CONCEPTUAL AND DISCURSIVE REALITY OF MEDICATION ACCUMULATION AT HOME

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE UNIVERSITY OF MINNESOTA
BY

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In 2005, I embarked on the great American voyage as a clueless exchange student. From learning English, which shares little similarity with my mother tongue, to completing the graduate studies, getting here has taken many unexpected turns. These turns made me want to give up countless times, but they helped me grow leaps and bounds. The turns also allowed me to meet incredible people who guided, inspired, and mentored me, including the mentors I met at and through the College of Pharmacy.

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"Losing family obliges us to find our family. Not always the family that is our blood, but the family that can become our blood" (Van Sant, 2000). Though being away from one may not be precisely equivalent to losing family, I also owe many thanks to these new family members.

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The completion of the PhD studies remarks the end of the journey of survival. The future journey will be less of a means to an end, and this transition was only possible thanks to these people I greatly cherish. The end of the journey of survival, however, does not denote the end of my journey of growth. To return this favor and express my gratitude to them, I will continue to grow as a person and scholar.

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List of Abbreviations

ADD: Automated Dose Dispensing

BSP: Business Source Premier

DRT: Dopamine Replacement Therapy

DSH: Deliberate Self-harm

IR: Interpretative Repertories

MME: Morphine Milligram Equivalence

OTC: Over—the-counter

PAS: Physician Assisted Suicide

UUE: Unused, Unwanted, or Expired

UUEL: Unused, Unwanted, Expired, or Leftover

WoS: Web of Science

SIRUM: Supporting initiatives to Redistribute Unused Medicine

CHAPTER 1: INTRODUCTION

1.1 Significance

Individuals with their medicine cabinet full of medications stockpiled from the past, or those who obtain as many medications as possible before the insurance deductible resets at the beginning of each year are anecdotally reported in healthcare. This type of drug retention behavior called medication hoarding is associated with unintended consequences on healthcare costs, patient safety, the environment, and quality of care, and needs to be researched more.

Jensen and Granzin suggested that hoarding of goods causes unnecessary inefficiency within consumer logistics, which is a conceptual framework designed for the consumer system. The system was established to facilitate consumption of the bundle of services residing in the economic goods being distributed. The system is comprised of five subsystems: communication, location, transportation, handling and storage, inventory. With hoarding, products cannot move along in the system, leading to inefficiency in the distribution (Jensen & Granzin, 2015). For instance, many unused, unwanted, or expired (UUE) medications are stored at home without being fully used (Bekker et al., 2018; Bettington et al., 2018; Vogler & de Rooij, 2018). Anticipatory stockpiling may also limit the access to medications for others, and some may not be able to obtain medications in time or at a reasonable cost (Kadowaki et al., 2014; Kobayashi et al., 2016; Stiff et al., 1975). Medication access is exceptionally crucial, as most medications affect one's well-being and may save one's life in emergencies.

The complicated payment structures and limited access to healthcare in the US form a high barrier for medication acquisition, appending an additional cost to this process other than the cost for the products (Holland et al., 2021). Also, for storage, solid dosage medications, such as tablets and capsules, may not take up a huge volume or require significant storage costs. However, liquid formulations such as insulin or biologics may require delicate storage conditions with additional storage costs.

Medication reservoirs building up at home may also increase the risk of accidental exposure of medications to children or pets (Cortinovis et al., 2015; Sorensen et al., 2005). According to the 2018 National Medication Inventory Survey, approximately 30 - 40% of the US households store medications that are frequently involved in accidental poisoning on an open counter (Lee & Schommer, 2022). Besides the increased risk of accidental exposure caused by medication hoarding, Sorensen et al. investigated how the retention of medications stored at home can affect different clinical aspects. His study indicated that the higher number of medications stored at home is associated with high severity of illness, therapeutic duplication, confusion between generic and trade names, low medication adherence and lack of medication administration routine (Sorensen et al., 2005). Thus, medication hoarding may act as an indicator of patients' health status and their medication use practice. Understanding medication hoarding may provide new directions for enhancing medication adherence and utilization.

When hoarded medications are eventually discarded, they can also harm the environment. Feminization of male fish by estrogen, impaired reproduction in

fish, and development of microbiological resistance have been reported (Braund et al., 2009; Guirguis, 2010; Kusturica et al., 2012; A. V. Law et al., 2015; Morgan, 2001; Simonsen et al., 2017). It is also suspected that the current water, disposal, or recycling systems cannot handle the sheer volume of hoarded medications (Ruhoy & Daughton, 2007).

To prevent medication hoarding and its negative consequences, various interventions may be developed. For effective development of such interventions, however, the reasons for medication hoarding must be understood. Knowing the why will explain the causes of the behavior to be targeted and clarify its mechanisms and downstream consequences.

1.2 Literature Review and Rationale

Before investigating the key components of medication hoarding, the status-quo of the information in the literature needs to be evaluated. However, research regarding medication hoarding is scant and ambiguous. Little research has focused specifically on medication hoarding. The lack of knowledge seems to originate from the lack of a consensus definition for medication hoarding available in the literature. Without knowing how it is defined, the reasons and mechanisms for the behavior are difficult to understand. The few available definitions in the literature are “the collection of medications in the home that are unwanted, no longer needed, or have expired and which may be the result of a patient’s desire to not be wasteful” (Martinez et al., 2012) and “cases where multiple medications

were retained in the home, particularly when medications were no longer required or had expired" (Sorensen et al., 2005). VanDyke et al. also referred medication hoarding and "medication saving," indicating the confusion in the terminology use (VanDyke & Steffen, 2017). The ambiguous definitions and their confusing use of the terminologies hinders comprehensive understanding of the behaviors required for future research.

As implied by the earlier definitions, medication hoarding is mentioned in the context of examining having UUEL medications or returning such medications for disposal. In several of these studies, the act of retaining such medications is referred as medication hoarding (Edwards, 1982; Eichenberger et al., 2011; Kalyango et al., 2012; Sorensen et al., 2005; VanDyke & Steffen, 2017). Despite these definitions, having UUEL medications is an act of retention, while hoarding is recognized as an acquisitive buying behavior in marketing (Bose et al., 2013). Thus, the two concepts should not be considered equivalent, while a close relationship between the two concepts may exist. The likely relation between the two concepts, however, is not clearly delineated in the literature.

The concept of hoarding also seems to compete with the concept of medication stockpiling. For instance, Elliot et al. defined medication hoarding as "stockpiling and retention of drugs no longer needed" (Elliott, 2006). However, stockpiling is often perceived economically rational in marketing and hoarding is not (Beasley, 1998; R. Blattberg et al., 1978; R. C. Blattberg et al., 1981; Bose et al., 2013; Fernando et al., 2021). The interchangeable use of the terms different in

their nature seems to indicate apparent conceptual confusion between medication hoarding and stockpiling.

Based on the content of the definitions, it appears that the concept of medication hoarding may compete with the other concepts such as medication stockpiling or the retention of UUEL medications (Elliott, 2006; A. V. Law et al., 2015; Maeng et al., 2017; Martinez et al., 2012; Morgan, 2001; Sorensen et al., 2005). A full grasp of the relationships among these seemingly competing concepts would provide insight into the cause of the conceptual confusion. By delineating the conceptual boundaries among these concepts, the nature of medication hoarding may also become apparent and distinguishable. Based on the comprehensive understanding, the reasons and mechanisms of such phenomenon can be better understood and targeted for prevention of its negative consequences.

1.3 Study Questions and Objectives

The literature review revealed that the rationales and mechanisms of medication accumulation at home were not clearly understood in the scientific literature. Medication accumulation also seemed to be reported as various phenomena but in a similar and confusing fashion. Such phenomena were medication hoarding, medication stockpiling, and UUEL medications. The identified gaps in the literature led to the formation of the following study questions:

a) why and how people hoard medications at home, and b) how is this phenomenon reported in the scientific literature?

To answer the research questions, the objectives of the current study are set as follows:

1) To conceptually analyze the hoarding of prescription and over-the-counter medications by individuals at home and its competing concepts such as medication stockpiling and the retention of UUEL medications in the scientific literature.
    a) To determine the conceptual definitions, operationalization, contexts, boundaries, antecedents, characteristics and outcomes of medication hoarding, medication stockpiling, the retention of UUEL medications in the scientific literature
    b) To evaluate the conceptual maturity of the three competing concepts, based on the epistemological, pragmatic, linguistic, and logical principles.
    c) To analyze the difference between the concepts reported in the literature extracted from healthcare-oriented and non-healthcare-oriented search platforms
2) To establish a theoretical definition of medication accumulation based on the three competing concepts of interest.
    a) To identify the areas to be targeted with interventions to prevent the negative consequences of mediation accumulation

3) To analyze the discourses around medication hoarding and stockpiling in the scientific literature that utilized the two terms interchangeably.
    a) To examine the use of discursive devices and interpretative repertoires, subject positions, and context of the relevant discourses.
    b) To theorize the reasons for interchangeable use of the terms, medication hoarding and stockpiling based on the use of discursive devices and interpretative repertoires, subject positions by the authors, and context of the relevant discourses.
4) To determine the congruence between the results of the principled-based concept analysis and discursive psychology.

CHAPTER 2: METHODOLOGY

2.1 Justification and Theoretical Framework

2.1a Principle-based Concept Analysis

Medication hoarding may lead to negative consequences clinically, environmentally, and economically (Jensen & Granzin, 2015; Sorensen et al., 2005; VanDyke & Steffen, 2017). To find a solution to minimize these phenomena, the reasons and mechanisms of the behavior should be understood first. However, a comprehensive review of medication hoarding has not been conducted, and its exact state of science reported in literature is unknown. Without establishing firm knowledge foundations based on literature, future research regarding medication hoarding cannot be strategically planned and conducted.

The initial screening of literature indicated that the information about medication hoarding was embedded in disparate literature. The screening also revealed other phenomena that were potentially equivalent or closely related to medication hoarding. However, without employing a systemic approach, the relationship among these concepts that seem to be related, and whether more related concepts exist cannot be examined.

Principle-based concept analysis adopts a deductive approach in analyzing and consolidating concepts in scientific literature. For the analysis, relevant literature information is categorized based on seven conceptual attributes: conceptual definitions, operationalization, context, boundaries, antecedents,

characteristics, and outcomes (Penrod & Hupcey, 2005). The reasons or rationales would precede the act of medication hoarding or other competing phenomena and would be recognized as antecedents in the analysis. The common mechanisms of medication hoarding, or its related phenomena would be recognized as characteristics. Thus, the information classified as antecedents and characteristics may clarify the reasons and mechanisms of medication hoarding which are the focus of the current study. A systemic literature review and scoping review were considered. However, principle-based concept analysis was deemed most appropriate based on the nature of the topics embedded in disparate literature (Munn et al., 2018) and the objectives of the current research.

Among the concept analysis methods developed for literature review in various facets, concepts related to patient behaviors are most discussed in nursing (Nuopponen, 2010). In nursing, Wilson first established the concept analysis approach, and such approach became polished methodologically over time (Hupcey et al., 1996). Morse and Penrod et al. observed the evolution of the Wilsonian methods and improved upon them by extracting the critical principles of these methods and complementing their weaknesses by introducing new components in their principle-based concept analysis (Hupcey et al., 1996; Penrod & Hupcey, 2005).

Principle-based concept analysis focuses on the state of the science and guide concept evaluation and in-depth exploration of a concept. Based on this methodology, "concepts are…names given to clusters of behaviors that together form some function or purpose" (Morse, 2000). The methodology also focuses on

scientific concepts, not ordinary concepts. Ordinary concepts appear in the everyday conversations and interactions in life. Often the descriptions and definitions of these concepts can be found in a dictionary. However, scientific concepts are a product of integrated conceptual units that are more precisely defined to align the understanding of a representation of reality (Hupcey & Penrod, 2005).

Principle-based concept analysis was developed based on four main theoretical principles: epistemological, logical, pragmatic, linguistic principles. In addition to these four facets of concepts, the concept analysis aims to evaluate other conceptual components such as characteristics and preconditions (Hupcey et al., 1996; Morse, 1995; Morse et al., 1996; Penrod & Hupcey, 2005). The evaluation criteria for these conceptual principles and components are shown in Figure 1.

1. Identification of relevant published literature regarding medication hoarding and any competing or similar concepts on various databases

↓

2. Concept analysis of the literature focusing on definitions, operationalization, context, boundaries, characteristics, antecedents, and outcomes

Criteria or questions to consider during the analysis

Epistemological

- Is the concept clearly defined?

Pragmatic

- Has the concept been appropriately operationalized?

Linguistic

- Is the concept used consistently and appropriately within context?

Logical

- Does the concept hold its boundaries?
- Has the concept been theoretically integrated with other concepts?

Other conceptual components (characteristics, antecedents, and outcomes)

- What are the key characteristics?
- What are the relationships among the characteristics?
- What are the antecedents?
- What are some of the outcomes or consequences?

↓

3. Construction of a theoretical definition that summarizes the current state of the science

Figure 1 Concept Evaluation Process (Morse et al., 1996)

Based on the evaluation criteria shown in Step 2 of Figure 1, the conceptual maturity of each of the four principles can be appraised. However, conceptual maturity is a mere label that summarizes the current state of the knowledge, but this label is not of critical importance. The gaps and inconsistencies in scientific knowledge identified during the evaluation of conceptual maturity is of greater importance, as this information is imperative in establishing a theoretical definition and determining the most appropriate technique for further concept development (Hupcey JE 2005).

2.1b Discursive Psychology

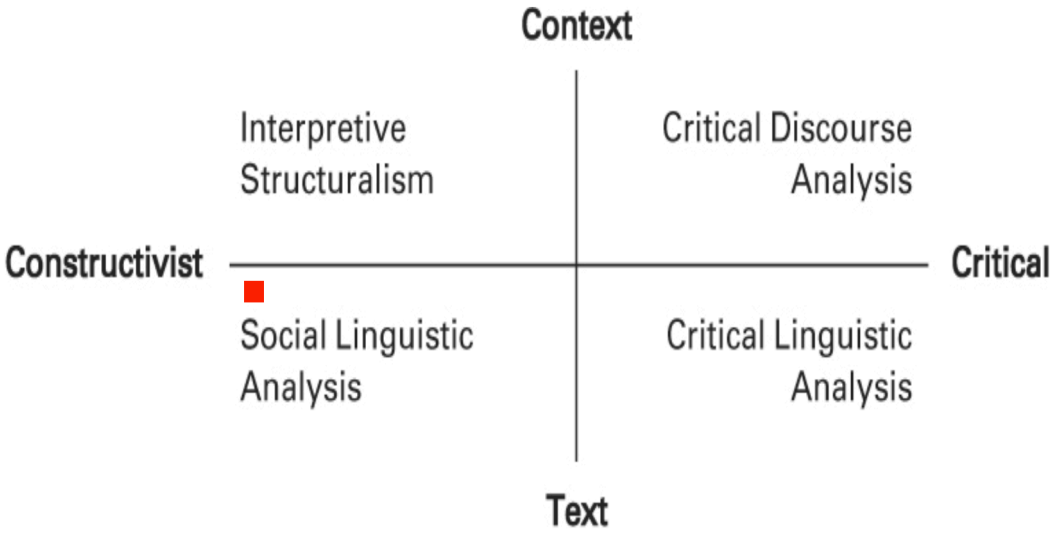

Figure 2 Discourse Analysis Quadrants (Phillips & Hardy, 2002; Phillips & Ravasi, 1998)

The previous principle-based concept analysis revealed that the concept of medication hoarding competed with the concept of medication stockpiling and the boundary between the two was ambiguous. Notably, a few studies used these two terms interchangeably to describe what seemed to be the same behavior. In fact, hoarding and stockpiling are regarded as different consumer behaviors (Bose et al., 2013; Fernando et al., 2021), and such distinction should be made when adopted in healthcare science. To do so, it is crucial to learn how the apparent conceptual confusion came about, so the sources of the confusion can be addressed, and the concepts can be more accurately delineated.

The primary aim for this section was to determine the cause of the ambiguous terminological use of medication hoarding and stockpiling in scientific

literature. Considering the weak conceptual base of medication hoarding and stockpiling, concept clarification was more needed than concept development. Discourse analysis is an appropriate method for analyzing and clarifying the terminological and conceptual ambiguity (Phillips & Hardy, 2002), based on the language use around medication hoarding and stockpiling in the scientific literature. This method holds an advantage over other methods such as grounded theory and ethnography in that it can utilize the existing text data collected during the principle-based concept analysis. Also, the other methods focus on concept development and may be too premature to be applied for the concepts of interest.

Discourses are the practice of talking or writing. The theoretical underpinning of discourse analysis is that the act of discursive production, dissemination, and consumption bring meanings to the texts in a specific social and historical context. Phillips and Ravasi provided a framework for identifying different types of discourse analysis, based on the two dimensions as shown in Figure 2 (Phillips & Hardy, 2002; Phillips & Ravasi, 1998). One dimension is a continuum between context and text; the other extends from the constructivist and critical approach. As indicated by the vertical axis in Figure 2, a discourse analysis can focus on the text within or surrounding the discourses of interest, or focus on local, cultural, social, and historical contexts. The horizontal axis in Figure 2 indicates that a discourse analysis can also explore how discourses construct a social reality or focus on the dynamics of power, knowledge, and ideology. Also, the axes represent continua, and they are not two sets of dichotomy (Phillips &

Hardy, 2002). In other words, a discourse analysis can incorporate varying degrees of context and text and take a more constructivist or critical approach.

The desired degree of the focus within the two continua of the current discourse analysis is indicated by the square dot in Figure 2. The placement of the dot was determined as following. First, it was assumed that the discourses in scientific literature mainly transferred information from the authors to audiences unidirectionally. The authors often held the knowledge in the unidirectional interactions. With this assumption, the critical discourse analysis which focused on the evolution of discourses under the dynamics of power, knowledge, and roles was not appropriate for the current study. Second, an unnecessarily broad contextual scope including the social and historical context of the language use was not desired. For concept clarification, the discourse analysis of choice had to be well aligned with the conceptualization of the literature data from the concept analysis. Hence, a wider scope of the discourse analysis may disrupt the aligned understanding of the discursive and conceptual states. Third, since most scientific literature followed similar rhetoric rules with similar tones, a detailed analysis of the grammatical and structural use of texts, as in microanalysis, was not expected to yield any meaningful results.

Discursive psychology takes the constructivist perspective which contrasts the positivist view. Within the constructivist approach, the reality is not fixed, and such reality can take multiple forms depending on the constituent individuals like the observer of their reality. When this approach is applied to discourse analysis, the focus of research is to understand what is accomplished by discourses. The

authors of scientific literature convey various meanings in their discourses and construct their own reality to accomplish their agenda (Potter, 1987; Wiggins, 2017). The agenda, for instance, may be to influence or persuade the readers in a certain way with their findings. Understanding the meanings of the discourses based on what is accomplished by them will delineate the realities of the two competing concepts and the sources of the conceptual confusion.

It is crucial to emphasize that discursive psychology does not focus on examining the thoughts, perspectives, or inner representations of the entities creating the discourses. These aspects are not considered the constituents of the reality. They, however, may contribute to the creation of the discourses and can be inferred from various discursive practices and how they are constructed (Potter, 1996). To study such discursive practices and the construction of their reality, discursive psychology provides a framework for discussive pattern recognition. The framework especially employs interpretative repertories and discursive devices. Interpretative repertories are metaphors, figures of speech and clusters of terms used to construct different meanings (Potter, 1987; Wiggins, 2017). Discursive devices are strategies used to shape an interaction to accomplish an agenda. Based on these features, the construction of the discursive reality can be clarified (Mueller & Whittle, 2011; Wiggins, 2017).

The current discursive psychology was conducted to analyze the discourses around the confusing application of medication hoarding and stockpiling observed in the scientific literature identified in the previous phases of the study. The other competing concept, retaining UUEL medications, was often

used to describe medication hoarding or stockpiling. Furthermore, based on the findings of the concept analysis, the retention of UUEL medications was determined to be subsumed under the concept of medication hoarding. Thus, distinguishing it from medication hoarding and stockpiling was unnecessary for the discursive psychology.

2.2 Data Collection

2.2a Familiarization

An overview of these steps is provided in Figure 3.

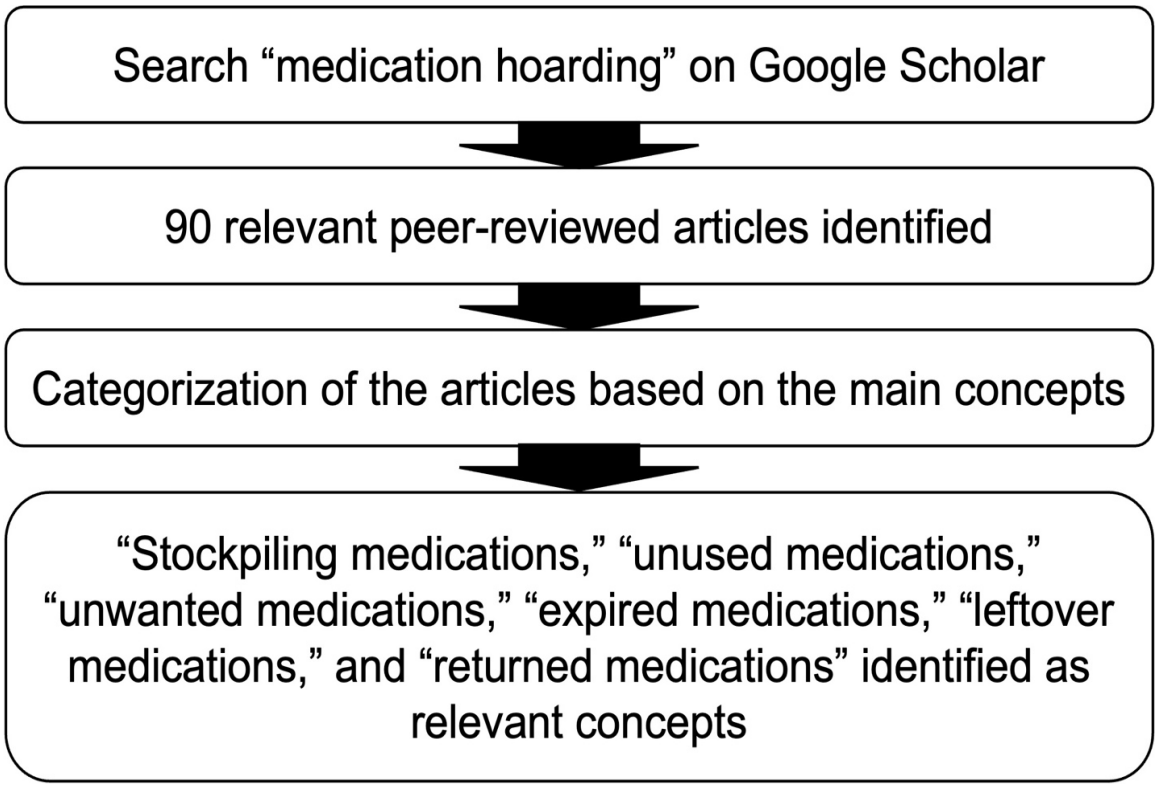

Figure 3 Process of “Familiarization”

The initial literature screening revealed medication hoarding was described in various terms in disparate literature. With the relevant information embedded in disparate literature, a brief literature review could not clearly determine the relevant search terms. For this reason, a more in-depth screening of the relevant literature or “familiarization” was conducted.

In qualitative research, familiarization often refers to the initial step in framework analysis where researchers are immersed in the data to identify major themes that are relevant to the research questions. The purpose of such is to understand the depth and variation of the given data set that are to be analyzed and coded within the same study (Goldsmith, 2021). However, “familiarization” in the current study is different from that, as the literature reviewed in this step was not the same data used in the subsequent analyses in the current study. The purpose of familiarization was to identify the specific topics related to medication hoarding which could be systematically searched.

Google Scholar was the database of choice to perform comprehensive search for interdisciplinary, peer-reviewed, and grey literature. The searches began with one search term “medication hoarding.” Each abstract in the search results was read and articles potentially relevant to the study questions were identified. If Google Scholar did not have an article available in full-text, the University of Minnesota Library Catalog was searched or an interlibrary loan through the University of Minnesota Library was requested to gain access to full-text articles. NVivo (v. 1.7.1) was used to categorize the ninety peer-reviewed articles based on their main concepts. Through the searches and categorization,

“stockpiling medications,” “unused medications,” “unwanted medications,” “expired medications,” “leftover medications” were identified as relevant concepts reported in the literature. “Returned medications” also appeared in the context of UUEL medications and were selected as a search term.

A reference trail for the familiarization was not recorded, since the purpose of the process was to review various literature to gain a better grasp of the target concepts, and a systemic search strategy was not necessary.

2.2b Principle-based Concept Analysis

Various terms, including but not limited to, “medication hoarding,” “medication stockpiling,” “unused medications,” “unwanted medications,” “expired medications,” “leftover medications,” and “returned medications” were searched on Ovid, PsychInfo, Web of Science, and Business Source Premier. Healthcare literature-based Ovid and PsychInfo were the search platforms of choice since the current study focused on medication-related behaviors. Web of Science was selected to obtain more comprehensive search results on a non-healthcare-oriented search platform. Business Source Premier, another non-healthcare-oriented search platform was searched to examine the understanding of the relevant concepts as consumer behavior.

“Leftover medications” and “leftover medications” were identified as concepts similar to medication hoarding during the familiarization and included in the systematic literature search process. For further theoretical sampling after the systematic literature search, Google Scholar was utilized. For the latter process, a

systematic process was not needed, because a sufficient concept depth was established without comprehensive searches.

The three common concepts appeared upon the literature search were medication hoarding, medication stockpiling, and having UUEL medications. The concept pertaining to UUEL medications was often operationalized as individuals who retained these types of medications. To represent these behavioral aspects, the concept was named “retaining” such medications.

The search terms and the search results are shown in Appendix 1. Upon searches, each abstract was carefully reviewed for data collection. The University of Minnesota Library Catalog was searched or an interlibrary loan through the University of Minnesota Library was requested to gain access to full-text articles. As shown in Appendix 1, the number of search results regarding the UUEL medications from Web of Science exceeded 2,000. However, these were searched last during the data collection. After sorting the results based on the relevance and reviewing the first seven articles on Web of Science, no new patterns in the data were found in the literature. It was determined that saturation in the data was reached, and the review of the search results ended.

