofen PM	Store at 20°C to 25°C (68°F to 77°F); avoid excessive heat. Protect from light.
Aleve /Naproxen	Store at 15°C to 30°C (59°F to 86°F)
Allegra/Fexofenadine	Store at 20°C to 25°C (68°F to 77°F)
Allopurinol	Store at 15°C to 25°C (59°F to 77°F). Store in a dry place. Protect from light.
Ambien	IR tablets: Store at 20°C to 25°C (68°F to 77°F).
Amlodipine	Store at 15°C to 30°C (59°F to 86°F).
Amoxicillin	Store at room temperature.
Anti-Allergy	Protect from light
Apidra	Stored under refrigeration between 2°C and 8°C (36°F to 46°F) until the expiration date or at room temperature for 28 days; do not freeze; keep away from heat and sunlight.
Arava	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from light.
Atenolol	Store at 20°C to 25°C (68°F to 77°F).
Ativan/Lorazepam	Store at 25°C (77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F).
Atomoxetine HCl	Store at 25°C (77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F).
Atripla	Store at 25°C (77°F); excursions permitted between 15°C to 30°C (59°F to 86°F). Dispense only in original container.
Aviane	Store at 20°C to 25°C (68°F to 77°F).
Azithromycin	Store between 15°C to 30°C (59°F to 86°F).
B-12	1000mcg soft gels, SL lozenges, Tablets: Store in a cool dry place*
Bayer/Aspirin	Store at room temperature; protect from moisture. Hydrolysis of aspirin occurs upon exposure to water or moist air, resulting in salicylate and acetate, which possess a vinegar-like odor.

Medication	Proper Storage
Benazepril	Store at ≤30°C (86°F). Protect from moisture.
Bentyl/Dicyclomine	Store at room temperature, preferably below 30°C (86°F). Protect tablet from direct sunlight.
Benzonatate	Store at 25°C (77°F); excursions permitted between 15°C to 30°C (59°F to 86°F). Protect from light.
Biotin	Store in a cool, dry place; Store at 59°F - 86°F (15°C - 30°C)
Brillinta	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Buspar/Buspirone	Store at 20°C to 25°C (68°F to 77°F); excursions permitted between 15°C to 30°C (59°F to 86°F). Protect from light.
Calcitriol	Oral capsule, injection, solution: Store at room temperature of 15°C to 30°C (59°F to 86°F). Protect from light.
Calcium + Vitamin D*	600 mg: Store in a cool, dry place*
Carbamazepine	Store at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F); protect from light and moisture.
Carvedilol	Store at <30°C (<86°F). Protect from moisture.
Celexa/Citalopram	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from moisture.
Chloraseptic	Store at controlled room temperature. Protect from humidity.
Cinnamon**	1000 mg: store at room temperature** 2000 mg: store at room temperature**
Ciprofloxacin	Store between 20°C to 25°C (68°F to 77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F).
Claritin/Loratadine	Store at 20°C to 25°C (68°F to 77°F).
Clindamycin	Store at 20°C to 25°C (68°F to 77°F).
Clonidine	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from light.
Clopidogrel	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Concerta/Ritalin	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from humidity.
CoQ10	100 mg: store in a cool, dry place* 100 mg: store at room temperature**
Cyclobenzaprine	Tablets: Store between 20°C and 25°C (68°F and 77°F).
Cymbalta/Duloxetine	Store at 20°C to 25°C (68°F to 77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F).
Dexilant	Store at 20°C to 25°C (68°F to 77°F); excursions are permitted to 15°C to 30°C (59°F to 86°F).