The inclusion and exclusion criteria for the literature were set based on the underlying positivist approach of the principle-based concept analysis. Only proven or directly observed scientific evidence in literature was coded and categorized in the analysis. Any information which was not based on direct observations of the relevant concepts or behaviors such as perspectives of patients, caregivers, or healthcare partitioners were excluded. Likewise, literature

such as letters, opinions, and commentaries, which likely presented authors' biases was excluded.

As the study objective stated, the study was regarding the relevant behaviors around prescription and OTC medications exhibited by individuals at home. Any studies with information irrelevant to human behaviors was excluded from the analysis. Likewise, the studies regarding affairs of institutions or organizations, and implementation of medication utilization services or programs were excluded. The information related to veterinary drugs was excluded, because these would involve a different acquisition process than most of human medications. Likewise, the information about illicit drugs and syringes was excluded because of their acquisition process different from the process for prescriptions and OTC medications.

2.2c Discursive Psychology

The literature analyzed in the principle-based concept analysis was the data source for discursive psychology. A total of six articles utilized the terms, medication hoarding and stockpiling, interchangeably. Any text pertaining to medication hoarding or stockpiling in this literature was collected with NVivo (v. 1.7.1). To provide better context for the analysis, any text preceding and following the main text of interest within the same paragraph was also collected in the sample.

2.3 Data Analysis

An illustration of the entire steps of the data analysis including the concept analysis and discursive psychology is provided in Figure 4.

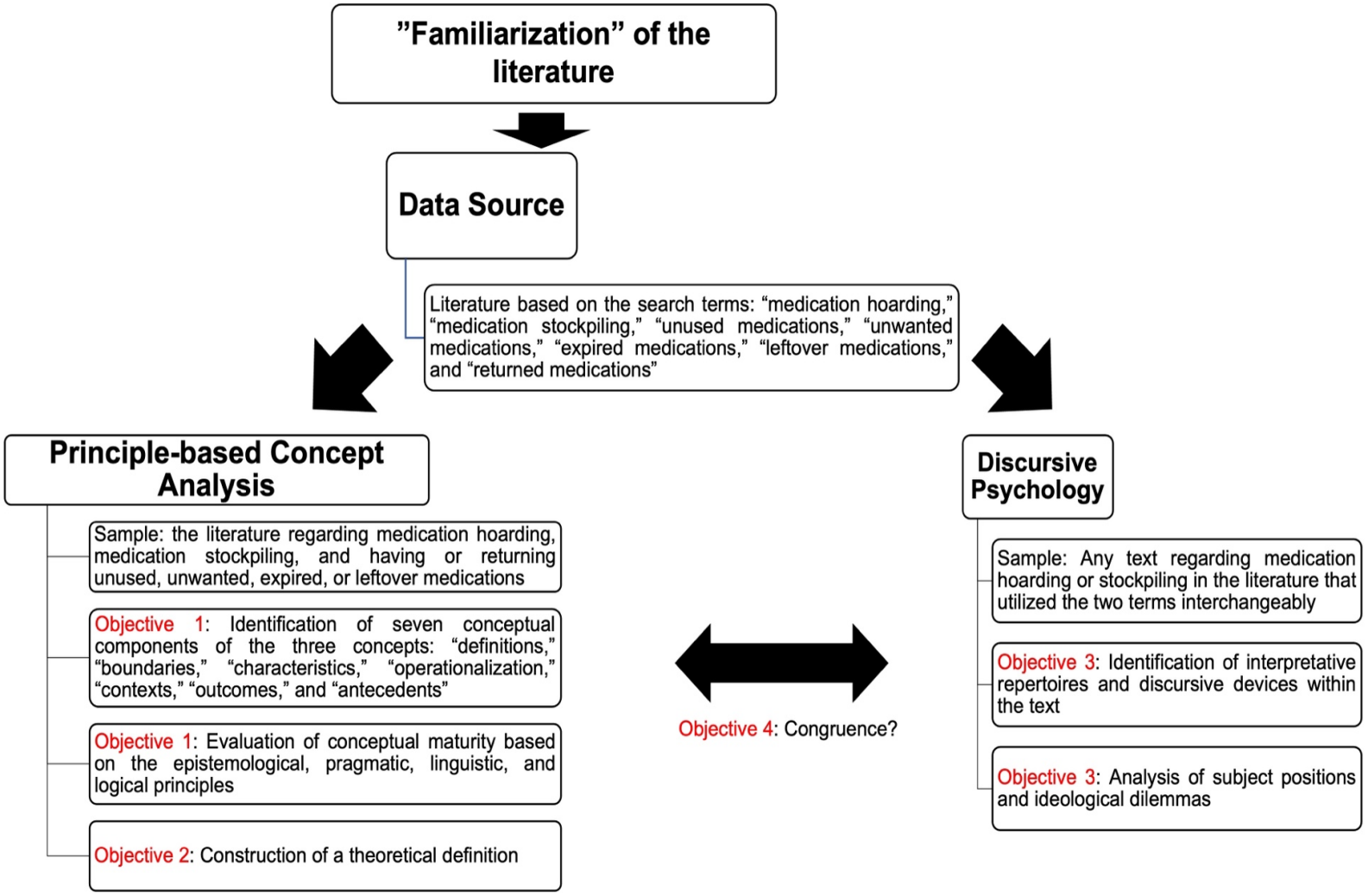

Figure 4 Overview of Data Collection and Analysis

2.3a Principle-based Concept Analysis – Part 1

An overview of the entire steps of the principle-based concept analysis including Part 1 and 2 is illustrated in Figure 5.

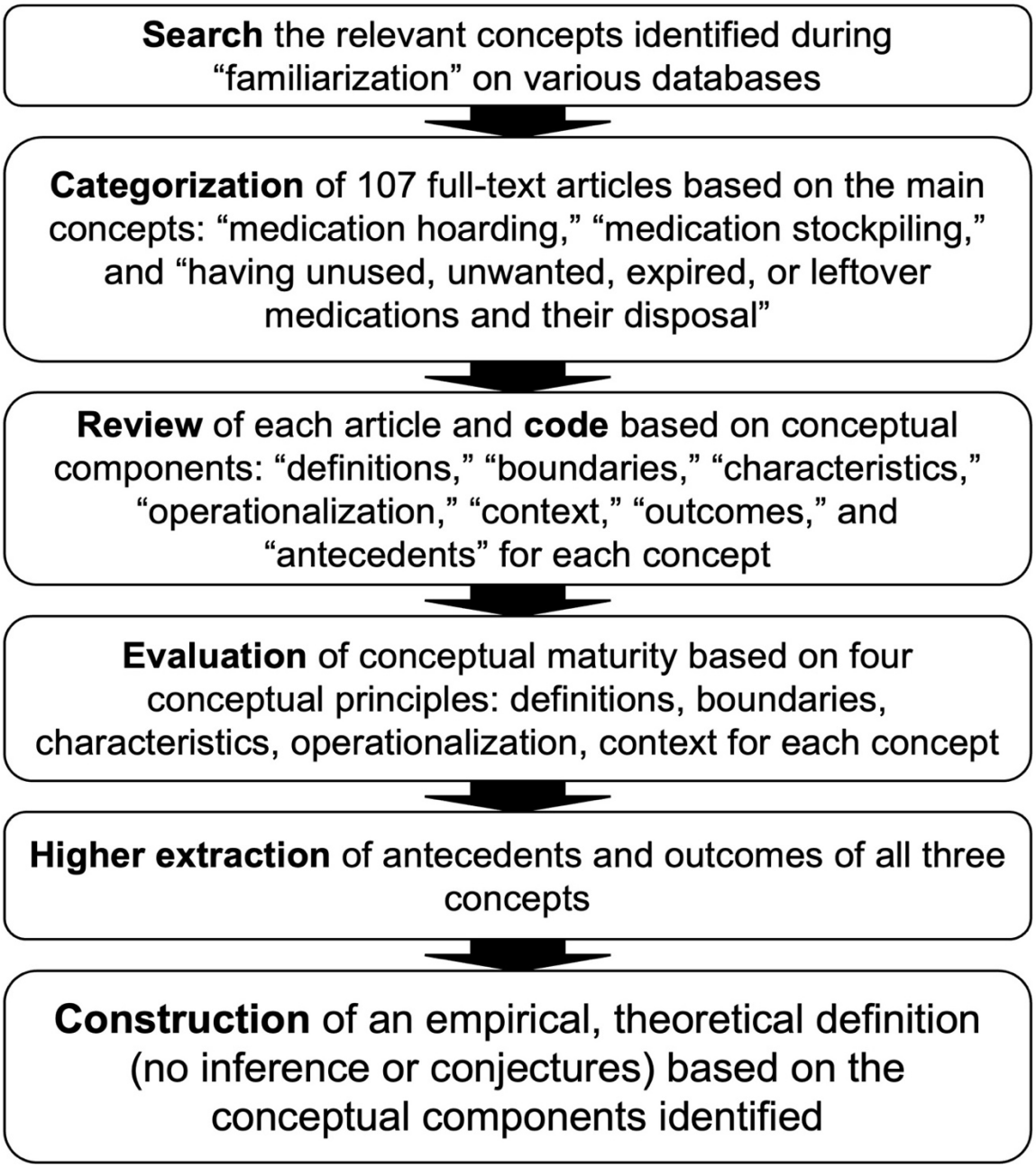

Figure 5 Principle-based Concept Analysis Process (Part 1 and 2)

NVivo (v. 1.7.1) was used to code and analyze the collected. Certain articles were only available as scanned documents, and the text information from these articles were transcribed verbatim by the principal investigators (SL). NVivo could capture and code images. However, the images and texts categorized under the same codes were not aligned well, preventing coherent analysis. The same transcription process was performed for tables and figures that could not be easily coded as text on NVivo.

Eighty-nine full-text articles found on Ovid and PsychInfo and eighteen found on Web of Science and Business Source Premier, including the supplementary materials were included in the analysis. Medication hoarding, medication stockpiling, and the retention of UUEL medications were the three common concepts appeared upon the literature search.

Each article was read at least twice entirely before being coded. Relevant information was coded into the seven parent codes accordingly: “Definitions,” “Boundaries,” “Characteristics,” “Operationalized,” “Context,” “Outcomes,” and “Antecedents.” Also, depending on the core concept presented in each article, the information was categorized under each parent code separately as “hoarding,” “stockpiling,” and “the retention of UUEL medications.” Each of the unused, unwanted, expired, and leftover medications appeared in the literature in the context of disposing them or returning them to a medication collection service. Therefore, these “returned” medications were categorized together under one parent code: the retention of UUEL medications.

Some literature utilized the terms, medication hoarding and medication stockpiling interchangeably. This confusing usage of the terms was believed to hinder the evaluation of the conceptual maturity and comprehensive understanding of the relevant concepts. Thus, the relevant information from the literature was coded separately as “h vs s,” but excluded from the current phase of the study. The same information, however, was utilized for the subsequent discourse analysis.

The inclusion criteria for “definitions” were loose to account for any descriptions of the concepts. These descriptions were not explicitly provided as a definition, and some were presented as an operationalized variable. For instance, Emanuel et al. asked the caregivers of terminally ill patients “did [patient’s name] ever hoard drugs for the purpose of using them to end (his/her) life?” Although an explicit definition of medication hoarding was not provided, its descriptor like the purpose of medication hoarding was coded under “definitions.”

The “outcomes” were composed of any events or phenomena that were triggered or happened due to the concepts of interest. The “Operationalized” included any variables that were measured to describe the concepts.

The “antecedents” were categorized into “rationales,” and “preconditions.” The “rationales” included any intrinsic motivations an individual that let them to executing the behaviors related to the concepts of interest. On the other hand, the preconditions were relevant circumstances or phenomena that occurred prior to the concepts of interest.

The “context” included the context of the research in which the concepts appeared, and any narrative connotations associated with the concepts. The collected data were also analyzed entirely again once the definitions, characteristics, operationalizations, antecedents, and outcomes of the concepts were analyzed.

The “boundaries” included other similar or competing concepts that appeared in the literature along with the concepts of interest. Any aspects described to be excluded from each concept were also coded under this category. Furthermore, for better evaluation of the conceptual boundaries, the analyzed data for the other six conceptual components were analyzed to distinguish the three concepts.

The information categorized under “characteristics,” contained a wide range of variability in the data which hindered finding a meaningful trend. Most of the relevant data in the literature were also measured quantitatively and were not appropriate for the qualitative concept analysis. To circumvent these issues, the information about the mechanisms and quantitative characteristics that were statistically proven to hold significant associations with each concept were selectively coded and analyzed. The information about the mechanisms was chosen, based on the study objectives. The statistically proven information was chosen, because these characteristics were observed less likely by chance and involves less bias. Focusing on the statistically significant quantitative data also aligns well with the positivist approach of the principle-based concept analysis (Penrod & Hupcey, 2005). Therefore, these types of information deemed to hold a

greater degree of conceptual substance and contribute more meaningfully to achieving this goal were categorized. In addition, when some relevant statistically significant data were not illustrated in text, these quantitative data were converted into text explaining whether a related association is significant or not by the principal investigator (SL). This data conversion was reviewed and agreed upon by JCS on 6/26/23.

This approach was taken to keep the analysis and results within the scope of the methodology, but to accommodate for the quantitative data. For this reason, during the categorization, the numerical propensities and nuances were not analyzed. Back et al., for example, found a statistical difference in hoarding of opioids by men and women (Back et al., 2009). With this data, the gender itself was categorized as a conceptual characteristic, but whether men or women hoarded more was not. Even if such statistical differences were discovered, the validity of the quantitative methods could not be evaluated within the scope of the current methodology. The methodology of choice does not aim to analyze and compare quantitative data in the literature. Any conceptual patterns observed from a large pool of literature were the focus of the current study, aiming to evaluate the concepts of interest and construct corresponding theoretical definitions.

The data from the healthcare-oriented search platform such as Ovid and PsychInfo and those from the non-healthcare-oriented search platforms such as Web of Science (WoS) and Business Source Premier (BSP) were separately analyzed and compared. The two sets of data were compared to find any

differences in the information reported in healthcare and non-healthcare disciplines.

Before reaching saturation in the data, an iterative process of coding through constant comparisons and theoretical sampling was performed. For theoretical sampling, medication hoarding in patients with Parkinson's disease were reported in the literature which did not meet the inclusion criteria for the analysis. These contents were searched on Ovid, Business Source Premier, or Google Scholar. The search results were reviewed and coded until sufficient knowledge about them was obtained. More detailed search strategies have been discussed earlier.

2.3b Principle-based Concept Analysis - Part 2

Another round of coding and analysis of the relevant data was conducted without differentiating the concepts associated with the data. In Part 1, each concept was identified as a health consumer consumption process, and the three concepts were deemed immature with ambiguous boundaries amongst them. The analysis in Part 1 could only loosely clarify some conceptual components and did not sufficiently convey a clear understanding of the procedural intricacies involved. Each concept was so immature that constructing its theoretical definition was meaningless. Therefore, by considering them as an act of medication accumulation and without differentiating the data based on the concepts, a higher extraction of categories was achieved.

Only the data pertaining to the conceptual components, such as preconditions, characteristics, and outcomes, were combined and analyzed. The conceptual components of the epistemological, pragmatic, linguistic, and logical principles utilized to evaluate conceptual maturity were irrelevant for Part 2. For this analysis, the data from the literature that utilized medication hoarding and stockpiling interchangeably coded as “h vs s” were included. The purpose of this analysis was the higher abstraction of categories and enriching the data set with the information from “h vs s” was appropriate.

Using the data that were already coded and categorized may not contain the nuances and connotations from the crude data. Therefore, for the analysis of the combined data set, the data from Part 1 were reviewed as a single entity separately. Based on the conceptual findings from Part 1 and the analysis of the combined data, a theoretical definition for the three concepts was constructed. This theoretical definition was established based solely on the data. Unlike other theoretical models, this definition was empirical and did not contain the author’s inference or conjectures (Penrod & Hupcey, 2005). This round of analysis was done about one month after the coding and analysis was completed for Part 1.

2.3c Discursive Psychology

An overview of the steps for discursive psychology is provided in Figure 6.

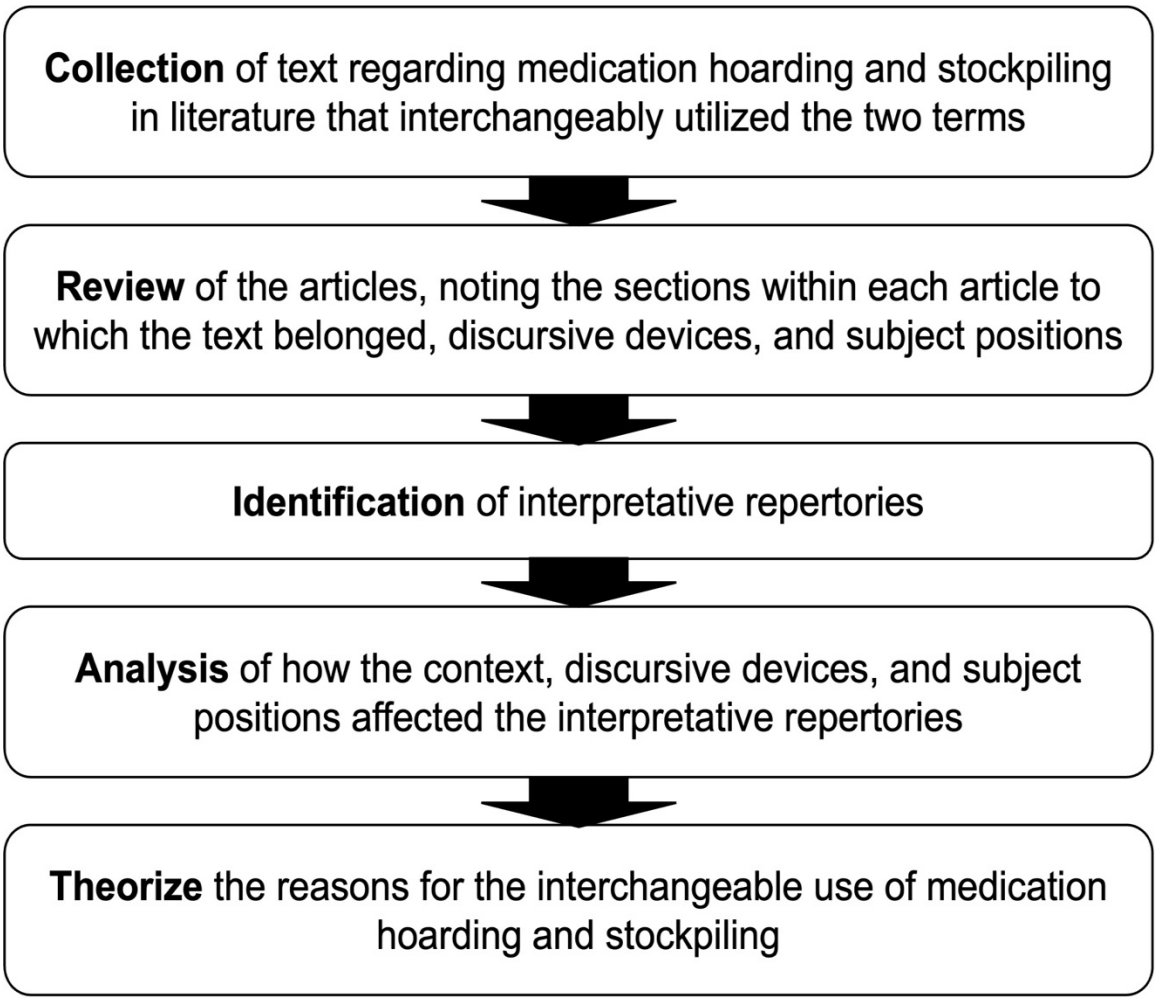

Figure 6 Discursive Psychology Process

The analysis adopted the steps illustrated in the work by Wiggins (Wiggins, 2017). The collected data on NVivo (v. 1.7.1) were exported as a Microsoft Word document (for Mac, v. 16.80). The text in the Word document was read entirely. During this round of review, the sections within the source article to which the sampled text belonged, such as introduction, methods, results, and discussion, was also noted. When the document was reviewed again, comments on what was being said and what the text tried to accomplish were made throughout the

document. For the third round of review, any uses of discursive devices, and subject positions were noted. The discursive devices referred to the figure of speech utilized by the subject to make their account more factual. Comprehensive sets of discursive devices were obtained from the literature by Wiggins (Wiggins, 2017), Mueller et al. (Mueller & Whittle, 2011), and Potter (Potter, 1996). The analysis of subject positions was critical in understanding how involved the authors were in the discourses.

After the review of the text, any cluster of words that constructed a version of medication hoarding and stockpiling or an interpretative repertoire were identified. Then, how the subject positions, discursive devices, and context of the text was located within the article affect the illustration of each interpretative repertoire was analyzed. The context was examined based on the content of the discourses preceding or following the sampled text and the sections within each article to which the text belonged. Based on this examination, the reasons for the interchangeable use of medication hoarding and stockpiling were theorized. At last, the results of discursive psychology were compared to the results of the principle-based concept analysis.

2.4 Considerations for Rigor

Morse et al suggested “without rigor, research is worthless, becomes fiction, and loses its utility (Morse et al., 2002).” To ensure the quality and rigor of research, the criteria for trustworthiness were developed by Lincoln and Guba: credibility,

dependability, confirmability, and transferability (Lincoln, 1985). The four criteria were applied to the principle-based concept analysis and discursive psychology.
Credibility: indicates how the research findings are credible representations of the original data.

Credibility pertains to ensuring trustworthy interpretation of the original data and representation of study findings (Kyngäs et al., 2020). For credibility, the data were coded and analyzed through constant comparison until saturation was achieved. A thorough audit trail and reflexive journal was recorded throughout the study. The thorough audit trail also enhanced transparency in reporting (Kyngäs et al., 2020; Lincoln, 1985). Methodological triangulation also enhanced this criterion through principle-based concept analysis and discursive psychology. The congruence of the findings from the two methodologies of different theoretical underpinnings indicated that the data were accurately interpreted (Tuckett, 2005).

Dependability pertains to the consistency and stability of data during the data collection, data analysis and theory generation (Kyngäs et al., 2020). This process was accomplished by recording a thorough audit trail and code-recode process. For each time new data were added to the existing set for analysis, they were recoded and analyzed. One-half of the data were then recoded and analyzed after two weeks to one month of the initial analysis and the results were compared. The findings were also discussed with another researcher (JS) to certify the consistency.

Confirmability pertains to how well the study findings are connected to the collected data (Kyngäs et al., 2020). To achieve confirmability, a thorough audit trail and reflexive journal was recorded throughout the study.

Transferability is concerned with the applicability of the study findings in other fields and context (Kyngäs et al., 2020). For this criterion, thick descriptions of sampling, contexts of the data, and their analysis were recorded in the audit trail and reported. This criterion was enhanced also by purposeful theoretical sampling and constant comparison of the data to include the widest possible range of information (Lincoln, 1985,Tuckett, 2005).

CHAPTER 3: RESULTS

3.1 Results for Objective 1 - Evaluation of Conceptual Maturity of Medication Hoarding, Medication Stockpiling, and the Retention of UUEL Medications

A summarized evaluation of the conceptual maturity of the three concepts is provided in Table 1.

Conceptual Principles	Medication Hoarding	Medication Stockpiling	Retention of UUEL Medications
Epistemological *Is the concept clearly defined?*	No – lack of consensus definitions		
	• Various functionality statuses, purposes, and quantity thresholds	• Various functionality statuses and quantity thresholds; tendency to prepare for natural disasters	• Inconsistent meanings of leftover, unused, and unwanted medications
Pragmatic *Has the concept been appropriately operationalized?*	Framework of Hoarding Disorder scale	No – lack of application of a theory or framework	
	• Inconsistent operationalization • Commonly measured the prevalence and demographics exploratively	• Consistently operationalized medications in use with respect to disasters and potential challenges to continuation of therapy	• Operationalized with respect to medication disposal • Explorative
Linguistic *Is the concept used consistently and appropriately within context?*	No - without clear definitions of the concepts, their contextual appropriateness could not be determined.		
Logical *Does the concept hold its boundaries?* *Has the concept been theoretically integrated with other concepts?*	No – ambiguous boundaries among the three concepts could only be inferred based on their involvement of "serviceable" vs. "unserviceable" medications, medication disposal, and adherence		
	• Tendency to involve more "unserviceable" medications • Included the concept of medication disposal	• Tendency to involve more "serviceable" medications • Involved voluntary acquisition	• Tendency to involve more "unserviceable" medications • Included the concept of medication disposal

	• Involved voluntary acquisition • Encompassed the retention of UUEL medications		• involuntary passive acquisition
Conceptual maturity	Immature	Immature	Immature

Table 1 Summary of Conceptual Maturity of Medication Hoarding, Medication stockpiling, and the Retention of UUEL Medications

3.1a Conceptual Definitions

The definitions of medication hoarding, and medication stockpiling were largely categorized into three factors: the functionality status, purpose, and quantity, as shown in Table 2 for comparison.

Definitions – Medication Hoarding

Among the 26 articles where the concept of medication hoarding appeared, four used the term, “hoarding,” without providing its explicit definition or explaining the concept in detail. Only eight of them further explained the action of medication hoarding as a form of medication retention. To “have” (Dunbar et al., 1989; Ekedahl, 2006), “store” (Alhomoud, 2020; Ewunetei et al., 2021; Parimi et al., 2002; Regenthal et al., 2002; Tsiligianni et al., 2012), “keep” (Kalyango et al., 2012), “save” (Back et al., 2009; Henderson et al., 2015; Huang, 1996), “retain” (Sorensen et al., 2005), and “collect” (Ellis et al., 2011; Martinez et al., 2012) were the actions adopted to describe the action of medication hoarding.

The definitions of medication hoarding explained the functionality status of the hoarded medications as “kept out of date” (Edwards, 1982), “discontinued” (Eichenberger et al., 2011; Kalyango et al., 2012), “expired” (Eichenberger et al., 2011; Ekedahl, 2006; Martinez et al., 2012; Sorensen et al., 2005; VanDyke & Steffen, 2017), “unused” (Alhomoud, 2020; Back et al., 2009), “unwanted,” “no longer needed” (Martinez et al., 2012), “no longer required” (Sorensen et al., 2005), and “leftover” (Alhomoud, 2020; VanDyke & Steffen, 2017). Some studies implied the definition of unused medications by specifically defining its antonym or the medications in current use (Alhomoud, 2020; Back et al., 2009; Dunbar et al., 1989; Edwards, 1982; Furst, 1975; Slater et al., 1986). Similarly, Ekedahl defined medication hoarding as having packs of “ongoing medication that have passed the expiry date.” The ongoing medications were defined as “medicines the patient was intended to use on the day the medicines were returned (to a pharmacy)” or “medicines a deceased patient was prescribed to take at the time of his or her death” (Ekedahl, 2006).

The purposes of medication hoarding, and the number of hoarded medications were also incorporated in some of the definitions. The purposes incorporated in the definitions were mostly future-oriented, including “emergency use” (Parimi et al., 2002) or future use (Back et al., 2009; Dunbar et al., 1989; Emanuel et al., 1996, 2000; Henderson et al., 2015; Huang, 1996; Kaboré et al., 2021; Slater et al., 1986; Tsiligianni et al., 2012). In contrast, Edward excluded medications kept for emergency use from the hoarded medications (Edwards, 1982). One definition was not future oriented, as they hoarded for the desire to not

be wasteful (Martinez et al., 2012). The purposes that were not incorporated in the definitions were identified in other parts of the literature as well. This information is discussed along with the other antecedents of the behavior.

The quantities used to determine the threshold of medication hoarding also had a common theme of having extra. However, the definitions did not have a consensus quantitative threshold for the number of hoarded medications such as hoarding “more than two” (Edwards, 1982) or “multiple” (Eichenberger et al., 2011; Sorensen et al., 2005) to determine medication hoarding. Also, the types of medications quantified were not consistent, as they pertained to either those in current use or out of use. For example, “packs exceeding 90 days’ treatment” (Ekedahl, 2006), and “the collection of three or more of the one kind of prescription medication that the patient cannot be expected to consume within a reasonable timeframe, usually 90 days’ worth of treatment” (Ellis et al., 2011) referred medication hoarding as having an excess amount of medications that could not be used immediately or a short period of time, but were still in use. Alternatively, “more than two products kept out of date or out of current…usage” (Edwards, 1982) and “multiple medications… no longer required or had expired” (Sorensen et al., 2005) referred to extra stocks that were not in use anymore.

Definitions – Medication Hoarding (Web of Science and Business Source Premier)

The definitions of medication hoarding found in the literature identified through Web of Science and Business Source Premier also followed the same

trend as the definitions found from the healthcare-oriented platforms. No literature utilized the concept of medication hoarding without providing its definition. In this data set, medication hoarding was defined as storing at least one leftover or newly received medication which was not in current use without or without purposes (Ewunetei et al., 2021). Regenthal et al. defined hoarding as the medications of the deceased husband stored by the spouse (Regenthal et al., 2002).

Is the Concept Clearly Defined? – Medication Hoarding

The available definitions of medication hoarding had similar structures, and some had similar meanings. However, some contents of the definitions were not explained clearly or were not uniformly defined. The inconsistent and unclear explanations led to the confusion in the understanding of the concept. A consensus definition of the concept could not be found, and the literature often assumed the common understanding of the concept. Hence, the conceptual definition for medication hoarding is deemed immature.

Definitions – Medication Stockpiling

Of the 13 articles where the concept of medication stockpiling was observed, eight studies provided its explicit definition. In six of the definitions, the action of stockpiling was described as to “store” (Donovan, 1990; Kobayashi et al., 2016; Unger et al., 2021), “have” (Heslin et al., 2013), “save,” (Larsen & Haugbølle, 2007; Moriarty et al., 2018), and “keep” (Patel et al., 2014).

The definitions of medication stockpiling were composed of the purpose, functionality status, and quantity. The purposes included in the definitions were related to an anticipated shortage of medications or challenge in obtaining additional supplies in the future. The most prominent challenging situations or anticipated shortages associated with the definitions were natural disasters (Dunn, 2017; Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012). An apocalypse (Kabel & Chmidling, 2014) and occasional HIV medication shortages (Moriarty et al., 2018) were also associated with the definitions of medication stockpiling. For this purpose, the medications being stockpiled were often already in use, and the patients obtained extra for emergency preparedness. In contrast, medications that were not in current use such as “old medicine that you no longer use” (Unger et al., 2021) and “old packets of medications from previous schemes” (Larsen & Haugbølle, 2007) were also included in the definitions of medication stockpiling.

Differently from the hoarding definitions, the stockpiling definitions did not distinguish between having one medication and more than one medication. When the stockpiled medications were quantified in the definitions, the unit of day-supply was utilized as the unit for stockpiles. These definitions also set the foundations to measure extra supplies of medications that were in use in preparation for medication shortages or natural disasters (Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Patel et al., 2014; Tomio et al., 2012).

Definitions – Medication Stockpiling (Web of Science and Business Source Premier)

Of the four studies found via Web of Science and Business Source Premier, two utilized the concept of medication stockpiling without providing its definition. The available definitions of medication stockpiling were related to the COVID-19 pandemic. Within the same context, purchasing medications during a specific period during the COVID-19 pandemic was defined as medication stockpiling in the literature found in the current data set (Al Zoubi et al., 2021; Nam et al., 2023). Nam et al. also used the expression “panic storing” to define stockpiling, showing its association with “panic buying” discussed in their article (Nam et al., 2023).

Is the Concept Clearly Defined? – Medication Stockpiling

To sum up, most of the literature assumed the common understanding of medication stockpiling, but at a lesser degree than in the medication hoarding literature. Most of the definitions were related to preparedness for disasters and medication shortages and obtaining extra stocks of the medications in use for the same purpose. However, some definitions did include the medications that were not in use conflicted with the former definitions. Due to these uncertainties, the conceptual definition is determined to be immature.

	Medication hoarding	Medication stockpiling
Functionality	• "Kept out of date" (Edwards, 1982) • "Discontinued" (Eichenberger 2011, Kalyango 2012, Martinez 2012) • "Expired" (Ekedahl 2006, Martinez 2012, Sorensen2005, VanDyke 2017) • "Unwanted" (Martinez 2012) • "No longer needed" (Martinez 2012) • "Leftover" (Alhomoud 2020, Ellis 2011, VanDyke 2017) • "No longer required" (Sorensen 2005) • "Not currently in use" (Ewunetei 2021)* • "Stored medication of her deceased husband" (Regenthal 2002)*	• Extra of in use (Dunn 2017, Heslin 2013, Kadowaki 2014, Kobayashi 2006, Tomio2012) • "Saving old packets of medications from previous schemes" (Larsen 2007) • Having "old medicine that you no longer use" (Unger 2021)
Purposes	• Emergency use (Parimi 2002) • Future use (Back 2009, Dunbar 1989, Emanuel 1996, Emanuel 2000, Henderson 2015, Huang 1996, Kaboré 2021, Slater 1986, Tsiligianni 2012) • For the desire to not be wasteful (Martinez 2012) • Those hoarded without or without purposes (Ewunetei 2021)*	• Prepare for natural disasters (Dunn 2017, Heslin 2013, Kadowaki 2014, Kobayashi 2006, Tomio2012) or an apocalypse (Kabel 2014) • Prepare for occasional HIV medication shortages (Moriarty 2018) • Prepare for the COVID-19 pandemic (Al Zoubi 2011, Nam 2023)*
Quantity	• "More than two" (Edward 1982) • "Multiple" (Eichenberger 2011, Sorensen 2005) • One medication with "packs exceeding 90 days' treatment" (Ekedahl 2006)	• Day-supply (Heslin 2013, Kadowaki 2014, Kobayashi 2006, Patel 2014, Tomio 2012)

	• "The collection of three or more of the one kind of prescription medication that the patient cannot be expected to consume within a reasonable timeframe, usually 90 days' worth of treatment" (Ellis 2011)	

Table 2 Three Common Factors of the Definitions of Medication Hoarding and Medication Stockpiling: Functionality status, Purpose, and Quantity (*: identified from Web of Science and Business Source Premier)

Definitions – Retention of UUEL Medications

Of the 46 articles, 14 explicitly defined at least one of the types of medications associated with the concept. The rest of the studies utilized the concept based on the assumed meaning of UUEL medications. The definition of each term is discussed below and summarized in Table 3. The retention of the relevant medications was also measured at the time of disposal or when they were returned to a disposal site. These returned medications also shared similar meanings with the other types and were included in this analysis.

Unused

The studies assessing medications returned to medication take-back services for disposal conferred "unused" a literal definition of being "unopened" (Bekker et al., 2018; Bettington et al., 2018) or "completely unused" (Vogler & de Rooij, 2018). Ewen et al. incorporated the concept of medication adherence in their definition for "unused" as "not taken as prescribed," or "not taken within the last 4 weeks before the visit" or the time of the assessment for their study. In this study,

the medication used by heart failure patients was assessed and their medications of interest were to be taken daily (Ewen et al., 2015). A couple of other definitions perceived the “unused” medications as those that were not being used at the time of their assessment. Tomas et al. examined self-medication practices with antibiotics in Serbian households. Their definition for “unused” was defined using its antonym. In this study, current use was defined as having been used “in 10 days prior to interview” (Tomas et al., 2017). In comparison, a similar but a more implicit definition for “unused” pertained to the medications that were not being used “regularly” (Haughey et al., 2019). Additionally, Law et al. defined the “unused” medications as “expired, discontinued, deteriorated and/or not intended for any future use” (A. V. Law et al., 2015).

Unwanted

The only definition of unwanted medications found in the literature was “medicines that are out of date (expired), unused (unopened packs) or used (opened packs), and no longer required” (Bettington et al., 2018).

Expired

No detailed explanations of expired were found in the literature.

Leftover

The most explicit definitions for the leftover medications were given in studies that measured the amount of residual medications prescribed after a set

number of days following surgical discharge (Ho et al., 2018; Metz et al., 2022; Voepel-Lewis et al., 2020, 2022). Furthermore, Buykx et al. defined leftover medications as those “discontinued … some time previously but retained” (Buykx et al., 2010).

Returned

The returned medications mainly indicated the medications collected at medication take-back services for disposal. Some definitions incorporated the collection dates and locations (Bekker et al., 2018; Shealy et al., 2019). Other definitions embodied the terms “unused,” or “unwanted” but did not elaborate on their meanings (Braund et al., 2009; Bronder & Klimpel, 2001; Jonjić & Vitale, 2014; Perry et al., 2014; Shealy et al., 2019; Vogler & de Rooij, 2018). Unlike the medications collected at take-back sites, in one study, “returned” medications indicated the medications of a decedent returned to family members (Reis et al., 2014).

Definitions – Retention of UUEL Medications (Web of Science and Business Source Premier)

Along with the returned medications, the concept of medication waste also appeared in the current data set, and its definitions were analyzed. In this data set, a total of two studies out of eight did provided an explicit definition for at least one of the types of medications. The rest of the studies utilized the concept based on the assumed meaning of UUEL medications.

Unused

Alfian et al. defined unused medications as “deteriorated, discontinued, expired, and other medications unintended for future use” (Alfian et al., 2021). In a different study, unused medications were defined as “old or unused,” or “extra and unneeded” (Alshehri & Banjar, 2022).

Returned

Similar to the earlier definitions of the returned medications, the definition found via the non-healthcare oriented search platforms involved unused opioids which were returned to an opioid buy-back program (Liu et al., 2020).

Medication Waste

In this data set, medication waste was defined as “contaminated, unused, unwanted, leftover, expired, prescribed, over-the-counter, drugs, vaccines, and sera that are no longer required and need to be disposed of” (Adedeji-Adenola et al., 2022) and the units the medications returned per their original units dispensed (H. Stewart et al., 2015).

Terms	Definitions
Unused	• "Unopened" (Bekker 2018, Bettington 2018) or "completely unused" (Vogler 2018) • "Not taken as prescribed," or "not taken within the last 4 weeks before the visit" (Ewen 2015) • Not "used in 10 days prior to interview" (Tomas 2017) • Not being used "regularly" (Haughey 2019) • "Deteriorated, discontinued, expired, and other medications unintended for future use" (Alfian 2021)* • "Old or unused," or "extra and unneeded" (Alshehri 2022)*
Unwanted	• "Medicines that are out of date (expired), unused (unopened packs) or used (opened packs), and no longer required" (Bettington 2018)
Expired	• None found
Leftover	• Residual prescribed medications after a set number of days after surgical discharge (Ho E 2010, Voepel Lewis 2020, Voepel Lewis 2022, Metz 2022) • "Discontinued … some time previously but retained" (Buykx 2010)
Returned	• With the exact collection dates and locations of medication return services (Bekker 2018, Shealy 2019, Liu 2020*) • "Unused," or "unwanted" (Braund 2009, Bronder & Klimpel 2001, Jonjić 2014, Perry 2014, Shealy 2019, Vogler 2018) • The medications of a decedent "returned" to family members of a decedent (Reis 2014)
Medication Waste	• "Contaminated, unused, unwanted, leftover, expired, prescribed, over-the-counter, drugs, vaccines, and sera that are no longer required and need to be disposed of" (Adedeji 2022)*. • Units returned/original units dispensed (Stewart 2015)*

Table 3 Definitions of Unused, Unwanted, Expired, Leftover, and Returned Medications, and Medication Waste (*: identified from Web of Science and Business Source Premier)

Is the Concept Clearly Defined? – Retention of UUEL Medications

The definitions for "unused," "unwanted," "expired," "leftover," and "returned" medications could have a wide range of meanings and they were not

clarified in the literature. Each type could be incorporated in the definitions of the other types or medication waste without much clarification of their nature. As the definitions of these types of medications could be interpreted differently, the conceptual definition is considered immature.

3.1b Conceptual Operationalization

The concepts were commonly operationalized as individuals exhibiting such concepts or as relevant medications. The results for each concept were illustrated with respect to persons and medications. A summary of the operationalization of the three concepts is provided in Table 4.

	Medication Hoarding	Medication Stockpiling	Retention of UUEL Medications
Data Sources	Patients, their caregivers or households	Patients, their caregivers or households	Patients, their caregivers or households
Application of a Theoretical Framework in Operationalization	Yes – adoption of hoarding disorder scales	No	No
Common Operationalizations of the Concepts	• Prevalence • Demographics	• Prevalence • Demographics • Preparedness for a disaster or challenge in continuation of therapy	• Prevalence • Medication disposal • Reasons for medication disposal and retention
Associated with Other Phenomena	• Medication diversion • Number of any medications	• Suicides • Automated dose dispensing	• Medication diversion • Medication overdoses

	stored in households • Suicides • History of depression • Physician assisted suicide (PAS)	scheme mandate in Denmark	• Suicides • Nonmedical prescription drug use • Willingness to reuse medications
Qualitative Operationalization	Yes	Yes	Yes
Operationalization of Medications	• "Unused" • "Leftover" • "Discontinued" • "Expired" • "Unwanted" • "No longer needed" • "No longer required" • Therapeutic categories • Formulations • Storage conditions • Quantity hoarded • Legend status • Prescribers	• "Extra" • "Stockpile" • "Unused" • "Old"	• "Unused" • "Unwanted" • "Expired" • "Leftover" • Therapeutic categories • Strengths • Formulations • Frequency of use • Quantity stored • Legend status • Prescribers

Table 4 Summary of Conceptual Operationalization of Medication Hoarding, Medication Stockpiling and the Retention of UUEL Medications

Operationalization – Medication Hoarding

The data regarding medication hoarding were collected directly from patients, their caregivers, or household members with surveys and qualitative interviews.

Medication Hoarders

The concept of medication hoarding most often appeared in the assessment of general medication use by patients or their households (Alhomoud, 2020; Edwards, 1982; Furst, 1975; Parimi et al., 2002; Slater et al., 1986; Sorensen et al., 2005; Tsiligianni et al., 2012; Zhang et al., 2020). Specific populations such as the chronic pain patients on opioids (Back et al., 2009; Kaboré et al., 2021), patients being admitted to an emergency department with the history of opioid use (Henderson et al., 2015), patients with the history of benzodiazepine use (Dunbar et al., 1989), transplant and diabetic patients (Eichenberger et al., 2011), oncology patients (Emanuel et al., 1996), terminally ill patients except for those with HIV (Emanuel et al., 2000), patients with chronic diseases (Kalyango et al., 2012; S. Stewart & Pearson, 1999) were included in the relevant studies. Among the chronic pain patients, Kaboré et al. specifically sampled chronic noncancer pain patients (Kaboré et al., 2021). For chronic disease patients, Stewart et al. collected data from patients after their post-acute hospitalization (S. Stewart & Pearson, 1999). Older patients were another specific group sampled in some of the related studies (Campbell et al., 1983; Elliott, 2006; Henderson et al., 2015; Huang, 1996; R. Law & Chalmers, 1976; VanDyke & Steffen, 2017). VanDyke et al. particularly assessed the female caregivers of older patients (VanDyke & Steffen, 2017).

The operationalization of hoarding in the literature mainly entailed the prevalence of medication hoarding (Alhomoud, 2020; Back et al., 2009; Campbell et al., 1983; Dunbar et al., 1989; Edwards, 1982; Eichenberger et al., 2011; Ellis et al., 2011; Emanuel et al., 1996, 2000; Furst, 1975; Henderson et al., 2015;

Huang, 1996; Kaboré et al., 2021; Kalyango et al., 2012; Parimi et al., 2002; Slater et al., 1986; S. Stewart & Pearson, 1999; Zhang et al., 2020) and demographics of the hoarders, their family members or households (Alhomoud, 2020; Back et al., 2009; Dunbar et al., 1989; Edwards, 1982; Kaboré et al., 2021; Parimi et al., 2002). The demographics of non-hoarders were measured to compare them to the demographics of the hoarders (Alhomoud, 2020; Back et al., 2009; Dunbar et al., 1989; Edwards, 1982; Kaboré et al., 2021; Parimi et al., 2002).

The in-depth efforts that qualitatively operationalized medication hoarding included three case studies (Giovannoni et al., 2000; Martinez et al., 2012; Walcott, 2000) and one focus group study (Ellis et al., 2011). Qualitative research can explore a wider scope of a topic, compared to quantitative research (Hupcey & Penrod, 2005). Among the three qualitative studies, the two case studies were overviews of the cases that involved medication hoarding. The focus-group study operationalized medication hoarding along with medication borrowing and sharing.

Medication hoarding was operationalized to examine its associations with other phenomena that could lead to negative consequences. The concept was measured in association with giving a child's prescription medication to another child (Alhomoud, 2020), the number of medications stored in households (Sorensen et al., 2005), committing suicide (Walcott, 2000) and the history of depression (Zhang et al., 2020). In addition to sharing a child's medication specifically, hoarding was operationalized as one of the reasons for lending their own medications to someone else (Alhomoud, 2020).

The association of medication hoarding with physician assisted suicide (PAS) (Emanuel et al., 1996, 2000) was also operationalized. In this case, hoarding was combined with other concepts and operationalized as one variable: “hoarded drugs, discussed euthanasia with physician or read Final Exit” (Emanuel et al., 1996, 2000). Furthermore, Martinez et al. and Ellis et al. qualitatively assessed the reasons for hoarding with vivid descriptions and words from the hoarders (Ellis et al., 2011; Martinez et al., 2012).

The Medication Saving Behavior (MSB) scale was developed by VanDyke et al., and a theoretical framework based on the Savings Inventory-Revised (SI-R), a scale utilized to screen for the hoarding disorder was adopted. To develop the scale, the female caregivers of the elder were sampled. Hoarding Rating Scale-Analogue (HRS), another scale for the hoarding disorder, and SI-R were used to examine the convergent validity of the new scale (VanDyke & Steffen, 2017).

Hoarded Medications

Based on the definition given in each study, the concept of hoarding was operationalized as hoarded medications that were “unused” (Alhomoud, 2020; Back et al., 2009; Dunbar et al., 1989; Edwards, 1982; Furst, 1975), “leftover” (Alhomoud, 2020; Ellis et al., 2011; VanDyke & Steffen, 2017), “discontinued” (Eichenberger et al., 2011; Kalyango et al., 2012; Martinez et al., 2012), “expired” (Ekedahl, 2006; Martinez et al., 2012; Sorensen et al., 2005; VanDyke & Steffen, 2017), “unwanted,” “no longer needed” (Martinez et al., 2012), and “no longer required” (Sorensen et al., 2005).

Hoarded medications were sorted based on their therapeutic categories per various standards (Edwards, 1982; Furst, 1975; R. Law & Chalmers, 1976; Martinez et al., 2012; Tsiligianni et al., 2012), formulations (Furst, 1975), storage conditions (R. Law & Chalmers, 1976), and medication sources or legend status (Alhomoud, 2020; Eichenberger et al., 2011; R. Law & Chalmers, 1976; Martinez et al., 2012).When the attributes of hoarded medications such as the therapeutic categories and the number of hoarded medications were assessed, the investigators reviewed them on their own or relied on the patient reported information. The hoarded medications were measured among prescription medications only (Alhomoud, 2020; Back et al., 2009; Dunbar et al., 1989; Ellis et al., 2011; Henderson et al., 2015; Kaboré et al., 2021; Parimi et al., 2002), and prescription and OTC medications altogether (Campbell et al., 1983; Edwards, 1982; Eichenberger et al., 2011; Furst, 1975; Huang, 1996; Kalyango et al., 2012; R. Law & Chalmers, 1976). Parimi et al. particularly measured hoarding of antibiotic medications (Parimi et al., 2002). The operationalization of medication hoarding pertaining only to OTC medications did not appear in the literature.

Some operationalization of medication hoarding confused the application of the conceptual definitions. Eichenberger et al. adopted the definition of medication hoarding from the research by Sorensen et al. and defined it as retaining multiple medications that were no longer required or had expired (Eichenberger et al., 2011; Sorensen et al., 2005). Eichenberger and the colleagues, however, measured retaining discontinued medication repeats and having expired medications separately from hoarding of prescription and OTC medications (Eichenberger et

al., 2011). On the other hand, Kalyango et al. defined hoarding as “keeping medicines that had been discontinued.” In this study, the “presence of drug hoarding,” and “presence of expired medicines” were separately measured (Kalyango et al., 2012). Unlike Eichenberger and the colleagues, the expired medications were not included in medication hoarding by Kalyango et al.

Differently from other explorative research regarding medication hoarding, a theoretical framework for the hoarding disorder was utilized to develop the Medication Saving Behavior (MSB) scale by VanDyke et al. In this study, the authors noted that the hoarding disorder was characterized by three factors: excessive acquisition of worthless items, excessive clutter, and difficulty discarding. With the hoarding disorder, excessive clutters often were caused by the space taken up by hoarded items. However, with medications, due to their generally small volumes, these clutters or the “disorganization” and “suboptimal storage” were perceived to be caused by the higher number of medications. They also noted that medications could only be worthless when they expired, and leftover medications may not always be worthless. In contrast to this theoretical background, to examine the concurrent validity of the scale, both the number of leftover and expired medications stored by patients and their statistical associations with the MSB scale scores were measured. The discriminant validity was examined by measuring the associations between the MSB scale and the number of prescription and OTC medications (VanDyke & Steffen, 2017). The misalignment between the theoretical framework and operationalization of medication hoarding may have occurred due to the lack of a consensus definition. VanDyke and the colleagues listed various

definitions of medication hoarding in the literature and criticized the confusion in its concept. Even with the sound explanation of how the characteristics of the hoarding disorder could translate into the characteristics of medication hoarding, the authors did not explicitly define medication hoarding.

Operationalization – Medication Hoarding (Web of Science and Business Source Premier)

Medication Hoarders and Hoarded Medications

Similar to the previous samples, the studies identified through Web of Science and Business Source Premier also included general households and the elder (Ewunetei et al., 2021; Regenthal et al., 2002) and measured the demographics of the households hoarding unused medications (Ewunetei et al., 2021). Regenthal et al. operationalized the outcome of medication hoarding with the toxicology analysis of the patient who overdosed on her hoarded medications (Regenthal et al., 2002).

Has the Concept Been Appropriately Operationalized? – Medication Hoarding

Medication hoarding was commonly operationalized to measure its prevalence and the demographics of the hoarders in the context of medication use assessment. Only few studies focused solely on medication hoarding and its comprehensive qualitative assessment was scant. The types of the hoarded

medications operationalized in the literature also varied, likely due to the inconsistent conceptual definitions. The explorative nature of the research also may have been attributed by the lack of appropriate application of a theoretical framework. Thus, this type of superficial and inconsistent operationalization could not yield any meaningful findings and was conceptually immature.

Operationalization – Medication Stockpiling

The data regarding medication stockpiling were collected directly from patients, their caregivers, or household members with surveys and qualitative interviews. No theoretical framework was applied in any of the operationalization of medication stockpiling.

Medication Stockpilers

For the studies involving the concept of medication stockpiling, specific patient groups such as HIV (Donovan, 1990; Larsen & Haugbølle, 2007), geriatric (de Sousa et al., 2020), renal transplant (Kadowaki et al., 2014), epilepsy (Kobayashi et al., 2016), and rheumatoid arthritis patients (Tomio et al., 2012), and veterans and nonveterans (Heslin et al., 2013), automated dose dispensing (ADD) scheme users in Denmark (Larsen & Haugbølle, 2007), and Hispanic residents in Southern California, USA were sampled.

The operationalization of medication stockpiling was explorative similar to the operationalization of medication hoarding. The information about medication stockpiling was obtained by surveying patients, except for a qualitative study which

interviewed both patients and caregivers (Kabel & Chmidling, 2014), a household survey about medication storage and use (Xu et al., 2023), and a case study of HIV patients (Donovan, 1990). The prevalence of stockpiling (Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Tomas et al., 2017; Unger et al., 2021), and the demographics of stockpilers (Heslin et al., 2013) were frequently and commonly measured.

Unlike the medication hoarding literature, medication stockpiling was operationalized to assess the degree of preparedness for a disaster or challenge in continuation of therapy (Heslin et al., 2013; Kabel & Chmidling, 2014; Kadowaki et al., 2014; Kobayashi et al., 2016; Moriarty et al., 2018; Patel et al., 2014; Tomio et al., 2012). The challenges included financial difficulties (Patel et al., 2014), and stockouts of HIV medications in Ghana (Moriarty et al., 2018). Heslin et al. asked the veterans and non-veterans in California, USA (Heslin et al., 2013) and Kabel et al. qualitatively interviewed the “preppers” on online platforms about their disaster preparedness and medication stockpiling practices (Kabel & Chmidling, 2014). When assessing disaster preparedness, physically handicapped patients with epilepsy (Kobayashi et al., 2016) and renal transplant patients (Kadowaki et al., 2014) after the Great East Japan Earthquake in 2011, and rheumatoid arthritis patients after sixteen disaster events in Japan from 2004 to 2006 (Tomio et al., 2012) were examined. To further assess disaster preparedness, the attributes such as the disaster related factors, comorbidities, the degree of disability, perceived general health status, distress score were inquired (Tomio et al., 2012).