Medication	Proper Storage
Dilantin	Store at 20°C to 25°C (68°F to 77°F). Protect capsules from light. Protect capsules from moisture.
Diltiazem	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from light. Avoid excessive heat (>30°C) and humidity.
Dimetapp	Store at room temperature.
Doxycycline	Store at 20°C to 25°C (68°F to 77°F); excursions permitted between 15°C and 30°C (59°F and 86°F). Protect from light and moisture.
Eliquis	Store at 20°C to 25°C (68°F to 77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F).
Enalapril	Tablet: Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from moisture.
Enbrel	Refrigerate at 2°C to 8°C (36°F to 46°F). Do not freeze or store in extreme heat or cold. Individual autoinjectors, prefilled syringes, dose trays, or prefilled pens may be stored between 20°C and 25°C (68°F and 77°F) for a maximum single period of 14 days with protection from light and sources of heat and humidity.
Equate Antacid	Store between 15°C to 30°C (59°F to 86°F).
Estarylla	Store at room temperature. Protect from light.
Estrofem	Store all products at controlled room temperature.
Excedrin	Store at room temperature; protect from light and moisture.
Finasteride	Store below 30°C (86°F). Protect from light. Keep container tightly closed.
Fish Oil	Store at 25°C (77°F); excursions are permitted to 15°C to 30°C (59°F to 86°F); do not freeze.
Flonase/Fluticasone	Store between 4°C to 30°C (39°F to 86°F).
Flovent	Store between 20°C and 25°C (68°F and 77°F); excursions are permitted to 15°C to 30°C (59°F to 86°F). Do not expose to temperatures greater than 48.8°C (120°F).
Focalin	Store at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from light and moisture.
Folic Acid	Store at 20°C to 25°C (68°F to 77°F); protect from light.
Fosamax/Alendronate	Store at room temperature of 15°C to 30°C (59°F to 86°F). Keep in well-closed container.
Furosemide	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 89°F). Protect from light.
Gabapentin	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Geodon	Store at 25°C (77°F); excursion permitted to 15°C to 30°C (59°F to 86°F).
Glimepiride	Store at 25°C (77°F); excursions permitted between 20°C and 25°C (68°F and 77°F)
Glipizide	Extended release: Store at 68°F to 77°F (20°C to 25°C); excursions permitted between 59°F to 86°F (15°C to 30°C). Protect from moisture and humidity. Immediate release: Store below 30°C (86°F).

Medication	Proper Storage
Glucosamine	Store at room temperature**
Humalog	Unopened vials, cartridges, and prefilled pens may be stored under refrigeration between 2°C and 8°C (36°F to 46°F) until the expiration date or at room temperature <30°C (<86°F) for 28 days; do not freeze; keep away from heat and light.
Humira	Store at 2°C to 8°C (36°F to 46°F) in original container to protect from light; do not freeze. Do not store in extreme heat or cold. If needed, may be stored at room temperature up to a maximum of 25°C (77°F) for up to 14 days
Hydrochlorothiazide	Store at 20°C to 25°C (68°F to 77°F). Protect from light and moisture.
Hydrogen Peroxide	Store at room temperature.
Hydroxyzine	Store <30°C (86°F). Protect from light.
Imitrex	Tablet: Store at 20°C to 25°C (68°F to 77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F); do not refrigerate or freeze.
Iron	(Spring Valley) 27 mg: Store at room temperature 59°F and 86°F (15°C and 30°C)
Isosorbide Mononitrate	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from moisture.
Klonopin/Clonazepam	Store at 20°C to 25°C (68°F to 77°F).
Klor-Con	Store at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from light and moisture.
Lamotrigine	Store at 15°C to 30°C (59°F to 86°F). Protect from light.
Lantus	Store unopened vials and prefilled pens refrigerated at 2°C to 8°C (36°F to 46°F) until expiration date, or at room temperature <30°C (<86°F) for 28 days; do not freeze; protect from heat and sunlight.
Lexapro/Escitalopram	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Librax	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Lipitor/Atorvastatin	Store at 20°C to 25°C (68°F to 77°F).
Lisinopril	Store at 15°C to 30°C (59°F to 86°F). Protect from moisture.
Lithium	Store between 15°C and 30°C (59°F to 86°F). Protect tablets and capsules from moisture.
Losartan	Store at 25°C (77°F); excursions are permitted to 15°C to 30°C (59°F to 86°F). Protect from light.
Lovastatin	Immediate release: Store at 20°C to 25°C (68°F to 77°F). Protect from light Extended release: Store at 20°C to 25°C (68°F to 77°F); excursions permitted between 15°C to 30°C (59°F to 86°F). Avoid excessive heat and humidity.
Lyrica	Store at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Magnesium	Store at controlled room temperature. Protect from moisture.
Melatonin	Store at room temperature and avoid excessive heat