As opposed to the operationalization of medication hoarding, more qualitative efforts exploring the concept of medication stockpiling were found. These qualitative studies examined the practice of medication stockpiling in association with other phenomena. They assessed stockpiling for the purpose of suicide (Donovan, 1990), in preparation for a possible apocalypse (Kabel & Chmidling, 2014), medication shortage (Moriarty et al., 2018) or financial challenge (Patel et al., 2014), or following the implementation of the automated dose dispensing scheme in Denmark (Larsen & Haugbølle, 2007). Donovan narrated from a healthcare practitioner's perspective, denoting what they observed when their patients stockpiled medications for suicide (Donovan, 1990). Unger et al. examined study participants' experience of storing medications no longer in use (Unger et al., 2021). The reasons and mechanisms of medication stockpiling were often qualitatively operationalized in focus group studies, allowing for collection of vivid descriptions about stockpiling from the stockpiler, themselves (Kabel & Chmidling, 2014; Larsen & Haugbølle, 2007; Moriarty et al., 2018; Patel et al., 2014; Unger et al., 2021). However, the main focus of these studies was not medication stockpiling, and a comprehensive assessment of the stockpiling practice was not observed.

Stockpiled Medications

The data about stockpiled medications were obtained from study participants, and the investigators did not assess them on their own. To assess disaster preparedness, the amount of stockpiled medications were measured in day-supply or as “extra” and a “stockpile” (Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012). Medication stockpiling was also operationalized as having “unused” medications or “old” medications that were no longer used (Larsen & Haugbølle, 2007; Unger et al., 2021). On the other hand, Xu et al. inventoried the medications in the Chinese households. For the assessment, a list of the medications likely to be in store was provided, but the participants could not freely report the medications stockpiled in the household, and could only choose from the given options of medications (Xu et al., 2023).

Operationalization – Medication Stockpiling (Web of Science and Business Source Premier)

Medication Stockpilers and Stockpiled Medications

The data identified via Web of Science and Business Source Premier were collected from households (Al Zoubi et al., 2021; Nam et al., 2023). A specific patient group like VA patients was sampled as well (Amenta et al., 2022). Similarly to the previous data set for medication stockpiling, most of the current data set was collected in association with a disaster or particularly the COVID-19 pandemic (Al Zoubi et al., 2021; Nam et al., 2023).

As for the medication stockpilers, their demographics (Al Zoubi et al., 2021; Nam et al., 2023), satisfaction of their purchasing decisions for stockpiling, payment methods for stockpiled medications (Al Zoubi et al., 2021), reasons for stockpiling (Al Zoubi et al., 2021; Nam et al., 2023), and the use of stockpiled medications during the COVID-19 pandemic (Amenta et al., 2022) were operationalized. To assess stockpiled medications in detail, their therapeutic classification was examined (Al Zoubi et al., 2021).

Has the Concept Been Appropriately Operationalized? – Medication Stockpiling

The operationalization of stockpiling had a common trend of involving the medications in current use and stockpiling them with respect to disasters and potential challenges to the continuation of therapy. The literature had more meaningful qualitative examinations than the medication hoarding literature. However, the operationalization was never based on a theory or framework and hence was considered explorative. For this reason, the operationalization of medication stockpiling was determined to be immature.

Operationalization – Retention of UUEL Medications

The data regarding the retention of UUEL medications were collected directly from patients, their caregivers, or household members with surveys or through assessment of disposed medications. One qualitative interview of the drug abusers who identified unused medications as a source of the drugs of abuse was

identified as well (Inciardi et al., 2009). No theoretical framework was applied in any of the operationalization of medication stockpiling.

Individuals Retaining UUEL Medications

To examine the retention of UUEL medications, general adult populations mainly including patients and their household members were frequently sampled (Aldred Cheek, 2018; Bettington et al., 2018; Beyene et al., 2019; De Bolle et al., 2008; Gascoyne et al., 2014; Gidey et al., 2020; Hassali et al., 2011; Jha et al., 2022; Kozak et al., 2016; Luiza et al., 2019; Lystlund et al., 2014; Persson et al., 2009; Sapkota et al., 2022; Tomas et al., 2017; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013). In addition, specific patient groups such as college students (Asmelashe Gelayee & Binega, 2017), those with history of prescription opioid use or their caregivers (Bicket et al., 2021; Metz et al., 2022; Voepel-Lewis et al., 2020, 2022), patients presenting to ED after overdosing with medications (Buykx et al., 2010), parents of children or adolescents (Egan et al., 2019, 2020; Renny et al., 2022), older heart failure patients (Ewen et al., 2015), homecare patients (Haughey et al., 2019), prescription opioid abusers (Inciardi et al., 2009), Medicare patients (Maeng et al., 2017), high school seniors (McCabe et al., 2013, 2019), palliative care patients (Omae et al., 2018), patients of suicidal deaths (Reis et al., 2014) were sampled. Other common samples observed in the literature were the drug take-back program participants (Aldred Cheek, 2018; Bekker et al., 2018; Braund et al., 2009; Bronder & Klimpel, 2001; Ekedahl, 2006; Garey et al., 2004; Gracia-Vásquez et al., 2015; Jonjić & Vitale, 2014; A. V. Law

et al., 2015; Perry et al., 2014; Shealy et al., 2019). Similarly, Vogler et al. sampled the medications collected in household garbage (Vogler & de Rooij, 2018). The medications being returned to a pharmacy unused in non-solid dosage forms such as cream, ointment, foam, and eye drops were excluded in one study (Ekedahl, 2006).

In most of the relevant literature, the prevalence of UUEL medications was measured by asking individuals whether they possessed such medications (Asmelashe Gelayee & Binega, 2017; Bashaar et al., 2017; Bettington et al., 2018; Beyene et al., 2019; Bicket et al., 2021; Gascoyne et al., 2014; Hassali et al., 2011; Haughey et al., 2019; Ho et al., 2018; Jha et al., 2022; Luiza et al., 2019; Lystlund et al., 2014; Maeng et al., 2017; Metz et al., 2022; Omae et al., 2018; Renny et al., 2022; Voepel-Lewis et al., 2020; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013). The prevalence was also estimated based on the history of disposing them or returning them to a collection service by the study participants (Aldred Cheek, 2018; Egan et al., 2019, 2020, 2020).

One common behavior of interest operationalized in relation to having UUEL medications was the disposal of these medications. The information about various mechanisms and the frequency of disposal, and factors influencing the decision on a disposal method was collected (Aldred Cheek, 2018; Asmelashe Gelayee & Binega, 2017; Bashaar et al., 2017; Bettington et al., 2018; Bicket et al., 2021; Egan et al., 2019, 2020; Haughey et al., 2019; Kozak et al., 2016; A. V. Law et al., 2015; Lystlund et al., 2014; Omae et al., 2018; Persson et al., 2009; Renny et al., 2022; Sapkota et al., 2022; West et al., 2016; Wieczorkiewicz et al., 2013).

The factors that could influence the retention of the relevant medications were measured as the history of education regarding safe disposal (Haughey et al., 2019; Renny et al., 2022; Wieczorkiewicz et al., 2013) and holders' reasons for being unable to handle prescription drugs as they believed properly (Persson et al., 2009). The holders' environmental and safety concerns (Aldred Cheek, 2018; Egan et al., 2020), and demographics including gender and income (Asmelashe Gelayee & Binega, 2017; Renny et al., 2022; Voepel-Lewis et al., 2020, 2022) were assessed in relation to disposal methods. The level of health literacy and comorbidities of the holders were also assessed as their attributes (Renny et al., 2022).

A few studies operationalized the UUEL medications in the context of opioid use and disposal. Bicket and the colleagues conducted a randomized trial assessing prompt disposal of opioids in three groups: the control group with no intervention, the second group that received an informational sheet about safe disposal and storage of opioids, and the third group with the informational sheet and a drug disposal kit (Bicket et al., 2021). Voepel Lewis et al. also examined the impact of a behavioral disposal method with or without opioid risk-enhancement education on the disposal and retention of child's opioids by their parents (Voepel-Lewis et al., 2020, 2022). Additionally, Egan et al. assessed parents' awareness of nearby disposal programs and their disposal methods (Egan et al., 2019, 2020). Their disposal methods were also compared, based on parents' perceptions of non-medical opioid use by their child's peers, perceived risk of non-medical prescription opioid use by adolescents, their disapproval of non-medical

prescription drug use, and perceived availability of prescription drugs (Egan et al., 2020).

Potentially negative events like prescription lending and borrowing (Beyene et al., 2019; Gascoyne et al., 2014), sharing a child's medication to another child (Gascoyne et al., 2014), accidental medication overdoses (Buykx et al., 2010), suicides by the family members with medications left behind by the decedents (Reis et al., 2014), nonmedical prescription drug use (Inciardi et al., 2009; McCabe et al., 2013, 2019) were also examined in association with having UUEL medications. One qualitative study that assessed prescription drug abusers identified unused and leftover medications as the sources of the drugs of abuse (Inciardi et al., 2009).

The relationship of the person returning the medications to the owner of the medications was one attribute that could only be measured in studies involving drug take-back programs (Bekker et al., 2018; Ekedahl, 2006).

Reasons for Retention and Disposal of UUEL Medications

The reasons for having unused medications (Braund et al., 2009; Ekedahl, 2006; Gidey et al., 2020; Haughey et al., 2019; A. V. Law et al., 2015, p. 201; Persson et al., 2009; West et al., 2016), unwanted medications (Bettington et al., 2018), leftover medications (Jha et al., 2022), and excess medications (Lystlund et al., 2014; Wieczorkiewicz et al., 2013), and for returning such medications to a collection site (Bekker et al., 2018; Persson et al., 2009), or disposing them (Perry et al., 2014) were notably measured. These reasons were operationalized

categorically, and the respondents had to choose from the set categories. Most of the reasons pertained to the discontinuation of therapy such as improved conditions (Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015; West et al., 2016; Wieczorkiewicz et al., 2013), adverse effects (Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015), and ineffective therapy (Braund et al., 2009; A. V. Law et al., 2015). More detailed explanations about the reasons will be discussed when evaluating the antecedents of the concepts.

UUEL Medications

The operationalized attributes of unused, unwanted, expired, leftover, or returned medications included the quantity stored or to be disposed (Bekker et al., 2018; Braund et al., 2009; Bronder & Klimpel, 2001; De Bolle et al., 2008; de Sousa et al., 2020; Ekedahl, 2006; Ewen et al., 2015, 2015; Garey et al., 2004; Gracia-Vásquez et al., 2015; Ho et al., 2018; Jonjić & Vitale, 2014; Lystlund et al., 2014; Metz et al., 2022; Omae et al., 2018; Perry et al., 2014; Shealy et al., 2019; Tomas et al., 2017; Voepel-Lewis et al., 2020; Vogler & de Rooij, 2018; Wieczorkiewicz et al., 2013), strengths and formulations of the medications (Bekker et al., 2018; Gracia-Vásquez et al., 2015), medication sources including the prescribers (Bekker et al., 2018; Bronder & Klimpel, 2001; Ewen et al., 2015) and types of pharmacies that originally dispensed the medications (A. V. Law et al., 2015), therapeutic categories (Bekker et al., 2018; Bronder & Klimpel, 2001; Ewen et al., 2015; A. V. Law et al., 2015; Lystlund et al., 2014; Omae et al., 2018; Perry et al., 2014; Renny et al., 2022; Shealy et al., 2019; Vogler & de Rooij, 2018), legend

status (Bettington et al., 2018; Bronder & Klimpel, 2001; Garey et al., 2004; Gracia-Vásquez et al., 2015; Shealy et al., 2019; Vogler & de Rooij, 2018), frequency of use (De Bolle et al., 2008), and cost (Braund et al., 2009; Garey et al., 2004; A. V. Law et al., 2015; Perry et al., 2014; Vogler & de Rooij, 2018). Furthermore, Law et al. compared the medications returned to drug take-back programs based on whether they were paid by insurance or cash, purchased at walk-in or mail-order, and independent or chain pharmacies (A. V. Law et al., 2015). Whether the indications of the medications known to the holder were also evaluated (De Bolle et al., 2008).

Some of the literature reported information about unused and expired medications together without differentiating them (Wajid et al., 2020; Wieczorkiewicz et al., 2013). For instance, Wajid et al. reported “the prevalence of unused or expired medicine,” and “what you do with unused or expired medicine” (Wajid et al., 2020). It was, however, unclear whether their operationalization initially distinguished the two types of medications, and the results reported both types together.

Operationalization – Retention of UUEL Medications (Web of Science and Business Source Premier)

Individuals Retaining UUEL Medications

The samples included in this data set were similar to the samples from the previous data set. The samples included general adult populations (Addis, 2023; Alfian et al., 2021; Alhamad et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022; Amoabeng et al., 2022) and specific populations such as orthopedic surgery patients (Aliory et al., 2021), females residing in urban areas (Aluko et al., 2022), VA patients (Liu et al., 2020), and drug take-back event participants (H. Stewart et al., 2015). The current data set also operationalized the holders of interest to measure the prevalence (Addis, 2023; Adedeji-Adenola et al., 2022; Alfian et al., 2021; Alhamad et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022; Aluko et al., 2022; Amoabeng et al., 2022), disposal practices (Addis, 2023; Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022; Aluko et al., 2022; Amoabeng et al., 2022), history of medication disposal education (Adedeji-Adenola et al., 2022; Alfian et al., 2021; Althagafi et al., 2022), and whether to divert or dispose the medications (Adedeji-Adenola et al., 2022). The concept was also operationalized to measure patients' willingness to reuse stored unused medications (Alhamad et al., 2022).

The concept was also operationalized in experimental interventions. One study measured the degree of retention of leftover opioids prescribed after orthopedic surgeries in those who receive education on medication disposal and

those who did not (Aliory et al., 2021). Another intervention was an opioid buy-back program, and compared those who returned leftover opioids and those who did not in various attributes such as age, gender, preoperative opioid status, expected pain levels, prescriber types, and average morphine milligram equivalents (MME) prescribed (Liu et al., 2020).

UUEL Medications

The legend status (Althagafi et al., 2022; H. Stewart et al., 2015), formulations (Alhamad et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022), and therapeutic classifications (Alhamad et al., 2022; Amoabeng et al., 2022; H. Stewart et al., 2015) of the medications of interest in the current data set was measured. Some of the literature reported the findings without distinguishing unused and expired medications similarly to the literature from the healthcare-oriented platforms (Adedeji-Adenola et al., 2022; Althagafi et al., 2022). Whether these studies differentiated the two types of medications in their data collection is also unknown.

Has the Concept Been Appropriately Operationalized? – Retention of UUEL Medications

The operationalization of the retention of UUEL medications was mostly done in cross-sectional research and intended to capture snap-shots of the phenomena. Such assessment involved a variety of aspects of the concept, but no theory or framework was adopted in the operationalization. One of the notable

topics involved the reasons for having or disposing the relevant medications. However, they were often operationalized categorically and a more in-depth analysis that could capture vivid and descriptive responses from the participants was not found. Without any efforts to comprehensively assess the concept, this operationalization was determined to be immature.

3.1c Conceptual Contexts

The contexts of the three concepts were assessed based on the research topics, narrative tones, and the medication use cycle. A summary of the conceptual contexts is given in Table 5.

	Medication Hoarding	Medication Stockpiling	Retention of UUEL Medications
Research Context	• Medication use, misuse, and its harm (e.g. "medicine cabinet," and "brown bag" assessment)	• Medication use associated with an event (e.g. new healthcare policies, disasters, medication shortages)	• Medication use and retention • Medication disposal
Narrative Tones	Often negative	Often justified	Often negative

Table 5 Summary of Research Context of Medication Hoarding, Medication Stockpiling, and the Retention of UUEL Medications

Contexts – Medication Hoarding

The concept of medication hoarding appeared consistently in the context of the assessment of medication use, misuse, and its harm. Most of the medication use assessment examined patients' medication management at home with some studies referring their research as "medicine cabinet" (Edwards, 1982) or "brown bag" (Martinez et al., 2012) assessment. The "brown bags" referred to the bags of medications that the case subject brought into the clinic for a medication therapy management appointment with a pharmacist (Martinez et al., 2012).

When the concept of medication hoarding was described in the literature, the tone of the narratives was often negative. It was recognized as an "aberrant" (Back et al., 2009) or "inappropriate" patient behavior (Kalyango et al., 2012), or a "problem" (Huang, 1996) for patients and their households. The negative connotations extended to examining medication hoarding in association with potentially risky medication-related behavior such as prescription medication sharing (Alhomoud, 2020) and intentional self-poisoning (Walcott, 2000).

Contexts - Medication Hoarding (Web of Science and Business Source Premier)

In the data set extracted from Web of Science and Business Source Premier, the concept of medication hoarding appeared in a household medication utilization practice study (Ewunetei et al., 2021) and a toxicology case study of an 80-year-old woman intentionally ingesting theophylline and aminopyrine hoarded for 35 years in their home (Regenthal et al., 2002).

Is the Concept Used Consistently and Appropriately within Context? – Medication Hoarding

Medication hoarding consistently appeared in medication use assessment often being narrated negatively in the literature. However, the appropriateness of the consistency cannot be determined because the nature of the concept was never clearly defined in the literature. Hence, the conceptual context was deemed immature.

Contexts – Medication Stockpiling

The concept of medication stockpiling was consistently reported in the medication use assessment literature (Larsen & Haugbølle, 2007; Unger et al., 2021; Xu et al., 2023). Larsen et al. examined the medication use after the enforcement of the automated dose dispensing (ADD) schemes (Larsen & Haugbølle, 2007). On the other hand, these studies most notably examined patients' medication management in disaster preparedness (Dunn, 2017; Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012) and anticipation of a medication shortage (Moriarty et al., 2018) or financial challenge (Patel et al., 2014) that could lead to discontinuation of their medication therapy. In their narratives in disaster preparedness, medication stockpiling was often justified and necessary especially for vulnerable patient populations (Dunn, 2017; Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012).

Although the narratives around medication stockpiling may be more positive than how medication hoarding was portrayed, stockpiling was also studied in association with a negative behavior like suicide attempts (de Sousa et al., 2020).

Contexts - Medication Stockpiling (Web of Science and Business Source Premier)

The studies from this data set assessed medication stockpiling during the COVID-19 pandemic (Al Zoubi et al., 2021; Amenta et al., 2022; Nam et al., 2023). Self-medication during the COVID-19 pandemic was a phenomena assessed in association with medication stockpiling (Amenta et al., 2022).

Is the Concept Used Consistently and Appropriately within Context? – Medication Stockpiling

Medication stockpiling consistently appeared in medication use assessment associated with other phenomena such as disasters and medication shortages. The concept was narrated in a more justified fashion, compared to medication hoarding. However, the appropriateness of this trend could not be determined because the nature of the concept was never clearly defined in the literature. Hence, the conceptual context was deemed immature.

Contexts – Retention of UUEL Medications

The concept of the retention of UUEL medications appeared as in the definitions and operationalization of medication hoarding and stockpiling. When

this concept appeared as its own entity, it was discussed in the context of medication use and retention (Asmelashe Gelayee & Binega, 2017; Bashaar et al., 2017; Bettington et al., 2018; Beyene et al., 2019; Bicket et al., 2021; De Bolle et al., 2008; Ewen et al., 2015; Gascoyne et al., 2014; Gidey et al., 2020; Hassali et al., 2011; Ho et al., 2018; Jha et al., 2022; Lystlund et al., 2014; Maeng et al., 2017; Metz et al., 2022; Omae et al., 2018; Renny et al., 2022), and most commonly appeared in the context of medication disposal (Aldred Cheek, 2018; Asmelashe Gelayee & Binega, 2017; Bashaar et al., 2017; Bekker et al., 2018; Bettington et al., 2018; Beyene et al., 2019; Bicket et al., 2021; Braund et al., 2009; Bronder & Klimpel, 2001; Egan et al., 2019, 2020; Ekedahl, 2006; Garey et al., 2004; Gidey et al., 2020, 2020; Gracia-Vásquez et al., 2015; Haughey et al., 2019, 2019; Jha et al., 2022; Jonjić & Vitale, 2014; Kozak et al., 2016; A. V. Law et al., 2015; Lystlund et al., 2014, 2014; Omae et al., 2018; Perry et al., 2014; Persson et al., 2009; Sapkota et al., 2022; Shealy et al., 2019; Voepel-Lewis et al., 2020, 2022; Vogler & de Rooij, 2018; West et al., 2016; Wieczorkiewicz et al., 2013).

The narrative of the concept was negative, as these medications were often recognized as “medication waste” (Jonjić & Vitale, 2014; West et al., 2016) and “preventable waste” (Bekker et al., 2018) or as keeping expired medications was considered “inappropriate” (Luiza et al., 2019). The concept also appeared in other research endeavors investigating risky medication behaviors such as prescription medication borrowing and lending (Beyene et al., 2019), nonmedical medical use of prescription opioids (Egan et al., 2020; McCabe et al., 2013, 2019), overdoses

with these medications (Buykx et al., 2010; Reis et al., 2014), and opioid diversion (Inciardi et al., 2009).

Contexts – Retention of UUEL Medications (Web of Science and Business Source Premier)

Similar trends were observed in this data set as well. The concept appeared in the assessment of the retention (Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022; Aluko et al., 2022; Amoabeng et al., 2022) and disposal of these medications (Addis, 2023; Adedeji-Adenola et al., 2022; Alfian et al., 2021; Aliory et al., 2021; Alshehri & Banjar, 2022; Althagafi et al., 2022; Aluko et al., 2022; Amoabeng et al., 2022; Liu et al., 2020; H. Stewart et al., 2015). The concept was also recognized as “waste” (H. Stewart et al., 2015) and appeared in the context of medications reuse in this data set (Alhamad et al., 2022).

Analysis of the Contexts with Medication Use Cycle

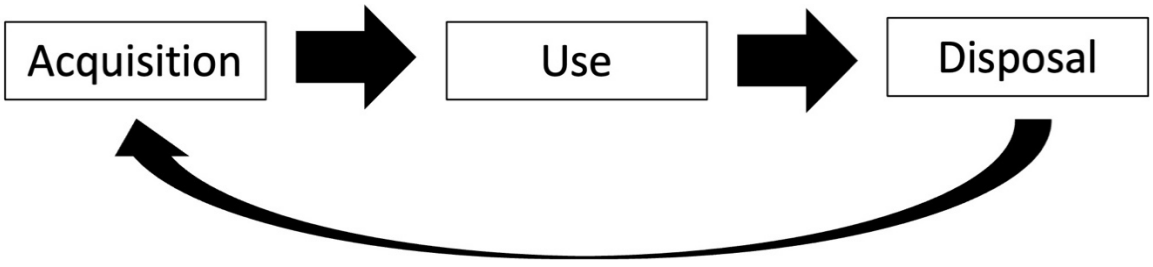

Figure 7 Traditional Product Consumption Model

A further analysis of the conceptual components revealed that they could be located within a traditional product consumption model with three stages:

“acquisition,” “use,” and “disposal.” (Figure 7, Cross et al., 2018). It is important to note that this analysis was conducted after all the other conceptual components were identified. However, the three stages of the model were not sufficient to accurately account for all the conceptual components. For this reason, a new medication use cycle was constructed with four stages: “acquisition,” “use,” “retention,” and “disposal” (Figure 13, Appendix 2). The addition of the retention stage was reasonable, as most of the hoarded, or stockpiled medications and UUEL medications were cross-sectionally examined in this stage.

All three concepts appeared in the context of acquisition, use and retention. Only the concept of medication stockpiling did not appear in the context of medication disposal. Unlike the other two other concepts, medication hoarding also did not involve storing medications immediately upon acquisition and retaining without use. This storage act was observed in the other two concepts slightly differently. Stockpilers retained medications in anticipation of their use in disasters or medication shortages, while the individuals observed in the concept of the retention of UUEL medications kept and disposed them without ever using them.

Appendix 2 illustrates the placement of the conceptual factors in the medication use cycle. This process was conducted once all the conceptual factors except for the conceptual boundaries were analyzed for the concept analysis. The serviceable and unserviceable medications in Figure 9 were the labels for the types of medications distinguished during the evaluation of the conceptual boundaries. A more detailed discussion about these labels can be found below (Figure 9).

Is the Concept Used Consistently and Appropriately within Context? – Retention of UUEL Medications

The current concept consistently appeared in medication use, retention, and disposal assessment often being negatively narrated. Although the concept was often incorporated in medication hoarding or stockpiling, the conceptual context was not able to indicate when the concept should be associated with either concept. Also, for the same reason with the other two concepts, the appropriateness of the context could not be determined without a concrete and consensus definition. Therefore, the conceptual context was determined to be immature.

3.1d Conceptual Antecedents

The “Antecedents” were categorized into “rationales,” and “preconditions.” The rationales were the intrinsic triggers which motivated an individual to hoard or stockpile medications or retain UUEL medications. On the other hand, the preconditions were relevant circumstances or phenomena that occurred prior to the concepts of interest, but they were not reported as main drivers of each behavior in the literature. A sequential illustration of the conceptual antecedents and outcomes of medication hoarding, medication stockpiling, and the retention of UUEL medications is given in Figure 8.

Preconditions: Prior Events		
• Sources: pharmacist, self-prescribed, general practitioners, doctors, and neighbors • COVID-19 pandemic	• Experience of a disaster or medication shortage • COVID-19 pandemic • Education by healthcare practitioners about the importance of continuation of therapy • Automated dose dispensing (ADD) scheme mandate in Denmark in 2001	• Sources: previous OTC stocks, and leftovers from friends and family • Therapy changes or discontinuation • Being overprescribed and being supplied with excess quantity • Unsure why prescribed • Receiving unclear instructions on prescriptions • Parents with history of prescription opioid misuse • Cultural environment
Rationales: Main Motivators		

• Future use
• Uncertainty about future supplies
• Continuously receiving prescriptions at medical visits
• Lack of knowledge about appropriate disposal
• Physician-assisted suicide
• Desire to not be wasteful
• Dopamine replacement therapy in Parkinson's
	• Convenience
	  ○ Experience of a disaster or medication shortage
	  ○ Cost of medications and financial hardships
	  ○ "Just in case"
	  ○ In fear of being unable to obtain additional stocks
	  ○ Share with others who might need them
	• Personal Values
	  ○ Family's health
	  ○ Family's illness history and medication taking habits
	• Self-harm
		• Convenience
		  ○ Future use
		  ○ "Just in case"
		  ○ For emergencies
		  ○ Sharing or diversion
		  ○ Cost of keeping vs disposing
		• Personal Values
		  ○ "As a reminder for what had worked in the past"
		  ○ "Did not believe in expiry dates"
		  ○ Environmental concerns
		  ○ To prevent negative effects of discarded medications on others

		• Negligence
		  ○ Hesitation to medication disposal
		  ○ Lack of knowledge about proper medication disposal
		  ○ Indifferent and lazy to dispose medications

↓	↓	↓
Medication Hoarding	**Medication Stockpiling**	**Having UUEL Medications**
↓	↓	↓
Outcomes		
• Sharing • Disposal • Suicide • Self-medication	• Use as a back-up • Sharing • Intentional overdose • Self-medication	• At home and out-of-home medication disposal • Self-medication • Non-medical use • Sharing • Overdose • Suicide

Figure 8 Conceptual Sequence of Antecedents and Outcomes of Medication Hoarding, Medication Stockpiling, and the Retention of UUEL Medications

Preconditions – Medication Hoarding

The data regarding the preconditions of medication hoarding were scant. However, the sources of the hoarded medications provided some insight into how the hoarders obtained their medications initially. Some of the sources identified were “pharmacist,” “self-prescribed,” “general practitioners,” “doctors,” and “neighbors” (R. Law & Chalmers, 1976; Tsiligianni et al., 2012). According to Tsiligianni et al., the hoarded medications in rural Greece “were mainly purchased from a pharmacist” (Tsiligianni et al., 2012). The COVID-19 pandemic was another identified precondition for hoarding (Zhang et al., 2020).

Rationales – Medication Hoarding

The most commonly reported reason for medication hoarding in the literature was keeping for “future use” (Back et al., 2009; Ellis et al., 2011; Giovannoni et al., 2000; Henderson et al., 2015; Huang, 1996; Kaboré et al., 2021; Parimi et al., 2002; Slater et al., 1986). A few of these cases involved hoarding opioids for future use (Back et al., 2009; Henderson et al., 2015; Kaboré et al., 2021) and “in fear of not being able to get more in the future” (Kaboré et al., 2021).

Giovannoni et al. reported case studies of Parkinson’s patients with hedonistic homeostatic dysregulation. These patients had a malfunctioning reward system of their brain and suffered from drug seeking and addiction. Their pathological syndrome led to hoarding of medications for dopamine replacement therapy (DRT) which were supposed to be taken for their Parkinson’s (Giovannoni 2000).

Ellis et al. conducted a qualitative analysis focusing on medication hoarding and shared a more in-depth insight into why patients hoarded. One rationale reported was that patients kept receiving prescriptions at each medical consultation: *"just keep taking something, they went to some other doctor, they prescribed something else, they kept taking."* Another rationale uncovered in the same study was the lack of knowledge about appropriate disposal of excess or expired medications (Ellis et al., 2011). Additionally, terminally ill patients were reported to hoard their medications for physician-assisted suicide (Emanuel et al., 1996, 2000), and the desire to not be wasteful was reported as a rationale for hoarding (Martinez et al., 2012).

Preconditions and Rationales – Medication Hoarding (Web of Science and Business Source Premier)

No information regarding the antecedents of hoarding was found in this data set.

Preconditions – Medication Stockpiling

The most commonly reported precondition for medication stockpiling was the experience of a disaster or medication shortage that threatened the continuation of therapy. The past disaster experience of more vulnerable patients such as renal transplant, antiepileptic, and rheumatoid arthritis patients and its impact on their medication stockpiling practice after the Great Japan Earthquake

in 2011 were discussed (Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012).

Moriarty et al. examined HIV patients, another vulnerable patient group, and the impact of the previous medication shortages. A participant with HIV in the study reported: “It (a shortage) has happened before.” The HIV patients started stockpiling medications after realizing that the medication supply from the clinic may not stay consistent. In addition to the past shortage experience, the HIV patients shared the effect of the therapy counseling by healthcare practitioners:

> *“I have never stopped taking the drugs because during the precounseling session he was told that whenever he would stop taking the drugs, the virus would go up, and I’m going to get some other condition, I might die”* (Moriarty et al., 2018).

Another precondition uncovered was the automated dose dispensing (ADD) scheme mandate in Denmark in 2001. An individual from the same study reported that they started stockpiling medications once discovering that a tablet was missing from the ADD bag (Larsen & Haugbølle, 2007).

Rationales – Medication Stockpiling

The rationales for medication stockpiling were categorized into "convenience," "personal values," and "self-harm."

Convenience

This category pertained to ensuring medication stocks for use in the future. The preconditions of experiencing a natural disaster or medication shortage led to motivating patients to stockpile medications (Kadowaki et al., 2014; Kobayashi et al., 2016; Larsen & Haugbølle, 2007; Tomio et al., 2012). Some reported stockpiling in anticipation of other types of challenges. One of the challenges was due to the cost of the medications:

> *"I know there was a gap between jobs where I had no coverage, but I knew it was coming"* (Patel et al., 2014).
>
> *"I don't dispose of them because we do not have medical coverage. We can use them in the future"* (Unger et al., 2021).

Personal Values

"Kabel et al. interviewed "preppers" on online platforms who believed in the future occurrence of an apocalypse. One reported rationale was for their family's health:

> *"My son is a type 1 diabetic, and this is something that I have pondered for a while. Insulin is my son's lifeblood, so whatever it took to get it, I would try."*

"The most important thing I can do as a father and husband, however, is to do my best to ensure my family's survival" (Kabel & Chmidling, 2014).

Xu et al. also discovered a family-related rationale while inventorying common medications stockpiled in Chinese households. In this case, the Chinese households were found to stockpile medications based on family's illness history and medication taking habits (Xu et al., 2023).

Self-harm

Another rationale reported by the "preppers" was to end their life to avoid being a burden of others:

"I have been thru the high blood sugar and the ensuing coma that takes days to come out of, and in a post-apocalyptic world I don't want to linger on being a burden to my family until it is over" (Kabel & Chmidling, 2014).

Stockpiling medications for suicide was also reported in a case report of HIV patients, the reason for their suicide, itself, wasn't reported (Donovan, 1990).

Preconditions – Medication Stockpiling (Web of Science and Business Source Premier)

The only observed precondition in this data set was the COVID-19 pandemic (Al Zoubi et al., 2021; Amenta et al., 2022; Nam et al., 2023) similar to the disaster experienced identified from the earlier dataset.

Rationales – Medication Stockpiling (Web of Science and Business Source Premier)

The rationales of medication stockpiling identified in the data set were "just in case," in fear of being unable to obtain additional stocks, to share with others who might need them (Al Zoubi et al., 2021). These belonged to the "convenience" category identified from the previous dataset.

Preconditions – Retention of UUEL Medications

Many reported therapy change or discontinuation as a precondition for having UUEL medications (Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015; Lystlund et al., 2014; West et al., 2016; Wieczorkiewicz et al., 2013). The therapies were stopped by the prescribers (Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015; Lystlund et al., 2014; West et al., 2016) or by the patients, themselves (West et al., 2016). The medical and treatment-related rationales mostly focused on the reasons of therapy discontinuation. The reasons included improved or resolved conditions (Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015; Lystlund et al., 2014; West et al., 2016; Wieczorkiewicz et al., 2013), adverse effects from the therapy (Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015), ineffective therapy (Braund et al., 2009; A. V. Law et al., 2015), and feeling worse on therapy (Lystlund et al., 2014). These rationales specified why patients "no longer needed" (Wieczorkiewicz et al., 2013) their medications.

Besides being left with medications of discontinued therapy, overprescribing or being supplied with excess quantity was noted as a precondition

as well (Braund et al., 2009; Ho et al., 2018; Jha et al., 2022; West et al., 2016). Ho et al. examined the residual amount of opioids prescribed upon orthopedic surgical discharge. The patients with residual opioids were prescribed with the higher daily morphine equivalence of opioids than the amount prescribed for their last 24 hours of the hospital admission. Some patients did not require any opioids in the last 24 hours of admission, but they were prescribed opioids upon discharge (Ho et al., 2018). Patients also reported that they were unsure why a certain medication was prescribed for them and ended up leaving it unused. Having unclear instructions on prescribed medications was another reason (Braund et al., 2009).

In another opioid related study, the parents with the history of prescription opioid misuse kept more leftover opioids prescribed for their children (Voepel-Lewis et al., 2020, 2022). Additionally, having no education regarding proper medication disposal preceded keeping UUEL medications (Renny et al., 2022).

Some of these medications were kept by the friends or family of decedents or when a patient moved out of the same residence (Braund et al., 2009; A. V. Law et al., 2015; Lystlund et al., 2014; West et al., 2016). Furthermore, while assessing the medications returned to family members from decedent, Reis et al. did not identify policies for confiscating or regulating the medications left behind by deceased individuals (Reis et al., 2014).

Rationales – Retention of UUEL Medications

"Convenience," "personal values," and "negligence" were identified as the child categories for the rationales for having UUEL medications.

Convenience

The most commonly reported rationale was to keep or save for "future use" (Asmelashe Gelayee & Binega, 2017; Bicket et al., 2021; Gidey et al., 2020; Persson et al., 2009; Sapkota et al., 2022; Voepel-Lewis et al., 2020, 2022), or "just in case" (Bettington et al., 2018), including "addressing the need…in emergencies" (Jha et al., 2022). Some reported keeping the medications for future use of family, relatives and friends or for the purpose of sharing or diversion (Bettington et al., 2018; Jha et al., 2022; Sapkota et al., 2022). In addition, patients implied that it was more convenient to keep these medications, as the benefit of the convenience did not outweigh the cost of disposal (Bettington et al., 2018) or the cost of medications (Voepel-Lewis et al., 2020, 2022).

Personal Values

In some cases, patients, caregivers, or family members kept their UUEL medications because of their beliefs toward medications. One rationale was concerned with the past success with patients' therapy as they kept them "as a reminder for what had worked in the past" (Bettington et al., 2018). Others expressed that they did not dispose medications and kept them, because they "did not believe in expiry dates" (Bettington et al., 2018). Individuals also seemed to

reflect their general attitude toward the society in their medication management practice. Some individuals were motivated to keep UUEL medications because of their environmental concerns and to prevent discarded pharmaceuticals from negatively affecting others (Bicket et al., 2021; Jha et al., 2022).

Negligence

The other rationales were related to negligence in medication disposal. Patients expressed some hesitation to disposing medications as it could be “too complex” (Bicket 2021). They noted they had “forgotten about them” and “hadn’t gotten around to disposing of them” or “returning them to a pharmacy” (Bettington et al., 2018; Bicket et al., 2021). Their lack of knowledge about proper disposal was also reported as a rationale (Bettington et al., 2018; Bicket et al., 2021; Gidey et al., 2020; Voepel-Lewis et al., 2020, 2022).

Some individuals showed their indifference toward medication disposal and reported they “haven’t thought about it [disposal]” (Bicket et al., 2021), “does not care,” “kept it aside without any interest” (Sapkota et al., 2022). When the individuals with unused medications were asked what was preventing them from properly disposing them, they shared their “laziness” as the main reason (Persson et al., 2009).

Preconditions – Retention of UUEL Medications (Web of Science and Business Source Premier)

Similar to the preconditions from the previous dataset, the preconditions from the current set contained low proportions of the study subjects reporting never receiving education on disposal (Addis, 2023; Althagafi et al., 2022). Furthermore, the reasons having these medications also included improved conditions (Addis, 2023; Adedeji-Adenola et al., 2022; Althagafi et al., 2022), unpleasant taste (Addis, 2023), intolerable side effects (Addis, 2023; Adedeji-Adenola et al., 2022; Althagafi et al., 2022), treatment change (Addis, 2023; Adedeji-Adenola et al., 2022; Althagafi et al., 2022), medication that had expired (Adedeji-Adenola et al., 2022; Althagafi et al., 2022), oversupplies or overprescribing, having no need for the medications, treatment completion (Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022).

The cultural influence in medication management in households (Aluko et al., 2022) was a unique precondition appeared in the current dataset. Aluko et al. explained that “medicines safekeeping, care for the child and sick” were a female responsibility in the study area in Nigeria (Aluko et al., 2022). The original sources of these medications were previous OTC stocks (Adedeji-Adenola et al., 2022) and leftovers from a decedent (Alshehri & Banjar, 2022).

Rationales – Retention of UUEL Medications (Web of Science and Business Source Premier)

The convenience and negligence categories were observed in this data set. The convenience category included “for future use,” and “medication sharing” (Alhamad et al., 2022). The negligence category was regarding the “lack of knowledge for medication disposal” (Alhamad et al., 2022).

3.1e Conceptual Characteristics

A summary of the conceptual characteristics of the three concepts is provided in Table 6.

Medication Hoarding	Mechanisms
	• Voluntary acquisition and accumulation
	  ○ Seeking help from multiple doctors, taking advantage of the error caused by the facility and hiding the stocks
	• Involuntary accumulation
	  ○ Pharmacy refilling prescriptions without knowing they were discontinued
	• Multiple storage locations
	• Original sources: pharmacists, self-prescribed, general practitioners, doctors, and neighbors
	
	Other characteristics
	• Demographics
	  ○ Gender, age, and residential locations, households with children or anyone older than 65 years
	• Socioeconomic status
	  ○ Employment status, monthly household income
	• Comorbidities
	  ○ Cancer, significant pain, depression, and duration of chronic disease, having a family member with chronic disease
	• Medication use and management
	  ○ Number of prescribers, number of medications in the home

Medication Stockpiling	Mechanisms
	• Navigate across systems
	  ○ How medication stockpilers interacted with various entities in the healthcare system to gain access to more medications
	• Paying for medications to be stockpiled
	• Keeping stockpiles
	  ○ Storage and inventory methods for stockpiled medications
	
	Other characteristics
	• Demographics
	  ○ Gender, age, race, household residential locations, household size
	• Socioeconomic status
	  ○ Insurance types, education levels, employment status, highest education status in the household,
	• Comorbidities and health status
	  ○ Asthma, diabetes, difficulty leaving home, vulnerability levels, long-term care levels, physical disability, having a family member with chronic diseases, or one who took

	regular medications or supplements that were not related to a chronic disease
	• Awareness*
	  ○ Having medical background, living with a physician in the household, having received formal information about the COVID-19 pandemic, perceived risk of medication stockpiling for medication shortages or harming children
	• History of trauma
	  ○ Suicide attempts, past disaster experience

Retention of UUEL medications	Mechanisms
	• The reasons for ending up with medications no longer needed
	  ○ Therapy changes and discontinuation, and medication oversupply
	• How medications were stored
	
	Other characteristics
	• Demographics
	  ○ Race, age, residential locations
	• Socioeconomic status
	  ○ Household income, child's insurance types, education levels, health literacy
	• Medication use
	  ○ Self-medication, medication legend status, medication indication known to the owner, medication frequency of use, average day-supply of prescription medication in store, history of medication sharing, and history of prescription opioid misuse
	• Comorbidities and health status
	  ○ Quality of life, dementia, coronary artery disease, and the number of comorbidities
	• Healthcare utilization
	  ○ Emergency department visit frequencies, primary care provider and specialist visit frequencies, medication costs of care, acute care utilization frequencies
	• Awareness
	  ○ History of medication disposal education or medication disposal intervention, Scenario-Tailored Opioid Messaging Program (STOMP)

Table 6 Summary of Conceptual Characteristics of Medication Hoarding, Medication Stockpiling and the Retention of UUEL Medications (*: identified from Web of Science and Business Source Premier)

Mechanisms – Medication Hoarding

> *"just keep taking something, they went to some other doctor, they prescribed something else, they kept taking"* (Ellis et al., 2011).

This was quoted in the earlier discussion of the rationale for medication hoarding, but it also indicated that patients continuously sought care from different doctors and implied they potentially went doctor shopping to receive additional prescriptions (Ellis et al., 2011).

Doctor shopping was also observed in Parkinson's patients receiving dopamine replacement therapy (DRT). These patients suffered from hedonistic homeostatic dysregulation which manifested as increasing consumption of DRT. They also requested more medications despite being dyskinetic, an adverse effect of DRT (Giovannoni et al., 2000).

Another case report by Walcott involved an inmate who ended his life with the medications that he was able to hoard in jail. When he was first caught hoarding his medications for suicide, the facility switched the oral tablet formulation of the hoarded medication to liquid. However, when he was transferred to a different facility, this formulation switch was not noted by the prescriber, and the inmate was prescribed with oral tablets again and was able to continue to skip their doses to hoard (Walcott, 2000).

Patients may also hoard medications involuntarily. In the case report by Martinez et al. the subject had a medication discontinued by their provider, but their pharmacy unknowingly kept refilling the medication. The patient ended up with an unwanted excess stock of that medication. The subject also shared that

the hoarded medications were stored in multiple locations in her home (Martinez et al., 2012).

Regardless of the voluntariness, the initial sources of the hoarded medications categorized as the preconditions were also recognized as a mechanism for acquisition, namely pharmacists, self-prescribed, general practitioners, doctors, and neighbors (R. Law & Chalmers, 1976; Tsiligianni et al., 2012).

Other Characteristics – Medication Hoarding

The other characteristics for medication hoarding were categorized into "demographics," "socioeconomic status," "comorbidities," and "medication use and management." The characteristics categorized under "demographics" were gender (Alhomoud, 2020), age, and residential locations (Kaboré et al., 2021). "Socioeconomic status" included employment status (Alhomoud, 2020). The "Comorbidities" were composed of cancer, significant pain (Emanuel et al., 1996), depression (Emanuel et al., 1996; Zhang et al., 2020), and the duration of chronic disease (Kalyango et al., 2012). "Medication use and management" included the number of prescribers (Kalyango et al., 2012), and number of medications in the home (Sorensen et al., 2005).

Mechanisms – Medication Hoarding (Web of Science and Business Source Premier)

No information regarding the mechanisms of hoarding was found in this data set.

Other characteristics – Medication Hoarding (Web of Science and Business Source Premier)

The characteristics identified from the literature in this data set belong to "demographics," "socioeconomic status" and "comorbidities." "Demographics" included households with children or anyone older than 65, "socioeconomic status" included monthly household income, and "comorbidities" included having a family member with chronic disease (Ewunetei et al., 2021).

Mechanisms – Medication Stockpiling

More information describing how individuals obtained extra stocks of medications was found. This information was categorized into "navigate across systems," "paying for medications to be stockpiled," and "process of keeping stockpiles"

Navigate Across Systems

A few studies revealed how medication stockpilers interacted with prescribers and the healthcare system to gain access to more medications. One

stockpiler acquainted their healthcare provider to receive prescriptions in their favor:

> *"I made friends with a couple of my Dr's. After building trust, they wrote me prescriptions for both name brand and generic. They gave me 12 months prescriptions. I buy both and store them in the fridge"* (Kabel & Chmidling, 2014).

Even when patients tried to request extra prescriptions discretely, their intention became apparent to prescribers:

> *"Other presenting features that caused me to suspect that they were stockpiling were requests for quantities and doses above what seemed appropriate"*(Donovan, 1990).

An HIV patient shared that they repeatedly obtained and retained medications that were not needed immediately in preparation for medication stock-outs:

> *"I have some of the drugs in the house. And I'm coming here [clinic] for more drugs"* (Moriarty et al., 2018).

African American women with asthma also reported that they refilled rescue and controller inhalers regardless of their immediate need to be combat a financial challenge due to an insurance coverage gap between jobs (Patel et al., 2014).

Some patients learned to stockpile without interacting much with the healthcare system. One "prepper" who stockpiled in anticipation of an apocalypse reported accessing venues outside of healthcare for extra stocks:

"Cost, restrictions, and idiot doctors. No paper [script] so no drugs is not an option for me. So I'm looking at vets, chemists, farm supply shops, aquarium shops, and doctors surgeries for SHTF [Shit Hits The Fan] supplies" (Kabel & Chmidling, 2014).

An HIV patient shared they sometimes benefited from the extra in stock containers from the manufacturers:

"It's not that every drug has 30 tablets. Sometimes it's 31, or 32, so if you continue taking the drug for 1 month, every 30 days, in 6 months time you get some in stock" (Moriarty et al., 2018).

On the other hand, in the study examining medication stockpiling after the mandate of an automated-dose dispensing scheme in Denmark, the patients reported saving the current stocks of medications to create a revivor for future use:

"store the unused medication from the dose bags that she was to take at 12 noon and 5 PM, which she simply skips" (Larsen & Haugbølle, 2007).

This information also implies that inappropriate medication adherence may be associated with medication stockpiling.

Paying for Medications to Be Stockpiled

Conflicting views on the utilization of insurance were observed. One group of individuals maximized the benefit of their current insurance. The African American women with asthma shared using her insurance to obtain medications for her daughter who does not have insurance:

> *"My daughter.. .had asthma so bad and her inhalers were so high, so I would give her mines. And then, since I have insurance, I would go get extra inhaler for me and go give her one, you know, for her"* (Patel et al., 2014).

The "preppers" reported a way to have their insurance cover higher quantities of medications than they actually used:

> *"Tell your health insurance that you use a little more insulin than you actually do. This will enable, over time, building up some extra bottles"* (Kabel & Chmidling, 2014).

The opposing view seemed to involve the desire of being free of the restriction from their insurance, as a "prepper" stockpiling medications for an apocalypse shared: *"when the SHTF, buy some extra, just pay for it [without insurance]"* (Kabel & Chmidling, 2014).

Besides the cases involving insurance, an HIV patient in the study by Moriarty et al. mentioned that medication stockpiling could take a desperate measure: *"when I don't have money, I borrow money from friends to come here"* (Moriarty et al., 2018).

Keeping Stockpiles

The storage methods for stockpiled medications were identified in the data. After the enforcement of the automated dose-dispensing, a patient "used the bottles and boxes from the old scheme to store the unused medication" (Larsen & Haugbølle, 2007). Others reported keeping inventory of the stockpiles:

"You should have an 18-month supply that is the shelf life when cooled. Rotate your stock" (Kabel & Chmidling, 2014).

"I keep so much medication, I'm the pharmacy. What I do, I just go through it every season. You know, I keep down the dates, and I throw them out'' (Patel et al., 2014).

Other characteristics – Medication Stockpiling

The characteristics of medication stockpiling were categorized into "demographics," "socioeconomic status," "comorbidities and health status," and "history of trauma." "Demographics" included gender, age, race (Heslin et al., 2013), "Socioeconomic status" involved insurance types (Heslin et al., 2013), and education levels (Tomio et al., 2012). The "comorbidities and health status" included asthma, diabetes, difficulty leaving home (Heslin et al., 2013), vulnerability levels, long-term care levels, and physical disability (Tomio et al., 2012). The "history of trauma" was composed of suicide attempts (De Sousa 2020) and past disaster experience (Tomio et al., 2012).

Mechanisms – Medication Stockpiling (Web of Science and Business Source Premier)

Keeping medications until their expiry date was a mechanism of medication stockpiling identified in this data set (Amenta et al., 2022), which belonged to "*keeping stockpiles"* category identified in the previous data set.

Other Characteristics – Medication Stockpiling (Web of Science and Business Source Premier)

Some of the characteristics of medication stockpiling identified from this data set were categorized into the three categories identified in the previous data set: “demographics,” “socioeconomic status,” “comorbidities and health status.” household Residential locations, and household size (Nam et al., 2023) were categorized as “demographics.” The education levels, employment status (Al Zoubi et al., 2021), highest education status in the household (Nam et al., 2023) belonged to “socioeconomic status.” Having a family member with chronic diseases or one who took regular medications or supplements that were not related to a chronic disease (Al Zoubi et al., 2021) belonged to “comorbidities and health status.” “Awareness” was a new category extracted from the current data set. It included having medical background (Al Zoubi et al., 2021), living with a physician in the household, having received formal information about the COVID-19 pandemic (Nam et al., 2023), and the perceived risk of medication stockpiling for medication shortages or harming children (Al Zoubi et al., 2021).

Mechanisms – Retention of UUEL Medications

Some of the preconditions for having these medications were identified as mechanisms as well. These mechanisms included the reasons for therapy change or discontinuation and consequently ending up with medications no longer needed (Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015; Lystlund et al., 2014; West et al., 2016; Wieczorkiewicz et al., 2013), including the process of receiving

oversupply of medications (Braund et al., 2009; Ho et al., 2018; Jha et al., 2022; West et al., 2016). These reasons were explained earlier in detail as the antecedents.

The rest of the data pertaining to the mechanisms focused on how UUEL medications were stored or retained. Aldred Cheek et al. reported that the households with unwanted medications kept them on the kitchen counter, in a cupboard, in a desk, in a drawer, in the garage, in the attic, on a spice rack near the recycling, in a closed storage area, in a locked cabinet, and in a box or plastic bag (Aldred Cheek, 2018). The cupboard was also a common storage location reported by Persson et al. (Persson et al., 2009) Some other storage information seemed to be associated with negligence of the medication owners. Some individuals shared that they kept unused medications until they expired, indicating a potential relationship between unused and expired medications (Bashaar et al., 2017; Gidey et al., 2020; Wajid et al., 2020). Others reported that they accumulated medications by “forgetting to take” them (A. V. Law et al., 2015).

Other Characteristics – Retention of UUEL Medications

The characteristics of the retention of UUEL medications were categorized into “demographics,” “socioeconomic status,” “medication use,” “comorbidities and health status,” “healthcare utilization,” and “awareness.”

Race, Age, and residential locations (Renny et al., 2022) belonged to “demographics.” The “socioeconomic status” entailed household income (Beyene et al., 2019), race, child’s insurance types, age, education levels, health literacy,

and residential locations (Renny et al., 2022). The “medication use” involved self-medication (Asmelashe Gelayee & Binega, 2017), medication legend status, medication indications known to the owner, medication frequency of use (De Bolle et al., 2008), average day-supply of prescription medications in store (Maeng et al., 2017), history of medication sharing (Renny et al., 2022), and history of prescription opioid misuse (Voepel-Lewis et al., 2020, 2022). The “comorbidities and health status” included the quality of life, dementia (Ewen et al., 2015), coronary artery disease, and the number of comorbidities (Maeng et al., 2017). The “healthcare utilization” was composed of emergency department visit frequencies, primary care provider and specialist visit frequencies, medication costs of care, acute care utilization frequencies (Maeng et al., 2017). The “awareness” comprised the history of receiving education about medication disposal (Maeng et al., 2017; Voepel-Lewis et al., 2020), and Scenario-Tailored Opioid Messaging Program (STOMP). STOMP was an interactive online program developed to enhance risk perception of opioids and prevent leftover opioid retention (Voepel-Lewis et al., 2020).