Medication	Proper Storage
Meloxicam	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect tablets and capsules from moisture.
Metamucil	Store at room temperature; protect from moisture
Metformin	Store at 20°C to 25°C (68°F to 77°F); excursion permitted to 15°C to 30°C (59°F to 86°F). Protect from light and moisture.
Methotrexate	Store between 20°C and 25°C (68°F and 77°F). Protect from light.
Metoprolol Succinate	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from moisture.
Metoprolol Tartrate	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from moisture.
Metronidazole	Store at 15°C to 25°C (59°F to 77°F). Protect the tablets from light.
Microgestin	Store at controlled room temperature.
Mirtazepine/Remeron	Store at 20°C to 25°C (68°F to 77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F). Protect from light and moisture.
Mucus Relief	Store at room temperature; do not refrigerate. Protect from light.
Nasacort	Store at 20°C to 25°C (68°F to 77°F); do not freeze.
Nexium	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Niacin	Store at room temperature.
Nifedipine	Store below 30°C (86°F); protect from light and moisture. excursions permitted to 15°C to 30°C (59°F to 86°F)
Nite Time/Nyquil/Dextrometorphan/Doxylamine succinate	Store at room temperature.
Norco	Store at 20°C to 25°C (68°F to 77°F). Protect from light.
Olmesartan	Store at 20°C to 25°C (68°F to 77°F).
Omeprazole	Capsules, tablets: Store at 15°C to 30°C (59°F to 86°F). Protect from light and moisture. OTC capsules: Store at 20°C to 25°C (68°F to 77°F); protect from moisture.
One A Day Women's Multivitamin	Store at room temperature; avoid excessive heat above 40°C (104°F)
Onglyza	Store at 20°C to 25°C (68°F to 77°F); excursions permitted between 15°C to 30°C (59°F to 86°F).
Oxybutynin	Immediate release tablet and syrup: Store at 20°C to 25°C (68°F to 77°F). Protect from light. Extended release tablet: Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from moisture and humidity.
Oxycodone	Store at 25°C (77°F); excursions permitted between 15°C to 30°C (59°F to 86°F). Protect from light and moisture.

Medication	Proper Storage
Paxil/Paroxetine	Tablets: Store between 20°C and 25°C (68°F and 77°F); excursions permitted between 15°C and 30°C (59°F and 86°F).
Penicillin	Store at 20°C to 25°C (68°F to 77°F).
Pepto Bismol	Store at room temperature. Avoid excessive heat. Protect from freezing.
Phenobarbital	Store between 20°C and 25°C (68°F and 77°F). Protect from light.
Phentermine	Store at 20°C to 25°C (68°F to 77°F).
PNV	Room temperature, avoid excessive heat
Polyethylene Glycol	Store at 20°C to 25°C (68°F to 77°F); excursions are permitted between 15°C to 30°C (59°F to 86°F).
Pravastatin	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from light.
Prednisone	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from light and moisture.
Propranolol	Store at controlled room temperature; protect from freezing or excessive heat. Protect from light and moisture.
Prozac/Fluoxetine	All dosage forms should be stored at controlled room temperature. Protect from light.
Quetiapine	Store at 25°C (77°F); excursions permitted between 15°C and 30°C (59°F and 86°F).
Refresh	Store at 59°F and 86°F (15°C and 30°C)
Remicade	Store intact vials at 2°C to 8°C (36°F to 46°F); may be stored at room temperature (maximum of 30°C [86°F]) for up to 6 months (not to exceed the original expiration date); do not return to refrigerated storage.
Risperidone	Store at 15°C to 25°C (59°F to 77°F). Protect from light and moisture.
Rosuvastatin	Tablet: Store between 20°C and 25°C (68°F to 77°F). Protect from moisture.
Senexon/Senna-lax	Store at 20°C to 25°C (77°F); excursions are permitted between 15°C and 30°C (59°F to 86°F).
Simethicone	Store at 20°C to 25°C (68°F to 77°F). Protect from moisture. Avoid high humidity and excessive heat.
Simply Sleep/Benadryl/Allergy Relief	Store at room temperature. Protect capsules and tablets from moisture.
Simvastatin	Store at 5°C to 30°C (41°F to 86°F).
Singulair	Store at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Protect from moisture and light.
Sinus Relief	Store at 20°C to 25°C (68°F to 77°F).
Sleep Aid	Store at 20°C to 25°C (68°F to 77°F)
Sotalol	Store at 25°C (77°F); excursions permitted between 15°C and 30°C (59°F and 86°F).