Mechanisms – Retention of UUEL Medications, (Web of Science and Business Source Premier)

No information regarding the mechanisms of the retention of UUEL medications was found in this data set.

Other characteristics – Retention of UUEL Medications (Web of Science and Business Source Premier)

The population density of the residential locations was identified as a characteristic in this data set (Aluko et al., 2022) and belonged to "socioeconomic status."

3.1f Conceptual Outcomes

A sequential illustration of the conceptual antecedents and outcomes of medication hoarding, medication stockpiling, and the retention of unused, unwanted, expired or leftover medications was previously given in Figure 8.

Outcomes – Medication Hoarding

The outcomes of medication hoarding were prescription medication borrowing and lending (Alhomoud, 2020), and their disposal (Ellis et al., 2011), and suicide with the hoarded medication (Walcott, 2000). Ellis et al. also described how an individual determined that their hoarded medications were ready for disposal: *"If they're old and funny, drop 'em down the dunny"* (Ellis et al., 2011).

Outcomes – Medication Hoarding (Web of Science and Business Source Premier)

An outcome of medication hoarding identified in this data set was self-medication using hoarded medications (Ewunetei et al., 2021).

Outcomes – Medication Stockpiling

Most of the outcomes of medication stockpiling were related to the need for stockpiled medications in challenging situations. The automated dose dispensing scheme users reported the use of their stockpiled medications *"when tablets from the dose bags fall on the floor and get lost"* or *"when his medication is changed until the changes are reflected in the dose bags"* (Larsen & Haugbølle, 2007). The HIV patients used their stockpiles during stock-outs which could cause treatment interruptions (Moriarty et al., 2018). Another circumstance where treatment interruptions could occur was having no insurance coverage. In this case, a family member with insurance coverage obtained medications for their family members who do not have coverage (Patel et al., 2014). The use of stockpiled medications was also observed in an intentional overdose by an HIV patient (Donovan, 1990).

Outcomes – Medication Stockpiling (Web of Science and Business Source Premier)

Self-medication (Amenta et al., 2022) with stockpiled medications, and sharing them with others (Al Zoubi et al., 2021) were the outcomes of stockpiling observed in the data set.

Outcomes – Retention of UUEL Medications

The data regarding the outcomes of having UUEL medications were mainly concerned with a variety of disposal methods. The disposal methods could be largely categorized into "at home" and "out-of-home" methods (Table 7 and 8).

Besides the disposal of UUEL medications, their use when in need was also reported. Leftover medications were the primary sources of any medications for university students in Ethiopia (Asmelashe Gelayee & Binega, 2017), leftover prescription opioids were used non-medically by high school seniors (McCabe et al., 2013, 2019), and leftover antibiotics were self-used by households in Serbia (Tomas et al., 2017).

Keeping prescription UUEL medications led to sharing them with individuals other than those who were prescribed with (Bashaar et al., 2017; Beyene et al., 2019; Gascoyne et al., 2014; Gidey et al., 2020; Omae et al., 2018; Sapkota et al., 2022; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013). On the other hand, in the study assessing prescription opioid diversion, individuals reported *"lots of people have leftover meds that they don't need,"* and that *"there is a lot of stealing from medicine cabinets"* (Inciardi et al., 2009). Selling UUEL medications was also reported in the literature (Inciardi et al., 2009; West et al., 2016).

Overdosing (Buykx et al., 2010) and committing suicide (Reis et al., 2014) with these medications were also reported as outcomes. The intentionality of the overdose incidences, however, was not reported (Buykx et al., 2010).

Outcomes – Retention of UUEL Medications (Web of Science and Business Source Premier)

The unique outcome that appeared in this data set was continuing to keep these medications (Addis, 2023; Adedeji-Adenola et al., 2022; Althagafi et al., 2022;

Aluko et al., 2022). Similar to the previous dataset, sharing them was identified as an outcome (Addis, 2023; Adedeji-Adenola et al., 2022; Alfian et al., 2021; Althagafi et al., 2022; Aluko et al., 2022, 2022).

The disposal methods were categorized in the same way in this dataset. The “at-home” disposal methods reported included flushing down the toilet or sink (Addis, 2023; Adedeji-Adenola et al., 2022; Alfian et al., 2021; Althagafi et al., 2022; Aluko et al., 2022; Amoabeng et al., 2022), throwing them in the trash (Adedeji-Adenola et al., 2022; Alfian et al., 2021; Alshehri & Banjar, 2022; Althagafi et al., 2022; Aluko et al., 2022, 2022; Amoabeng et al., 2022) , burning them (Addis, 2023; Adedeji-Adenola et al., 2022; Alfian et al., 2021; Aluko et al., 2022; Amoabeng et al., 2022), throw them into the environment (Addis, 2023), and burying in the ground (Addis, 2023; Aluko et al., 2022). A few at-home processing methods for disposal were reported and they were “crashing before discarding,” “diluting with water,” and “as it is” (Adedeji-Adenola et al., 2022).

The “out-of-home” disposal methods were returning the medications to pharmacy (Addis, 2023; Adedeji-Adenola et al., 2022; Alfian et al., 2021; Althagafi et al., 2022; Amoabeng et al., 2022; Liu et al., 2020), hospital (Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022) and an opioid buy-back program (Amoabeng et al., 2022), or donating them to charities (Alshehri & Banjar, 2022).

At home	
Disposal Methods	References
• Flushed it down the toilet or washed it down the sink	Aldred Cheek 2019, Addis 2023, Adedeji 2022, Alfian 2021, Althagafi 2022, Aluko 2022, Amoabeng 2022, Asmelashe Gelayee & Binega 2017, Bashaar 2017, Bettington 2018, Bicket 2021, Egan 2019, Egan 2020, Ellis 2011, Gidey 2020, Haughey 2019, Jha 2022, Kozak 2016, Law 2015, Lystlund 2014, Perry 2014, Renny 2022, Sapkota 2022, Wajid 2020, West 2016, Wieczorkiewicz 2013
• Threw it out in the trash	Aldred Cheek 2019, Aluko 2022, Adedeji 2022, Alfian 2021, Alshehri 2022, Althagafi 2022, Aluko 2022, Amoabeng 2022, Asmelashe Gelayee & Binega 2017, Bashaar 2017, Bettington 2018, Bicket 2021 (mixing vs not mixing), Egan 2019, Egan 2020, Gidey 2020, Haughey 2019, Jha 2022, Kozak 2016, Law 2015, Lystlund 2014, Omae 2018, Perry 2014, Persson 2009, Renny 2022, Sapkota 2022, Vogler 2018, Wajid 2020, West 2016, Wieczorkiewicz 2013
• Burning	Addis 2023, Adedeji 2022, Alfian 2021, Aluko 2022, Amoabeng 2022, Aldred Cheek 2019, Asmelashe Gelayee & Binega 2017, Gidey 2020, Jha 2022, Sapkota 2022
• Throw into the environment	Addis 2023
• Disposal kit	Bicket 2021
• Burying	Addis 2023, Aluko 2022, Asmelashe Gelayee & Binega 2017
• mixing medications with something before throwing away,	Aldred Cheek 2019, Bicket 2021
• Sharps container	Bettington 2018
• Recycling bin	Persson 2009
• Crashed before discarding • Diluted with water discarding • Disposing as is	Adedeji 2022, Gidey 2020

• Separate unused and expired before disposal	
• Throw them to open fields	Asmelashe Gelayee & Binega 2017

Table 7 At-home Medication Disposal Methods for UUEL Medications

Out of home	
Disposal Methods	References
Returning to a collection site • Take-back programs • Permanent public drop-off site • Hazardous waste collection facility • Drop box • Mailed it through a pharmacy program • Police department/fire station, hazardous waste facility, or special collection events within the community • Took it to the dump/waste transfer center • Took to a central collection point other than dump/waste transfer center • Opioid buy-back program	Aldred Cheek 2019, Amoabeng 2022, Bekker 2018 (returned meds), Bettington 2018, Bicket 2021, Braund 2009, Bronder 2001, Egan 2019, Egan 2020, Gracia-Vásquez 2015, Law 2015, Lystlund 2014, Perry 2014, Shealy 2019, West 2016, Wieczorkiewicz 2013
Returning to a business or healthcare facility • Dropped it off at a pharmacy • Return to a medical store • Took it to a business or shop (e.g. pharmacy or chemist) • Return to the doctor, pharmacy, or other authorized drug disposal location • Return to hospital, or vet's • Return to a healthcare center	Addis 2023, Adedeji 2022, Alfian 2021, Alshehri 2022, Althagafi 2022, Amoabeng 2022, Liu 2020, Aldred Cheek 2019, Asmelashe Gelayee & Binega 2017, Bashaar 2017, Bettington 2018, Beyene 2019, Ekedahl 2006, Garey 2004, Gidey 2020, Law 2015, Persson 2009, Renny 2022S, Sapkota 2022, Wajid 2020, West 2016, Wieczorkiewicz 2013
• Donated to charity	Alshehri 2022, West 2016

Table 8 Out-of-home Medication Disposal Methods for UUEL Medications

3.1g Conceptual Boundaries

Traditionally in principle-based concept analysis, the evaluation of the four conceptual principles (epistemological, linguistic, pragmatic, and logical) are presented first, and then the other conceptual components such as the characteristics, antecedents and outcomes are reported and examined. For the current study, the evaluation based on the logical principle regarding conceptual boundaries is presented last. Such sequence will allow for a more coherent narration of the results and more in-depth discussion incorporating all the conceptual components of the three concepts.

Boundaries – Medication Hoarding

The “current users” of the medications were commonly excluded from the medication hoarders in the literature. While the common understanding of “current use” was assumed in most, some specified the timeframe for the previous usage of medications to define current use. Furst et al. and Slater et al. excluded medications that were “being taken on the day of the survey” (Furst, 1975) and “had been used in the previous 48 hours” (Slater et al., 1986), respectively. On the other hand, noncancer chronic pain patients were found to hoard opioids (Kaboré et al., 2021). Considering the nature of chronic pain that would require consistent use of pain therapy, these patients were likely to hoard medications that were still in use. The concept of medication adherence also appeared along with medication hoarding, as an inmate was able to skip their doses and hoard the medications for suicide (Walcott, 2000)

Boundaries - Hoarding (Web of Science and Business Source Premier)

The medications that were in use at the time of the data collection were excluded from the hoarded medications (Ewunetei et al., 2021).

Boundaries – Medication Stockpiling

The concept of medication stockpiling also included the medications that were not in use. For instance, stockpiling was defined as having “old medicine that you no longer use” (Unger et al., 2021) and “old packets of medications from previous schemes” (Larsen & Haugbølle, 2007). In contrast, most of the other literature determined medication stockpiling as having extra stocks of the medications that were already in use (Dunn, 2017; Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Moriarty et al., 2018; Tomio et al., 2012). The concept of medication adherence also appeared along with medication stockpiling, as skipping doses was a way of acquiring extra stocks of medications for future use (Larsen & Haugbølle, 2007).

Boundaries – Medication Stockpiling (Web of Science and Business Source Premier)

Panic buying was mentioned along with medication stockpiling. The expression, “panic buying and stockpiling” often appeared sequentially and stockpiling was paraphrased as “panic storing” (Nam et al., 2023).

Boundaries – Retention of UUEL Medications

Different timeframes were given for the previous usage to define unused medications. Tomas et al. defined current use “as use in 10 days prior to interview” (Tomas et al., 2017). On the other hand, Ewen and the colleagues defined “used drug packs” as “drugs taken daily as prescribed.” In their research, prescription medications taken daily for heart failure were of their interest, and “used” and “unused” medications were defined based on patients’ medication adherence (Ewen et al., 2015). Likewise, forgetting to take medications was identified as a reason for having unused medications (A. V. Law et al., 2015).

Some of the medications returned for disposal were referred as “unused,” or “unwanted” (Braund et al., 2009; Bronder & Klimpel, 2001; Jonjić & Vitale, 2014; Perry et al., 2014; Shealy et al., 2019; Vogler & de Rooij, 2018), indicating its close relationship with medication disposal. Likewise, various medication disposal methods were also identified in the relevant literature, as shown in Table 7 and 8.

Medication reuse was another concept appeared in association with the current concept. Bekker et al. classified medications returned to a collection service as “preventable waste" or eligible for redispensing if they were “unopen, undamaged,” and had “6 or more months until the expiry date” (Bekker et al., 2018).

Boundaries – Retention of UUEL Medications (Web of Science and Business Source Premier)

“Forgetfulness” was identified as a reason for having unused or expired medications (Addis, 2023), implying the association between the concept and

medication adherence. The concept of medication waste also appeared along with the current concept. Medication waste was defined in the literature as “contaminated, unused, unwanted, leftover, expired, prescribed, over-the-counter, drugs, vaccines, and sera that are no longer required and need to be disposed of” (Adedeji-Adenola et al., 2022), or the units the medications returned to a collection service per their original units dispensed (H. Stewart et al., 2015).

Serviceable and Unserviceable Medications

Medication hoarding and stockpiling thus far were discussed in terms of their inclusion and exclusion of medications in current use. However, as shown in a definition for medication hoarding, “ongoing medications” (Ekedahl, 2006) or medications in current use may be interpreted as ongoing therapy and may not pertain to the physical pharmaceuticals being taken at the moment. Likewise, the terms such as in use and ongoing medications may cause confusion in their interpretation. Instead, the types of medications can be described with more product-focused labels. In the current study, “serviceable” and “unserviceable” medications were used to distinguish the types of medications associated with the three concepts.

The serviceable medications indicated those in use or being stored to be used for their initial intentions. For instance, prescription medications being used for the prescribed individual and for the prescribed use, and unexpired OTC medications were considered serviceable. The medications in “current use” were commonly excluded from medication hoarding in some literature. The medications

taken on the day of research assessment (Furst, 1975) and in the previous 48 hours (Slater et al., 1986) were determined to be in current use. However, some of these medications may not have been taken within the narrow time frames by accident. The concept of UUEL medications also excluded those in use by setting various time frames. The medications taken in the previous 10 days (Tomas et al., 2017) and 4 weeks (Ewen et al., 2015) were considered to be in use. Some of them also may be taken as needed, and the patients did not need them during the time frames. Thus, it was believed that some of these medications determined to be “unused” would be still considered serviceable. With medication stockpiling, many individuals obtained extra of the medications already in use to take them in case of a disaster (Dunn, 2017; Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012). Hence, these were deemed serviceable.

The unserviceable medications were those that ceased to function for their initial intention. The unserviceable medications included “unopened” medications returned to a collection service (Bekker et al., 2018), “deteriorated, discontinued, expired, and other medications unintended for future use” (Alfian et al., 2021), “old,” “extra and unneeded” (Alshehri & Banjar, 2022), expired (Bettington et al., 2018; De Bolle et al., 2008), “no longer required”(Bettington et al., 2018), or discontinued (Buykx et al., 2010; Ho et al., 2018; Metz et al., 2022; Voepel-Lewis et al., 2020, 2022). Likewise, the medications that were not taken as prescribed, but kept by the same prescribed patient and use were deemed serviceable. However, when these medications were not used by the prescribed patient, left unused until

expired (Bashaar et al., 2017; Ellis et al., 2011; Gidey et al., 2020; Wajid et al., 2020), or disposed, then they were considered unserviceable.

Medication Hoarding vs. Medication Stockpiling vs. Retention of UUEL Medications

The concept of medication adherence appeared in all three concepts. Skipping doses was recognized as a way of accumulating extra stocks in medication hoarding (Walcott, 2000) and stockpiling (Larsen & Haugbølle, 2007). Forgetting to take medications (Addis, 2023; A. V. Law et al., 2015) or being unable to take them daily as prescribed were identified as reasons for having unused medications (Ewen et al., 2015).

The concept of medication disposal only appeared along with medication hoarding and the retention of UUEL medications. Unlike medication stockpiling, the two concepts involved involuntary acquisition of extra stocks of medications. In medication hoarding, the patient's pharmacy filled discontinued prescriptions unknowingly and they ended up with unnecessary stocks of medications (Martinez et al., 2012). In the retention of UUEL medications, changes in therapy or its discontinuation were identified as a mechanism for ending up with medications no longer needed.

The two concepts also involved unserviceable medications more prominently than serviceable medications. Medication stockpiling exhibited a reverse trend where its greater involvement of serviceable medications distinguished itself from the other two concepts. In Figure 9, medication stockpiling

and the other two concepts cover different portions of “Serviceable Medications” and “Unserviceable Medications.” The different coverages represent how having “serviceable medications” and “unserviceable medications” was more prominently reported in the concept of medication stockpiling and medication hoarding or the retention of UUEL medications, respectively.

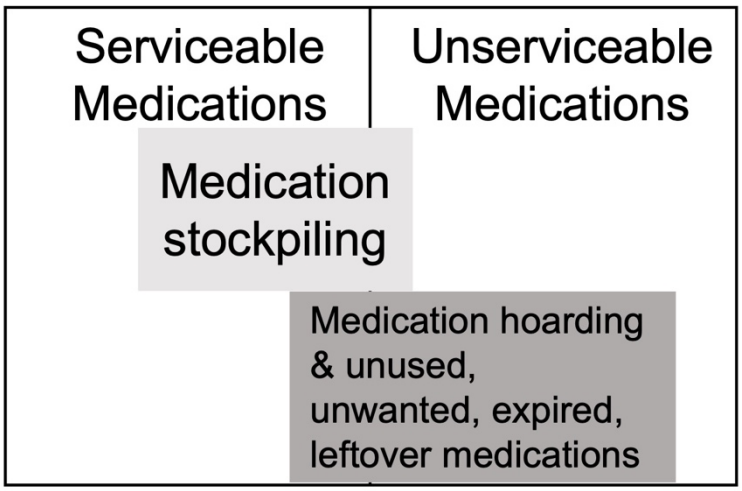

Figure 9 Involvement of Serviceable and Unserviceable Medications in Medication Hoarding, Medication Stockpiling, and the Retention of UUEL Medications

Despite the similarities, medication hoarding differed from the retention of UUEL medications in that it involved the mechanism of voluntary acquisition. For instance, medication hoarders reported seeking care from different physicians to receive additional prescriptions (Ellis et al., 2011). Such acquisition was not observed in the retention of UUEL medications. However, stockpilers voluntarily acquired extra stocks of medications for anticipated disasters (Kabel & Chmidling, 2014), financial difficulties (Patel et al., 2014), suicide (Donovan, 1990), and medication shortages (Larsen & Haugbølle, 2007; Moriarty et al., 2018).

Involuntary acquisition of extra medications was observed in all three concepts. For example, a patient hoarded extra because their pharmacy refilled their discontinued prescriptions unknowingly (Martinez et al., 2012), a patient stockpiled extra accidentally contained in the manufacturer's stock bottle (Moriarty et al., 2018), and patients ended up with unused, unwanted, expired, and leftover medications after discontinuation or change in the therapy for various reasons.

In conclusion, with these medication-related concepts, their constituent medications were determined to hold greater importance in characterizing them compared to the other components. Thus, medication hoarding and stockpiling which involved serviceable and unserviceable medications at a different extent were determined to be different concepts. Medication hoarding was more similar to the retention of UUEL medications with their higher degree of involvement of unserviceable medications, in addition to their conceptual association with medication disposal. In addition, with medication hoarding having a larger scope covering both voluntary and involuntary acquisition, it seemed to be a greater concept that included the retention of UUEL medications.

Does the concept hold its boundaries? Has the concept been theoretically integrated with other concepts? – All Three Concepts

Medication hoarding and the retention of UUEL medications were significantly similar. The two concepts incorporated unserviceable medications more prominently and involved involuntary acquisition of extra medications and their disposal. On the other hand, medication stockpiling involved serviceable

medications more prominently and did not encompass involuntary acquisition and medication disposal.

Involuntary acquisition was observed only with medication hoarding and stockpiling. However, based on the types of associated medications, and their relevance to medication disposal, medication hoarding and stockpiling were deemed to be different concepts. With medication hoarding entailing both voluntary and involuntary acquisition, it was determined to be a greater concept that included the retention of UUEL medications. Despite these findings, the boundaries were determined based on a loose trend, and were not firm. Future research should focus on these aspects to further clarify the boundaries.

3.2 Results for Objective 2 - Concept Analysis of Medication Accumulation

3.2a Antecedents – Medication Accumulation

Preconditions – Medication Accumulation

The preconditions for the concepts were categorized into the personal factors related to the therapy and acquisition of medications, and external factors related to the circumstances that preceded the appearance of the concepts. The circumstances were related to information, systems, disasters, and interventions.

Personal Factors – Therapy-related Events

The personal factors were mainly related to treatment changes or discontinuation either by healthcare practitioners (Addis, 2023; Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Braund et al., 2009; Buykx et al., 2010; Gidey et al., 2020; A. V. Law et al., 2015; West et al., 2016) or by patients on their own (Althagafi et al., 2022; Braund et al., 2009; Ellis et al., 2011; Gidey et al., 2020; A. V. Law et al., 2015; Lystlund et al., 2014; West et al., 2016; Wieczorkiewicz et al., 2013). The reasons for the changes or discontinuation were described as illness resolved (Addis, 2023; Adedeji-Adenola et al., 2022), adverse effects (Addis, 2023; Adedeji-Adenola et al., 2022; Althagafi et al., 2022; Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015), ineffective therapy (Braund et al., 2009; A. V. Law et al., 2015), feeling worse on therapy (Lystlund et al., 2014), unpleasant taste (Addis, 2023), and therapy no longer needed (Alshehri & Banjar, 2022;

Wieczorkiewicz et al., 2013). Other therapy related categories were “multiple treatment failure” (Lester, 2014), “passing or relocation of family members or someone close,” “relocation of family members or someone close” (Alshehri & Banjar, 2022; Braund et al., 2009; A. V. Law et al., 2015; Lystlund et al., 2014; Plummer, 2013; Regenthal et al., 2002; Reis et al., 2014; West et al., 2016). The concept of stockpiling did not appear in this category.

External Factors – Information

The information-related external factors entailed receiving no education regarding medication disposal (Addis, 2023; Aliory et al., 2021; Alshehri & Banjar, 2022; Althagafi et al., 2022; Braund et al., 2009; Gidey et al., 2020; Haughey et al., 2019; Jha et al., 2022; Renny et al., 2022; West et al., 2016; Wieczorkiewicz et al., 2013), and being unsure why medications were prescribed (Braund et al., 2009). The concept of stockpiling did not appear in this category.

External Factors – Systems

The system-related factors included receiving oversupplies prescribed by healthcare providers (Addis, 2023; Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022; Braund et al., 2009; Ho et al., 2018; Jha et al., 2022; West et al., 2016) or manufacturers (Moriarty et al., 2018), having no policies regarding medication diversion in place (Reis et al., 2014), having a restricted drug supply from the manufacturer (Buchholz et al., 2007), and conducting medication

management influenced by the culture (Aluko et al., 2022). The concept of stockpiling did not appear in this category.

External Factors – Disasters

The disaster-related factors were regarding the prior experiences with a disaster or medication shortage (Kadowaki et al., 2014; Kobayashi et al., 2016; Moriarty et al., 2018; Tomas et al., 2017), and limited access to care due to a disaster (Kadowaki et al., 2014; Kobayashi et al., 2016; Nam et al., 2023; Tomas et al., 2017). Specific disasters mentioned were the Great Japan Earthquake (Kadowaki et al., 2014; Kobayashi et al., 2016) and COVID-19 pandemic (Al Zoubi et al., 2021; Nam et al., 2023).

External Factors – Interventions

The intervention-related external factors involved various medication disposal interventions (Bicket et al., 2021; Liu et al., 2020; Metz et al., 2022; Voepel-Lewis et al., 2020, 2022) and the enforcement of the automated dose dispensing schemes in Denmark (Larsen & Haugbølle, 2007).

Rationales – Medication Accumulation

The reported rationales were about fulfilling various needs and circumventing challenges.

Fulfilling Needs

The commonly reported needs were future oriented. Keeping for "future use" (Alhamad et al., 2022; Asmelashe Gelayee & Binega, 2017; Gidey et al., 2020; Henderson et al., 2015; Huang, 1996; Jha et al., 2022; Persson et al., 2009; Sapkota et al., 2022; Unger et al., 2021; Voepel-Lewis et al., 2020, 2022), diversion or sharing (Al Zoubi et al., 2021; Alhamad et al., 2022; Jha et al., 2022; Sapkota et al., 2022; Unger et al., 2021), just "in case" (Al Zoubi et al., 2021; Back et al., 2009; Bettington et al., 2018; Bicket et al., 2021; Ellis et al., 2011), emergencies (Parimi et al., 2002), and as backup (Larsen & Haugbølle, 2007), or as a reminder for what had worked in the past constitute the reported future needs (Bettington et al., 2018). Some rationales were about achieving specific purposes such as self-harm, or self-sabotage (Lester, 2014; Wu et al., 2012), suicide (Donovan, 1990; Emanuel et al., 2000; Kabel & Chmidling, 2014), and being in immediate need of medications (Al Zoubi et al., 2021). The concepts also appeared when individuals were exhibiting the relevant behaviors for others such as their family (Kabel & Chmidling, 2014; Patel et al., 2014; Xu et al., 2023) and the environment (Bicket et al., 2021; Jha et al., 2022). Adhering to one's values was another need identified, as individuals did not believe in expiry dates (Bettington et al., 2018), and expected to receive prescriptions at each medical consultation (Ellis et al., 2011).

Circumventing Challenges

The other rationales were related to challenges. Individuals either prepared for anticipated financial difficulties, medication shortages, and natural disasters (Al Zoubi et al., 2021; Kaboré et al., 2021; Kadowaki et al., 2014; Moriarty et al., 2018; Patel et al., 2014, 2014) or reported challenges around medication disposal. The anticipated challenges provided more specific purposes compared to the purpose of future use discussed in the context of fulfilling needs. The cost associated with medications already in possession (Voepel-Lewis et al., 2020, 2022), new medications (Unger et al., 2021), and their disposal (Bettington et al., 2018) were reported as challenges for disposal. The other challenges related to disposal were being unsure or having no knowledge about how to dispose (Alhamad et al., 2022; Bettington et al., 2018; Bicket et al., 2021; Ellis et al., 2011; Gidey et al., 2020; Voepel-Lewis et al., 2020), perceiving disposal as inconvenient (Voepel-Lewis et al., 2022), and being indifferent or hesitant towards disposal, or planning on disposal (Bettington et al., 2018; Bicket et al., 2021; Persson et al., 2009; Sapkota et al., 2022).