Medication	Proper Storage
Spironolactone	Store below 25°C (77°F).
Starlix	Store at 25°C (77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F).
Synthroid/Levothyroxine/Levoxyl	Store at 25°C (77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F). Protect from heat, light, and moisture.
Tizanidine	Store at 25°C (77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F).
Tradjenta	Store at 20°C to 25°C (68°F to 77°F); excursions permitted between 15°C to 30°C (59°F to 86°F).
Tramadol	Store at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Trazodone	Store at 20°C to 25°C (68°F to 77°F); excursions permitted between 15°C to 30°C (59°F to 86°F). Protect from light.
Triamcinolone	Cream: Store at 20°C to 25°C (68°F to 77°F).
Trilipix/Fenofibrate	Store at 25°C (77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F). Protect TriCor from moisture.
Tylenol/Acetaminophen	Store at 20°C to 25°C (68°F to 77°F); avoid excessive heat (40°C [104°F]).
Tylenol PM	Store at 20°F and 25°F (68°C and 77°C)
Vaniqa	Store at controlled room temperature 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F); do not freeze.
Venlafaxine/Effexor	Immediate-release tablets and extended-release capsules: Store at 20°C to 25°C (68°F to 77°F). Extended-release tablets: Store at 25°C (77°F); excursions permitted between 15°C and 30°C (59°F and 86°F). Protect from moisture and humidity.
Ventolin/ProAir	Metered-dose inhalers (HFA aerosols): Store at 15°C to 25°C (59°F to 77°F). Do not store at temperature >120°F. Do not puncture. Do not use or store near heat or open flame.
Verapamil	Calan SR (tab): Store at 15°C to 25°C (59°F to 77°F). Protect from light and moisture. Verelan (cap): Store at 20°C to 25°C (68°F to 77°F). Avoid excessive heat; protect from moisture. Brief temperature >25°C (77°F) should be avoided.
Vesicare	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Vicodin	Store at 20°C to 25°C (68°F to 77°F). Protect from light.
Victoza	Prior to initial use, store at 2°C to 8°C (36°F to 46°F); after initial use, may be stored at 2°C to 8°C (36°F to 46°F) or at 15°C to 30°C (59°F to 86°F). Do not freeze or store directly adjacent to the refrigerator cooling element. Protect from heat and light.
Vitamin C	Store at room temperature.
Vitamin D/Vitamin D3 Cholecalciferol D3	Store at 15°C to 30°C (59°F to 86°F); do not freeze. Protect from light.
Vivelle-Dot Patch	Store in protective pouch.
Warfarin	Store at 15°C to 30°C (59°F to 86°F). Protect from light.

Medication	Proper Storage
Wellbutrin	Store at 15°C to 30°C (59°F to 86°F). Protect from light and moisture.
Xanax/Alprazolam	Store at 20°C to 25°C (68°F to 77°F).
Xyzal	Store at 20°C to 25°C (68°F to 77°F)
Yosprala	Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Store in original container. Protect from moisture.
Zantac	Store between 20°C and 25°C (68°F and 77°F). Protect from light. Protect from moisture.
Zoloft/Sertraline	Store at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F).
Zonegran/Zonisamide	Store at 25°C (77°F) excursions are permitted between 15°C and 30°C (59°F and 86°F). Protect from moisture and light.
Zyrtec/Wal-zyr	Store at 20°C to 25°C (68°F to 77°F); excursions are permitted between 15°C and 30°C (59°F and 86°F).
<p>All medication information was gathered from Lexi-drugs via Lexicomp drug information database^[8] *Retrieved from Nature Made prescription label^[9] *Retrieved from Nature's Bounty prescription label^[10]</p>	

Appendix 2

Nonsense Medications
"good", "ahn", "one", "yes", "nore", "jetson", "exelium", "hgygu", "borg", "medizel", "gius", "metrolmsop", "metrokoloious", "gtreth", "as", "tyroid", "trats", "unknown", "dol", "idk", "unsure", "capsules", "oxy", "fevers", "sustatin"
Nonspecific Medications
"birth control", "after sun lotion", "callous liquid", "muscle relax", "bandage", "multi-vitamin", "multivitamins", "oneaday", "ear drops", "vitamins", "Flintstone vitamins"
Storage Not Specified on Package Label/Lexicomp
Hydrangea root, Therapain, Arnicare