Medication Sources – Medication Accumulation

The sources of the medications of interest identified in the literature were categorized into “persons,” “medication types,” and “facilities.”

Persons

The “persons” were mostly composed of healthcare practitioners, including “physicians” (Bronder & Klimpel, 2001; Ewen et al., 2015; R. Law & Chalmers, 1976; McCabe et al., 2013; Tsiligianni et al., 2012), “pharmacists” (R. Law & Chalmers, 1976; Tsiligianni et al., 2012), “dentists” (McCabe et al., 2013). The other persons were “neighbors” (Tsiligianni et al., 2012), and “friends or relatives” (Adedeji-Adenola et al., 2022; Alfian et al., 2021; Bashaar et al., 2017; Gidey et al., 2020; McCabe et al., 2019; Wajid et al., 2020; West et al., 2016). The concept of stockpiling did not appear in this category.

Medication Types

The “medication types” provided information about the original sources of the medications, as some studies specified that individuals obtained OTC or self-medication drugs (Adedeji-Adenola et al., 2022; Bronder & Klimpel, 2001; Ewen et al., 2015; R. Law & Chalmers, 1976), and samples (Perry et al., 2014). Most of the literature did not specify whether the medication of interest was prescription or OTC or focused on prescription medications only in their research.

Facilities

The “facilities” were “hospitals” (Ewen et al., 2015), “independent pharmacies,” “chain pharmacies” (A. V. Law et al., 2015), “community pharmacies,” “mail services” (Perry et al., 2014).

3.2b Characteristics – Medication Accumulation

Mechanisms – Medication Accumulation

The reported mechanisms were categorized into “medication storage and maintenance,” and “acquisition.” The mechanism of acquisition also appeared in the definitions discussed earlier.

Medication Storage and Maintenance

The “medication storage and maintenance category” entailed “storage locations” (Aldred Cheek, 2018; Gidey et al., 2020; Martinez et al., 2012; Persson et al., 2009; Renny et al., 2022), “storage methods” (Larsen & Haugbølle, 2007), and “keeping inventory of the medications in hand” (Patel et al., 2014). Some medications which were once serviceable turned unserviceable, as described by “forgetting to take medications” (Addis, 2023; A. V. Law et al., 2015), and “retaining medications until expired” (Bashaar et al., 2017; Ellis et al., 2011; Gidey et al., 2020; Wajid et al., 2020).

Acquisition

The “acquisition” category was further divided into “voluntary acquisition,” and “involuntary acquisition.” The mechanisms of active acquisition involved intentional and active effort in the process. They were composed of “repeated acquisition of prescriptions” (Donovan, 1990; Ellis et al., 2011; Giovannoni et al., 2000; Moriarty et al., 2018; Patel et al., 2014), intentionally “skipping doses” (Larsen & Haugbølle, 2007; Lester, 2014; Wu et al., 2012), “doctor shopping” (Ellis et al., 2011; Giovannoni et al., 2000; Wu et al., 2012), “insurance frauds,” “utilizing venues other than healthcare” (Kabel & Chmidling, 2014), and “borrowing money to get more” (Moriarty et al., 2018).

The mechanisms of involuntary acquisition involved unintentional and passive attainment of excess supplies of medications. These included “packaging errors by drug manufacturer” (Moriarty et al., 2018), “passing or relocation of family members or someone close,” or “relocation of family members or someone close” (Alshehri & Banjar, 2022; Braund et al., 2009; A. V. Law et al., 2015; Lystlund et al., 2014; Plummer, 2013; Regenthal et al., 2002; Reis et al., 2014; West et al., 2016), and “pharmacies refilling discontinued medications” (Martinez et al., 2012).

Some of the preconditions related to treatment changes and discontinuation also explained the mechanism of involuntary acquisition (Addis, 2023; Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Braund et al., 2009; Buykx et al., 2010; Gidey et al., 2020; A. V. Law et al., 2015; West et al., 2016). Such mechanisms were the resolution of illness (Addis, 2023; Adedeji-Adenola et al., 2022), adverse effects (Addis, 2023; Adedeji-Adenola et al., 2022; Althagafi et al.,

2022; Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015), ineffective therapy (Braund et al., 2009; A. V. Law et al., 2015), feeling worse on therapy (Lystlund et al., 2014), unpleasant taste (Addis, 2023), multiple treatment failure (Lester, 2014).

Other Characteristics – Medication Accumulation

The categories for other characteristics that involved all three concepts included *predisposition, healthcare utilization, demographics, socioeconomic status, risky health behaviors, and comorbidities and health status.* The categories such as *healthcare utilization,* and *medication retention and use* involved all concepts except for medication stockpiling. The *disposal* category only involved the concept of UUEL medications.

Predisposition

"Awareness that medication stockpiling may increase the risk of medication shortage or harming children" (Al Zoubi et al., 2021), "knowing COVID-19 pandemic information" (Nam et al., 2023), "past disaster experience" (Tomio et al., 2012), "having education about disposal" (Maeng et al., 2017), "parental risk perception of opioid retention and misuse" (Voepel-Lewis et al., 2020), "health literacy" (Renny et al., 2022), "the ability to read and write as the highest education status in the family" (Ewunetei et al., 2021), living with a family member "having medical background" (Al Zoubi et al., 2021) and "living with a physician family member" (Nam et al., 2023) consisted of predisposition.

Healthcare utilization

The characteristics coded for health utilization were extracted from the study by Maeng et al. These were “emergency room visit frequency,” “primary care provider and specialist visit frequency,” “medical cost of care,” “acute care utilization frequency,” and “average day supply of prescription medications dispensed” (Maeng et al., 2017). “Number of prescribers” (Kalyango et al., 2012; Plummer, 2013), and “number of dispensaries” were extracted from the research by Plummer and the colleagues pertaining to the hoarded/stockpiled medications of decedents. The investigators utilized the terms hoarding and stockpiling interchangeably in this case (Plummer, 2013).

Demographics

“Living with a child,” “living with a person older than 65 years old” (Ewunetei et al., 2021), “population density of the residential location” (Aluko et al., 2022), “living with a physician family member” (Nam et al., 2023), “age” (Alhomoud, 2020; Heslin et al., 2013; Renny et al., 2022), “gender” (Back et al., 2009; Heslin et al., 2013), “residential location” (Kaboré et al., 2021; Nam et al., 2023; Renny et al., 2022), and “race” (Heslin et al., 2013; Renny et al., 2022) were categorized under demographics.

Socioeconomic Status

The following socioeconomic characteristics were extracted: “household income” (Beyene et al., 2019; Ewunetei et al., 2021), “population density of the

residential location" (Aluko et al., 2022), "employment status" (Al Zoubi et al., 2021; Alhomoud, 2020), "education level" (Al Zoubi et al., 2021; Ewunetei et al., 2021; Nam et al., 2023; Tomio et al., 2012), "insurance type" (Heslin et al., 2013; Renny et al., 2022), and "social status" (Buchholz et al., 2007).

Risky Health-related Behavior

"History of sharing medications" (Alhomoud, 2020; Renny et al., 2022), "suicide attempts" (de Sousa et al., 2020), "self-medication" (Asmelashe Gelayee & Binega, 2017), and "parental history of prescription opioid misuse" (Voepel-Lewis et al., 2020) made up *risky health-related behavior*. These behaviors were deemed potentially risky via the literature review for the discussion of the principle-based concept analysis in the current study.

Medication Retention and Use

"Storage conditions" (Edwards, 1982), "medication indications known to owners" (De Bolle et al., 2008), "number of medications in the home" (Sorensen et al., 2005), "frequency of use," and "medication legend status" (De Bolle et al., 2008) were included in this category.

Comorbidities and Health Status

The characteristics related to comorbidities included "cancer," "significant pain" (Emanuel et al., 1996), "depression" (Emanuel et al., 1996; Zhang et al., 2020), "duration of chronic disease" (Kalyango et al., 2012), "asthma," "diabetes"

(Heslin et al., 2013), “living with a family member with chronic illness” (Al Zoubi et al., 2021; Ewunetei et al., 2021), “physical disability,” “dementia” (Tomio et al., 2012), “number of comorbid conditions,” “coronary artery disease” (Maeng et al., 2017), and “psychiatric diagnosis” (Plummer, 2013). The characteristics reflecting the overall health status were “difficulty leaving home” (Heslin et al., 2013), “vulnerability level,” “long-term care level,” (Tomio et al., 2012), “living with a family member who took regular medications or supplements that were not related to chronic disease” (Al Zoubi et al., 2021), and “quality of life” (Ewen et al., 2015).

Disposal

“Anonymous collection” and “pharmacy ownership” (Jonjić & Vitale, 2014) pertained to how disposed medications were collected. Other characteristics coded under *disposal* were “education about disposal” (Maeng et al., 2017; Renny et al., 2022), and “Scenario-Tailored Opioid Messaging Program (STOMP)” (Voepel-Lewis et al., 2020).

3.2c Outcomes – Medication Accumulation

The outcomes were categorized into “keep,” “use,” and “dispose.”

Keep

One outcome category was to “keep” (Addis, 2023; Adedeji-Adenola et al., 2022; Al Zoubi et al., 2021; Aluko et al., 2022; Asmelashe Gelayee & Binega, 2017;

Bashaar et al., 2017; Gascoyne et al., 2014; Gidey et al., 2020; Jha et al., 2022; Kozak et al., 2016; A. V. Law et al., 2015; Lystlund et al., 2014; Metz et al., 2022; Omae et al., 2018; Perry et al., 2014; Persson et al., 2009; Plummer, 2013; Renny et al., 2022; Sapkota et al., 2022; Tomas et al., 2017; Wajid et al., 2020), often indicating the continuous retention of the medications of interest.

Use

The medications of interest were kept for the person for which they were prescribed (Asmelashe Gelayee & Binega, 2017; Ewunetei et al., 2021; Larsen & Haugbølle, 2007; Moriarty et al., 2018) or their repurposed use. The repurposed uses involved diverting prescription (Addis, 2023; Adedeji-Adenola et al., 2022; Al Zoubi et al., 2021; Alfian et al., 2021; Alhomoud, 2020; Althagafi et al., 2022; Gascoyne et al., 2014; Gidey et al., 2020; Inciardi et al., 2009; McCabe et al., 2019; Omae et al., 2018; Patel et al., 2014; Reis et al., 2014; Sapkota et al., 2022; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013) and OTC medications (Adedeji-Adenola et al., 2022; Alfian et al., 2021; Alhomoud, 2020; Gascoyne et al., 2014; Sapkota et al., 2022; Wieczorkiewicz et al., 2013) to someone else (Addis, 2023; Adedeji-Adenola et al., 2022; Al Zoubi et al., 2021; Alfian et al., 2021; Alhomoud, 2020; Althagafi et al., 2022; Gascoyne et al., 2014; Gidey et al., 2020; Inciardi et al., 2009; McCabe et al., 2019; Omae et al., 2018; Patel et al., 2014; Reis et al., 2014; Sapkota et al., 2022; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013), self-medication for COVID-19 (Amenta et al., 2022) or nonmedical use (McCabe et al., 2013, 2019), overdose (Buykx et al., 2010), and

self-harm (Donovan, 1990; Lester, 2014; Reis et al., 2014; Walcott, 2000; Wu et al., 2012). Some of the references explicitly reported sharing of OTC medications.

Dispose

When the medications of interest were not being kept, they were disposed via various methods discussed earlier in Part 1 (Table 7 and 8). The concept of stockpiling did not appear in this category.

3.2d Theoretical Definition

When the main trends of the results for the current study were pulled and woven together, the process of medication accumulation at home could be illustrated with five phases: acquisition and accumulation of medications with their catalytic conditions, and outcomes (Figure 12). This process was organized as a theoretical definition for medication accumulation at home. According to Penrod et al., a theoretical definition should only integrate scientific evidence and should not involve authors' conjectures or derivatives of such evidence (Penrod & Hupcey, 2005). Thus, the definition was built solely from the evidence identified during the principle-based concept analysis.

Acquisition was divided into voluntary and involuntary acquisition, depending on individuals' voluntary and involuntary endeavors in obtaining extra supplies of medications, respectively. The voluntary acquisition included repeated acquisition of prescriptions (Donovan, 1990; Ellis et al., 2011; Moriarty et al., 2018;

Patel et al., 2014), intentionally skipping doses (Larsen & Haugbølle, 2007; Lester, 2014; Wu et al., 2012), doctor shopping (Wu et al., 2012), insurance frauds (Kabel & Chmidling, 2014), utilizing venues other than healthcare (Kabel & Chmidling, 2014), "borrowing money to get more" (Moriarty et al., 2018), and "buying or obtaining for free from friends" (McCabe et al., 2019).

The antecedents of the voluntary acquisition or "catalytic conditions 1" in Figure 23 indicated that such acquisition could be driven by anticipated acquisition barriers and use intent for the future. In anticipation of acquisition barriers such as financial difficulties, medication shortages, and natural disasters (Al Zoubi et al., 2021; Kabel & Chmidling, 2014; Kaboré et al., 2021; Kadowaki et al., 2014; Moriarty et al., 2018; Patel et al., 2014), individuals acquired extra supplies to be utilized in the future. Certain incidences of voluntary acquisition were driven only by the use intent for self-harm (Lester, 2014; Wu et al., 2012), suicide (Donovan, 1990; Emanuel et al., 2000; Kabel & Chmidling, 2014), being in immediate need of medications (Al Zoubi et al., 2021), and the anticipated use by the family (Kabel & Chmidling, 2014; Patel et al., 2014).

The voluntary acquisition mainly led to the accumulation of serviceable medications to be utilized for their initial intent or as prescribed (Asmelashe Gelayee & Binega, 2017; Ewunetei et al., 2021; Larsen & Haugbølle, 2007; Moriarty et al., 2018). Among them, the OTC medications stayed serviceable until their use or being shared with someone else (Adedeji-Adenola et al., 2022; Alfian et al., 2021; Alhomoud, 2020; Gascoyne et al., 2014; Sapkota et al., 2022; Wieczorkiewicz et al., 2013). However, the medications acquired as serviceable

could turn unserviceable. This trend was observed when individuals forgot to take them (Addis, 2023; A. V. Law et al., 2015), retained them until expired (Bashaar et al., 2017; Ellis et al., 2011; Gidey et al., 2020; Wajid et al., 2020), and took them for repurposed uses such as self-harm, or self-sabotage (Lester, 2014; Wu et al., 2012), and suicide (Donovan, 1990; Emanuel et al., 2000; Kabel & Chmidling, 2014). This transition is noted as "*" in Figure 10.

Being left with unnecessary medications led to their involuntary acquisition as illustrated in Figure 12. The formation of the leftover stocks was caused by oversupplies prescribed by healthcare providers (Addis, 2023; Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022; Braund et al., 2009; Ho et al., 2018; Jha et al., 2022; West et al., 2016), dispensed by pharmacies (Martinez et al., 2012), or packaged by manufacturers (Moriarty et al., 2018). The other causes of the formation included passing or relocation of family members or someone close (Alshehri & Banjar, 2022; Braund et al., 2009; A. V. Law et al., 2015; Lystlund et al., 2014; Plummer, 2013; Regenthal et al., 2002; Reis et al., 2014; West et al., 2016). The changes and discontinuation of therapy for various reasons regardless of patients' will to stop the therapy were also determined as the catalytic conditions for involuntary acquisition (Addis, 2023; Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Braund et al., 2009; Buykx et al., 2010; Gidey et al., 2020; A. V. Law et al., 2015; West et al., 2016).

Medications acquired through involuntary acquisition were kept as unserviceable (Addis, 2023; Adedeji-Adenola et al., 2022; Al Zoubi et al., 2021; Aluko et al., 2022; Asmelashe Gelayee & Binega, 2017; Bashaar et al., 2017;

Gascoyne et al., 2014; Gidey et al., 2020; Jha et al., 2022; Kozak et al., 2016; A. V. Law et al., 2015; Lystlund et al., 2014; Metz et al., 2022; Omae et al., 2018; Perry et al., 2014; Persson et al., 2009; Plummer, 2013; Renny et al., 2022; Sapkota et al., 2022; Tomas et al., 2017; Wajid et al., 2020) or disposed (Table 7 and 8). The use intent for unserviceable medications and the barriers to their disposal determined whether such medications obtained through involuntary acquisition were kept or disposed. The barriers that prevented individuals from disposing their medications were being unsure or having no knowledge about how to dispose (Alhamad et al., 2022; Bettington et al., 2018; Bicket et al., 2021; Ellis et al., 2011; Gidey et al., 2020; Voepel-Lewis et al., 2020), perceiving disposal as inconvenient (Voepel-Lewis et al., 2022), and being indifferent or hesitant towards disposal, or planning on disposal (Bettington et al., 2018; Bicket et al., 2021; Persson et al., 2009; Sapkota et al., 2022). The use intent was described as for "future use" (Alhamad et al., 2022; Asmelashe Gelayee & Binega, 2017; Gidey et al., 2020; Henderson et al., 2015; Huang, 1996; Jha et al., 2022; Persson et al., 2009; Sapkota et al., 2022; Unger et al., 2021; Voepel-Lewis et al., 2020, 2022), just "in case" (Al Zoubi et al., 2021; Back et al., 2009; Bettington et al., 2018; Bicket et al., 2021; Ellis et al., 2011), emergencies (Parimi et al., 2002), as backup (Larsen & Haugbølle, 2007), and as a reminder for what had worked in the past constitute the reported future needs (Bettington et al., 2018).

The unserviceable medications retained for future were shared with others or diverted (Addis, 2023; Adedeji-Adenola et al., 2022; Al Zoubi et al., 2021; Alfian et al., 2021; Alhomoud, 2020; Althagafi et al., 2022; Gascoyne et al., 2014; Gidey

et al., 2020; Inciardi et al., 2009; McCabe et al., 2019; Omae et al., 2018; Patel et al., 2014; Reis et al., 2014; Sapkota et al., 2022; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013). When prescription medications were shared with others (Addis, 2023; Adedeji-Adenola et al., 2022; Al Zoubi et al., 2021; Alfian et al., 2021; Alhomoud, 2020; Althagafi et al., 2022; Gascoyne et al., 2014; Gidey et al., 2020; Inciardi et al., 2009; McCabe et al., 2019; Omae et al., 2018; Patel et al., 2014; Reis et al., 2014; Sapkota et al., 2022; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013), they ceased to function for their initial intent, and were determined to be unserviceable. Other outcomes were being consumed for self-medication (Amenta et al., 2022), nonmedical use (McCabe et al., 2013, 2019), and overdose (Buykx et al., 2010). As explained previously, the medications that were voluntarily acquired as serviceable could turn unserviceable when they were consumed for repurposed use such as self-harm, or self-sabotage (Lester, 2014; Wu et al., 2012), and suicide (Donovan, 1990; Emanuel et al., 2000; Kabel & Chmidling, 2014). The medications which were not taken as prescribed and disposed as unused or expired (Addis, 2023; Bashaar et al., 2017; de Sousa et al., 2020; Ellis et al., 2011; Ewen et al., 2015; Gidey et al., 2020; Wajid et al., 2020) indicated that they were once serviceable but turned unserviceable.

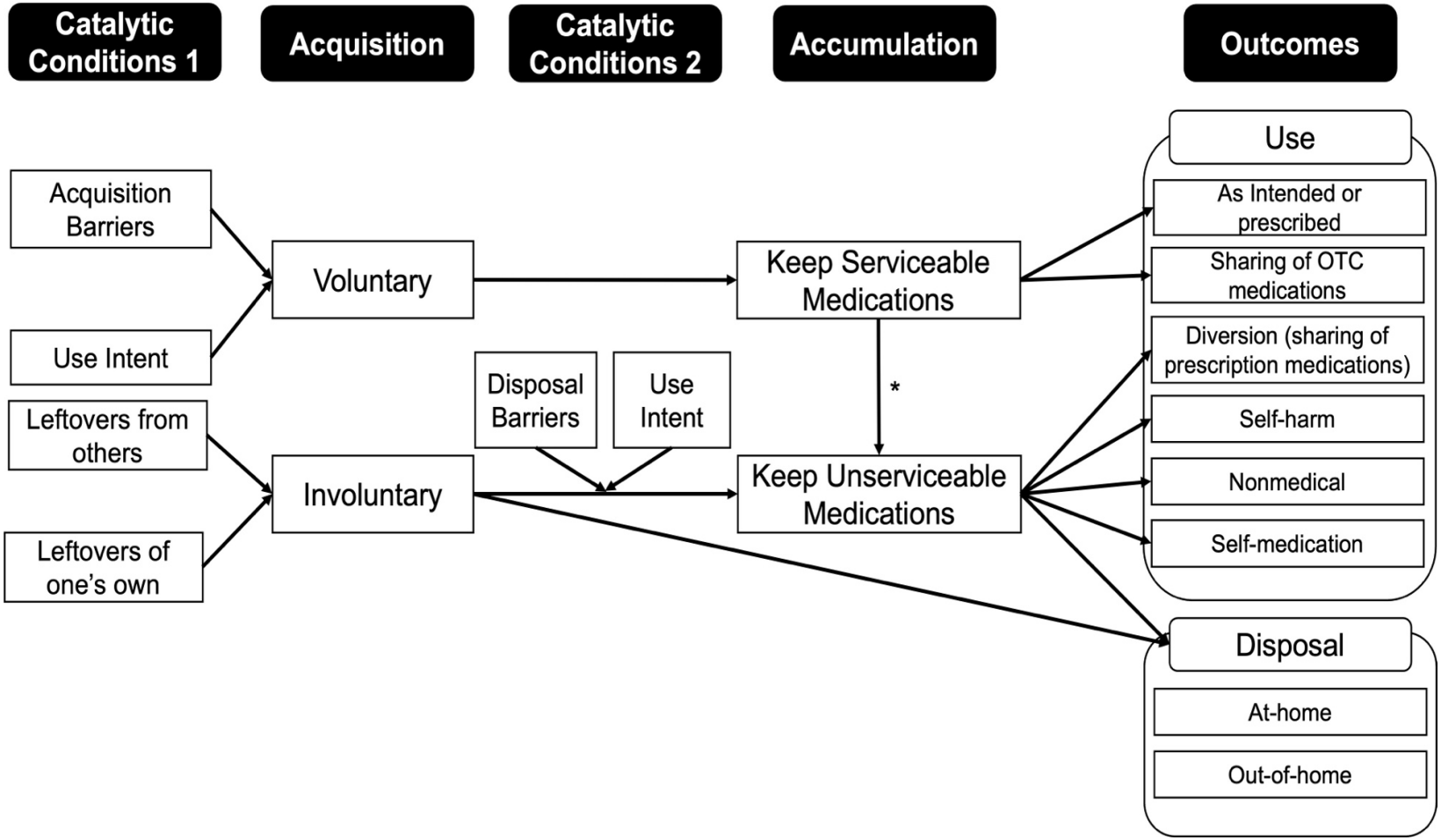

Figure 10 Theoretical Definition of Medication Accumulation at Home (*the transition from being serviceable to unserviceable)

3.3 Results for Objective 3 - Discursive Psychology of Medication Hoarding and Stockpiling

Four interpretative repertories were identified in the discourses in the literature which utilized the terms medication hoarding and stockpiling interchangeably. The four were namely, medication hoarding and stockpiling as negative behaviors (IR-1), medication stockpiling as a medication consumer behavior (IR-2), empiricist repertoires (IR-3), and conjectural repertories (IR-4), as shown in Figure 11. Thus, the former two yielded a conflict or an ideological dilemma which each other, as well as the latter two.

Interpretative Repertories (IR) of Medication Hoarding and Medication Stockpiling
IR-1: Medication Hoarding and Stockpiling as Negative Behaviors
IR-2: Medication Stockpiling as a Consumer Behavior
IR-3: Empiricist Repertories
IR-4: Conjectural Repertories

Table 9 Four Interpretative Repertories (IR) of Medication Hoarding and Stockpiling

3.3a Interpretative Repertoires 1: Medication Hoarding and Stockpiling as Negative Behaviors

Some of the adverse outcomes associated with medication hoarding and stockpiling were mentioned based on their potential risk. For instance, stockpiling "can lead to the development of (antibiotic) resistance" (Buchholz et al., 2007), "has the potential to harm the environment and humans" (Thach et al., 2013) or

has “subsequence adverse outcomes including increased healthcare costs, poisonings, and diversion” (Plummer, 2013).

Other narratives involved negative consequences directly observed in their research. For instance, Lester reported the hoarding behavior exhibited by individuals with eating disorders:

> *“May actively restrict their intake of medications, take them and then purge them, or hoard them and ‘binge’ on them. Such behaviors are often labeled clinically as ‘treatment resistance,’ and power struggles over medication adherence between clinicians and clients often ensue”* (Lester, 2014).

Lester mentioned hoarding medications and the act of medication binge sequentially and later labeled such behavior as “treatment resistant,” negatively framing the account. Wu et al. also reported “some visited different doctors to stockpile medicines for further deliberate self-harm (DSH) (Wu et al., 2012).” In the same article, stockpiling was also listed in a three-part list along with other negative acts:

> *“Nonadherence was a theme derived from participants’ descriptions that included the issues of irregular medication consumption, stockpiling medication, and doctor-shopping”* (Wu et al., 2012).

In a different case, medication stockpiling was mentioned in place of a different negative act:

> *“In a situation where there is a resource shortfall (such as is described by our data), a key concern for emergency management is to avoid a situation of panic or disorder that escalates the problem. For example, if one family*

starts ‘‘panic buying’’ or stockpiling more resources than they need this behaviour can become contagious” (Tomas et al., 2017).

Here, “stockpiling” was juxtaposed with “panic buying” after “or,” a conjunction indicating the similar tone of the terms preceding and following it. To ensure to confer a negative impression of panic buying, the author also mentioned it as a situation that should be avoided.

3.3b Interpretative Repertoires 2: Medication Stockpiling as a Consumer Behavior

Within the negative narrations, medication stockpiling was also described as a consumer behavior. In other words, the term, stockpiling, was substituted with terms describing consumer behaviors. Buchholz et al. described stockpiling of the influenza antivirals as “having” or “buying private supplies” (Buchholz et al., 2007). Here, the private supplies indicated the antivirals stockpiled by individuals, not by institutions. In this context, the actions of purchase and possession were utilized to describe stockpiling. In the work by Thach et al., the meaning of stockpiling was clarified by being juxtaposed with “store:”

“consumers often unintentionally stockpile unused or expired medications in homes and/or purposely store them to wait for an acceptable method of disposal” (Thach et al., 2013).

In this case, the act of storing was listed separately from the act of stockpiling, indicating that stockpiling may not include the meaning of storage. The inconsistent

inclusion of the meaning of storage suggested confusion in the understanding of medication stockpiling.

In contrast to the neutral description of medication stockpiling, Tomas and colleagues construed its meaning as negative only in a particular situation:

> *"The real problem occurs around ''panic buying'' and attempts to stockpile more than is necessary to survive"* (Tomas et al., 2017).

This statement may indicate that stockpiling could be acceptable but could become problematic when done "more than necessary to survive" or excessively.

3.3c Interpretative Repertoires 3: Empiricist Repertories

Scientific literature has a distinctive set of linguistic and rhetorical patterns, called empiricist repertoires. Such repertories minimize the involvement of the authors to enhance the objectivity in their writing. Any theories or logical extrapolations also are based on the data in discursive forms such as "these data or findings suggest…" (Potter, 1996; Wiggins, 2017) Such empiricist repertoires and other discursive devices were used in the sample to present the information more factual.

The authors of the sampled literature avoided using first-person nouns as shown in Table 9. To minimize the accountability of their reports, the authors kept themselves distant or minimized their involvement in their text. The more the author is involved or show more interest or stake in a statement, the statement can sound more biased or less natural and weaken its facticity. However, Lester's work

was an exception, as the author narrated their patient cases as a practitioner from a first-person perspective (Lester, 2014). At times, the footing shifted to indicate the accountability of the sources of the information being presented. For instance, as shown in Table 9, Plummer and Wu et al. listed Daughton and Ruhoy, and the study participants respectively as the main subjects accountable for the presented information (Plummer, 2013; Wu et al., 2012). To enhance the credibility of the information, Plummer also applied category entitlement by introducing Daughton and Ruhoy as "researchers" and their work as "seminal articles" for their own research (Plummer, 2013).

Making theoretical suggestions based on the data was also observed as follows:

> *"The elderly population is increasing and accounts for the majority of prescription drug users (SEC, 2006). As a consequence, the number of medications will increase along with the potential for stockpiling and/or the unsafe disposal of prescription medications"* (Thach et al., 2013).

Thach and the colleagues made a prediction of increased stockpiling and unsafe prescription medication disposal, based on the data indicating the increase of the elderly population as the majority of prescription drug users. Likewise, treating the data as primary of building theoretical foundations was not a discursive device but a main paradigm of the empiricist repertories (Potter, 1996).

Providing detailed accounts is another discursive device, called "detail," commonly observed in scientific literature. Some of the examples are shown in

Table 9 with certain reports containing specific statistics of the research or direct quotations of the study participants.

Narrative organization is another discursive device commonly applied in scientific literature. When an account is given in a structured manner, for instance, with its introduction, development, and conclusion, the account would sound more convincing. The standard formats of scientific journals and dissertations, for instance, in introduction, methods, results, and discussions, were recognized a form of narrative organization. With this commonly reported discursive format, the facticity of these discourses was enhanced.

Discursive Devices	Examples
Neutral or Distant Footing	Buchholz et al. 2007 • *"**A telephone survey was planned** with the objective of finding out the extent to which individual households are stockpiling neuraminidase inhibitors, and what factors were influencing people to do this."* • *"**The results of this survey** indicate that a substantial number of people are stockpiling neuraminidase inhibitors at home, even though these drugs are only available on prescription."* Plummer 2013 • *"**The CACHES model** builds upon these existing models while incorporating additional supporting literature."* • *"**Stockpiles of unused and expired medications** can lead to the individual being confused as to which medications are current versus those that have been discontinued."* Thach et al. 2013 • *"Currently, **there** is **a lack of uniform federal and state regulations** governing the proper disposal of pharmaceuticals, which may contribute to further hoarding."*

	Tomas et al. 2014 • *"**There** is already **evidence of panic buying and hoarding behaviour** after large-scale events, such as in the aftermath of the 2011 Tohoku earthquake and subsequent tsunamis where particularly anxious Japanese households stockpiled food supplies, even in urban locations where supplies were not in shortage."* Wu et al. 2012a • "**Nonadherence** was a theme derived from participants' descriptions that included the issues of irregular medication consumption, stockpiling medication, and doctor-shopping."
Footing shifts	Buchholz et al. 2007 • *"Researchers **Christian Daughton and Ilene Ruhoy** developed several theoretical models… a) the mechanisms by which the individual consumer stockpiles medication and introduces APIs into the environment"* Wu et al. 2012 • *"**Some participants** perceived medical contact as simply an opportunity to obtain or renew medications."*
Detail	Buchholz et al. 2007 • **"Twenty-two (1.7 %) of 1305 participants** said that they currently had possessed a private supply of oseltamivir… **Sixteen of these people** reported having one pack at home, five individuals kept **2, 4, 5, 8, and 10 packs**, respectively, while one individual gave no answer." Plummer 2013 • *"This pilot study was designed to describe the prevalence, size (number of bottles and pills), and types of unused medications stockpiled in the home. The study used data originally collected by MLDIs in the course of death scene investigations in **Davidson County, TN from January 1 - December 31, 2013**."* Tomas et al. 2014 • *"Computer-aided personal interviews were conducted with **172 householders** to examine how many days people believed they were able to shelter in place… taking into account…medicine they had stockpiled…"* Wu et al. 2012

	• *"Unfortunately, some visited different doctors to stockpile medicines for further DSH…* ***(Through medical visits) I thought I could get medication, but I only took the hypnotics and stacked up the rest of drugs. People said that if I took all those drugs with alcohol, my heart would stop. I wanted to try. So I collected everything I had left over. (CS18, a 50-year-old woman, DSH method: drug overdose)"***
Narrative Organization	Standard format organization of scientific literature: e.g. introduction, methods, results, and discussion

Table 10 Discursive Devices within Empiricist Repertoires (IR-3) (Example discursive devices in bold)

3.3d Interpretative Repertoires 4: Conjectural Repertories

Despite the efforts to make the discourses sound more factual and objective, some of the discourses were given without supporting evidence and seemed to take a leap of logic. These conjectures were made with modal verbs or the verbs suggesting a chance of occurrence such as would, could, will, and might, and script formulation which mad an account sound like a usual and normal occurrence. The examples of these conjectures with the modal verbs in bold are reported in Table 10.

The examples mostly focused on the logic and existence of a chance of a related event. As shown in Table 10, in the example by Buchholz et al., stockpiling of the antivirals was not recommended based on an assumption that it could lead to their improper use and antiviral resistance. This assumption was later clarified with the presumed confusion between influenza with other acute illnesses and consequential development of antiviral resistance. However, the basis of the

assumptions were not studied in their research or supported with literature evidence (Buchholz et al., 2007). Based on the authors' logic and assumption the event that could happen was extrapolated into substantial information.

In the example by Thach et al., instead of a modal verb, "often" indicated a similar assumption made by the authors (Thach et al., 2013). The authors assumed that consumers usually unintentionally stockpile unused or expired medications without supporting data. The thoughts from the authors seemed to be infused in these examples despite their neutral or distant footing to sound objective. The conjectures were also made for potential negative consequences of medication hoarding and stockpiling and seemed to frame these behaviors more negatively, as discussed with IR-1.

Buchholz et al. 2007

- *Private stockpiling is not recommended, because improper use of antivirals can lead to the development of resistance…As influenza **can easily be confused** with other acute illnesses, self-diagnosis is unreliable, and the erroneous application of antiviral drugs **could have** adverse effects such as development of resistance.*

Plummer 2013

- *Stockpiles of unused and expired medications **can lead to** the individual being confused as to which medications are current versus those that have been discontinued. This situation contributes to accidental ingestion of duplicate classes of medications, overdosing, increased likelihood of drug-drug interactions, and/or the use of contraindicated medications.*
- *A lack of access to medications would reduce the risk of having excess medications stockpiled in the home.*
- *In the community setting, individuals oftentimes store medication in multiple locations within the home. As a result, standard MLDI search procedures might not uncover all of the decedent's medications thereby contributing to an under sampling of the stockpile of unused medications in the home.*
- *Due to socioeconomic reasons, minorities **are less likely** to have access to and be able to purchase prescription medications. A lack of access to medications **would reduce** the risk of having excess medications stockpiled in the home.*

Thach et al. 2013

- *Consumers **often** unintentionally stockpile unused or expired medications in homes and/or purposely store them to wait for an acceptable method of disposal.*
- *The elderly population is increasing and accounts for the majority of prescription drug users (SEC, 2006). As a consequence, the number of medications **will increase** along with the potential for stockpiling and/or the unsafe disposal of prescription medications.*

Table 11 Examples of Conjectural Repertoires (IR-4) (modal verbs in bold)

3.3e Interchangeable Use of Medication Hoarding and Stockpiling

The examples of the interchangeable use of medication hoarding and stockpiling are presented in Table 11. In the article by Lester, the term, "stockpiles," was used to indicate the objects that were hoarded (Lester, 2014). The change in

the terminology was done potentially to avoid redundant word usage in terms such as “some hoard their medications, finding comfort in hoarded drugs.”

Plummer explicitly defined hoarding as a synonym of stockpiling (Table 11). By the same token, both medication hoarding and stockpiling were determined to be the causes of the formation of Community-Based ACcumulation of Home mEdicationS (CACHES). However, in the same article, the individuals who exhibited medication hoarding were described to be at risk of stockpiling medications in the home, indicating that the two behaviors may not be the same. The relationships became even more confusing when the risk factors of CACHES were described as the risk factors for medication stockpiling throughout the article (Plummer, 2013).

In most of the discourses where medication stockpiling was the behavior of interest, the term, hoarding, appeared to substitute stockpiling seldomly or mostly in a sentence or two. For instance, Buchholz et al. discussed private stockpiling the influenza antivirals in their article with “private” indicating a behavior by individuals, not institutions (Buchholz et al., 2007). However, as indicated in bold in Table 11, the term, hoarding, substituted stockpiling seemingly with the same meaning. The same trend was observed in the articles by Thach et al., Tomas et al., and Wu et al. as noted in Table 11 (Thach et al., 2013; Wu et al., 2012). Hence, as stockpiling was clarified with other actions in IR-2, hoarding was used in place of stockpiling potentially to clarify the meaning of stockpiling. However, considering that both behaviors were negatively narrated in IR-1, the interchangeable use of the two similarly perceived behaviors may cause confusion. Without clarifying and

distinguish their definitions, the confusing terminology use did not add more significant meanings to the discourse. In other words, such use contributed little to the knowledge base but much to the confusing construction of the discursive reality.

Buchholz et al. 2007

- *"Private **stockpiling** is not recommended, because improper use of antivirals can lead to the development of resistance…In October 2005, the manufacturer announced that the distribution of oseltamivir to pharmaceutical wholesale traders would be restricted until the onset of the seasonal influenza wave, in order to discourage the public from **hoarding** the drug."*

Lester 2014

- *"Some **hoard** their medications, finding comfort in having **stockpiles** of drugs and using them in what they plan to be a final, terminal medication 'binge.'"*

Plummer 2014

- *"**Stockpiling**, also known as **drug hoarding**, behaviors have a direct contributory affect to the development of CACHES. **Hoarding** behavior is defined as holding onto unused medications past their expiration date and/or prescribed time of use. The motivation for **hoarding** is multifaceted including desire for cost savings, saving in anticipation of a future need for the medication, and wanting to limit pollution via improper medication disposal...With increasing cultural awareness of the environmental impact of improper disposal of medications, some patients are **hoarding** medications due to a lack of access to environmentally friendly disposal options in their community. Concerned about the potential consequences of sewering unused medications, patients are left with no other option than to **stockpile** these medications in their closets, medicine and kitchen cabinets. **Hoarding** of unused medications contributes to the formation of CACHES, which place the individual at risk for adverse outcomes including adverse drug events, accidental poisonings, and poor health outcomes related to non-adherence."*

Thach et al. 2013

- *"The elderly population is increasing and accounts for the majority of prescription drug users (SEC, 2006). As a consequence, the number of medications will increase along with the potential for **stockpiling** and/or the unsafe disposal of prescription medications…Currently, there is a lack of uniform federal and state regulations governing the proper disposal of*

*pharmaceuticals, which may contribute to further **hoarding** (Lauer et al., 2010; Simons, 2010). The lack of environmentally safe disposal guidelines and of take-back services may explain why all users of the medication take-back program found the service valuable."*

Tomas et al. 2014

- *"In a situation where there is a resource shortfall (such as is described by our data), a key concern for emergency management is to avoid a situation of panic or disorder that escalates the problem. For example, if one family starts ''panic buying'' or **stockpiling** more resources than they need this behaviour can become contagious…There is already evidence of panic buying and **hoarding** behaviour after large-scale events, such as in the aftermath of the 2011 Tohoku earthquake and subsequent tsunamis where particularly anxious Japanese households **stockpiled** food supplies, even in urban locations where supplies were not in shortage."*

Wu et al. 2012

- *"Irregular medication consumption or **stockpiling** behavior derived from thoughts of dying may develop into acting on such over the long term… Nurses can serve as gatekeepers to detect medication **hoarding** among DSH individuals to reduce overdose risks and refer those at risk to professional services."*

Table 12 Examples of the Interchangeable Use of Medication Hoarding and Medication Stockpiling (hoarding and stockpiling in bold)

3.4 Results for Objective 4 - Congruence between Principle-based Concept Analysis and Discursive Psychology

The discussion regarding Study Objective 4 pertaining to the congruence of the results of the principle-based concept analysis and discursive psychology is provided under section 4.3 and 4.4. It was determined that the findings for objectives 3 and 4 could be discussed in a similar context more effectively, so they were presented under the same section.

CHAPTER 4: DISCUSSION

4.1 Discussion for Objective 1 – Evaluation of Conceptual Maturity of Medication Hoarding, Medication Stockpiling, and the Retention of UUEL Medications

The non-healthcare-oriented platforms such as Web of Science and Business Source Premier were searched to examine and distinguish the information about the concepts reported in disciplines other than healthcare. The information identified from the non-healthcare platform were redundant and indistinguishable from the findings from the healthcare planforms. In other words, the new information found on these platforms did not change the overall patterns of the categories identified during the concept analysis. For instance, the context of medication stockpiling during the COVID-19 pandemic was found from such platforms, but this was recognized as another disaster like those reported in the literature from the healthcare-oriented platforms. Due to such similarities, the findings from the two types of search platforms are discussed together in this section.

Conceptual Definitions - Medication Hoarding

The definitions for medication hoarding commonly included three factors: the functionality status, quantity, and purpose of the hoarded medications. Depending on the interpretation, the reported functionality status could hold a different degree of meanings. For instance, “unused” medications (Alhomoud,

2020; Back et al., 2009) may refer to stocks left over after some use or those that have not been used at all. The latter case could be more problematic since the patient was given the medication when they did not need it in the first place. On the other hand, although their specific definitions were not provided, “unwanted medications” could only mean that thy were not desired any longer (Martinez et al., 2012). These medications still could become problematic if the corresponding therapy was supposed to continue regardless of owners’ desire. Medication could have become unwanted by patient without having full knowledge of the medication and patient’s health or discussing with their healthcare provider. Furthermore, “discontinued” (Eichenberger et al., 2011; Kalyango et al., 2012), “no longer needed” (Martinez et al., 2012), and “no longer required” (Sorensen et al., 2005) all could only mean that the therapy has ended, and stopping the therapy was necessary.

The quantities incorporated in the definitions commonly indicated medication hoarding was an act of storing extra medications. However, the extra quantities suggested to classify medication hoarding varied in these definitions. Some definitions pertained to having multiple types of medications (Edwards, 1982; Eichenberger et al., 2011; Sorensen et al., 2005), while others involved retaining extra quantities of one type of medications (Ekedahl, 2006; Ellis et al., 2011).

The purposes incorporated in the definitions were mostly future-oriented with keeping them for unspecified future use (Back et al., 2009; Dunbar et al., 1989; Emanuel et al., 1996, 2000; Henderson et al., 2015; Huang, 1996; Kaboré et al., 2021; Slater et al., 1986; Tsiligianni et al., 2012). Also, one definition included

medications hoarded for emergency use (Parimi et al., 2002), while another definition excluded them (Edwards, 1982). Other definitions that were not future-oriented were concerned with the desire to not be wasteful (Martinez et al., 2012) and were kept without a purpose (Ewunetei et al., 2021).

Conceptual Definitions - Medication Stockpiling

The definitions for medication stockpiling were composed of the three common factors: the functionality status, purpose, stockpiled quantity. The purposes included in the definitions were future-oriented, as they were related to being prepared for specific events such as natural disasters (Al Zoubi et al., 2021; Dunn, 2017; Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Nam et al., 2023; Tomio et al., 2012) and medication shortages (Moriarty et al., 2018). Aligned with this purpose, the quantity thresholds for stockpiling in its definitions were determined in day-supply (Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Patel et al., 2014; Tomio et al., 2012). This type of measurement is appropriate to estimate how long patients can continue their therapy when the access to medications is compromised.

For the functionality status, like in medication hoarding, the medications that ceased to fulfill their initial intentions were observed. However, for “old medicine that you no longer use” (Unger et al., 2021) and “old packets of medications from previous schemes” (Larsen & Haugbølle, 2007), it is unclear whether the corresponding therapy had been discontinued. Without further clarification, it is difficult to gauge the implications of such stockpiled medications. On the other

hand, the definitions of medication stockpiling most prominently included having extra supplies of medications that were in use in preparation for a shortage or disaster.

Conceptual Definitions - Retention of UUEL Medications

Of the 54 relevant studies, a total of 16 studies provided an explicit definition of at least one of the types of medications associated with the concept. These medications were also incorporated in the definitions of returned medications and medication waste. Most of the studies assumed the meaning of UUEL medications. These medications were not clearly defined, potentially because they seemed self-explanatory. However, the interpretations of these terms by the authors and readers may be different. The leftover and unused medications can be residual stocks of discontinued therapy or of ongoing therapy that a patient has not taken yet. Also, for instance, in the United States, a prescription medication can have two different expiration dates: one from the manufacturers in the stock packages, or one year from the dispense date. The expiration dates assigned to a prescription medication at the time of dispensing can differ from the expiration date provided by the manufacturer. For this reason, the expiration date on a prescription label may not represent the true expiration date of the medication concerned with their stability and sterility. However, no studies informed the basis of expiry.

The available definitions for these types of medications also did not reach a consensus. For example, unused could be interpreted as “unopened” (Bekker et al., 2018; Bettington et al., 2018; Vogler & de Rooij, 2018), “not taken as prescribed”

(Ewen et al., 2015), “deteriorated, discontinued, expired, and other medications unintended for future use” (Alfian et al., 2021). Unlike the former two, the latter two could be interpreted as medications that were partially used.

When one of the terms was incorporated in the definition of another term, its meaning was not sufficiently elaborated upon. For instance, “unused” and “unwanted” were incorporated in the definitions of the returned medications (Braund et al., 2009; Bronder & Klimpel, 2001; Jonjić & Vitale, 2014; Perry et al., 2014; Shealy et al., 2019; Vogler & de Rooij, 2018) without clarification of what they exactly meant. Such trend was also observed in the definitions of medication waste (Adedeji-Adenola et al., 2022; H. Stewart et al., 2015). Unwanted, expired, and leftover medications also were incorporated in the definitions of medication hoarding. However, the definitions these medications were not specified and obscured the understanding of the concept.

In summary, the definitions for “unused,” “unwanted,” “expired,” and “leftover” had a wide range of meanings which were not clarified in the literature. These types of medications were incorporated in the definitions of returned medications and medication waste without clarification on what they meant.

Overall - Evaluation of the Conceptual Maturity Based on the Epistemological Principle

The explicit definitions of the three concepts were rarely provided in the literature with the common understanding of the concepts often being assumed. The available definitions, however, were not consistent and did not reach a

consensus for each concept. In conclusion, this variation and lack of a precise definition prevent the firm understanding of the conceptual meanings and suggest that the concepts are immature.

Conceptual Operationalization - Medication Hoarding

The extent of the operationalization of medication hoarding was explorative, mainly pertaining to the prevalence of medication hoarding, demographics of the hoarders, and therapeutic categories of the hoarded medications. Most studies were cross-sectional surveys, targeting patients, caregivers, and households, and examining the general medication. The explorative nature of the operationalization may reflect the innate limitations of cross-sectional studies which capture a snapshot of a phenomenon and cannot determine cause and effect.

The commonly explorative nature of research also led to the inconsistent conceptual operationalization. The hoarded medications were operationalized as “unused” (Alhomoud, 2020; Back et al., 2009; Dunbar et al., 1989; Edwards, 1982; Furst, 1975; Slater et al., 1986, 1986), “leftover” (Alhomoud, 2020; Ellis et al., 2011; VanDyke & Steffen, 2017), “discontinued” (Eichenberger et al., 2011; Kalyango et al., 2012; Martinez et al., 2012), “expired” (Ekedahl, 2006; Martinez et al., 2012; Sorensen et al., 2005; VanDyke & Steffen, 2017), “unwanted,” “no longer needed” (Martinez et al., 2012), and “no longer required” (Sorensen et al., 2005). As the medication hoarding definitions also pertained to the functionality status, the inconsistency likely originated from the lack of a precise and consensual definition. In one study by Eichenberger et al. particularly, how medication hoarding was

defined and operationalized were not aligned. Eichenberger and the colleagues defined medication hoarding as retaining multiple medications that were no longer required or had expired. However, within the same study, the retention of discontinued medication repeats, retention of expired medication, hoarding of prescription medications, and hoarding of OTC medications were measured separately (Eichenberger et al., 2011). A similar type of operationalization was also observed in Kalyango et al. (Kalyango et al., 2012), and both studies did not explain the reasons for having separate variables. With medication hoarding encompassing the possession of both discontinued and expired medications, the reason for measuring these variables separately is questionable.

To make the matter worse, all the relevant qualitative studies were not able to explore medication hoarding in-depth. Only certain aspects of the concept such as the preconditions and rationales for medication hoarding were ascertained. Without having the basis of rigorous qualitative exploration which often leads to a comprehensive understanding of the topic, the sophisticated quantitative examination may be too premature for the concept of medication hoarding.

An attempt to operationalize medication hoarding based on a theoretical framework for the hoarding disorder was found. To operationalize medication hoarding more accurately, VanDyke et al. developed the Medication Saving Behavior (MSB) scale was developed. The scale adopted the Savings Inventory-Revised (SI-R), a scale used to measure hoarding disorder. As the hoarding disorder scale was adopted to measure medication hoarding, some inconsistencies between the suggested theoretical framework and the

operationalization of the concept were identified. The hoarding disorder is characterized by the excessive acquisition of worthless items, excessive clutter, and difficulty discarding the items. The authors noted that medications could only become worthless when they expired, and they would need to distinguish leftover and expired medications. However, both leftover and expired medications were measured to test the concurrent validity of the MSB scale. Furthermore, with medications generally taking up smaller volumes, they believed that the higher number of medications could lead to more disorganization and suboptimal storage. In contrast to their theoretical explanations, the numbers of prescription and OTC medications stored by patients were utilized to examine the discriminant validity of the MSB scale. This confusing adoption of SI-R and operationalization of medication hoarding were also likely to be caused by the lack of a precise and consensus definition. VanDyke and the collogues did list various definitions of medication hoarding in the literature, noting the confusion in this concept. However, they did not explicitly provide their own definition for medication hoarding as a basis of the MSB scale development (VanDyke & Steffen, 2017).

Another pitfall of this application of the hoarding disorder framework was approaching medication hoarding from a pathological perspective. The estimated prevalence of the hoarding disorder is 2-5% of the US population, while medication hoarding was reported to be “commonplace” (Ellis et al., 2011). The contrast in the prevalence suggests that medication hoarding may be different in their nature from hoarding disorder. According to Maycroft, the research in hoarding is of a medical nature, emphasizing the behavioral and chemical components of the behavior, and

regarding hoarders as “helpless compulsives” (Maycroft, 2009). This perspective of “medicalization shifts attention from the social context as we see behavioral problems and pathologies on an individual level” and “ignores the possibility that the behavior is not an illness but an adaptation to a social situation” (Conrad, 1980; Shaeffer, 2017). In other words, medicalizing medication hoarding in the literature may leave out and stigmatize the types of medication hoarding that are not related to the hoarding disorder. Thus, medication hoarding may carry a sense of being a rational and economic consumer behavior. However, no literature that operationalized medication hoarding acknowledged this notion.

Conceptual Operationalization - Medication Stockpiling

The operationalization of medication stockpiling was mostly explorative, frequently involving the measurement of its prevalence, and the demographics of stockpilers. Compared to medication hoarding, medication stockpiling was more operationalized in association with specific events such as a natural disaster (Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012), an apocalypse (Kabel & Chmidling, 2014), the COVID-19 pandemic (Al Zoubi et al., 2021; Amenta et al., 2022; Nam et al., 2023), a medication shortage (Moriarty et al., 2018), the implementation of the automated dose dispensing schemes in Denmark (Larsen & Haugbølle, 2007) and a financial challenge (Patel et al., 2014).

As implied previously, medication stockpiling was operationalized to measure the degree of disaster preparedness. The extent of disaster

preparedness was often measured in the unit of day-supply to estimate how many days patients could survive without adequate access to medications during or after the occurrence of a disaster (Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012).

Most of the operationalization of medication stockpiling focused on keeping medications that were already in use. However, having “unused” or “old” medications that were no longer used were operationalized as medication stockpiling (Larsen & Haugbølle, 2007; Unger et al., 2021). This inconsistency in the operationalization was likely due to the lack of a precise and consensus definition of medication stockpiling.

Compared to the medication hoarding literature, the stockpiling literature involved more qualitative assessment. However, as these studies often incorporated medication stockpiling in association with their main phenomena of the assessment, only certain aspects of medication stockpiling such as the reasons and mechanisms were examined. Also, unlike medication hoarding, no attempt to apply a theoretical framework for medication stockpiling was identified.

Conceptual Operationalization - Retention of UUEL Medications

UUEL medications were often operationalized with respect to medication disposal. Various aspects of the disposal practices, such as the disposal methods, frequency, and factors influencing disposal were measured. In addition, the prevalence and demographics of the individuals storing or disposing these medications were operationalized. These operationalizations were mostly done in

explorative cross-sectional research, following the trend of the operationalization of medication hoarding and stockpiling. The only qualitative study examined how unused medications were diverted (Inciardi et al., 2009), marginally contributing to the conceptual information about the consequences of having these medications.

The literature related to this concept notably often pertained to opioid use and disposal. Opioids have been commonly known to be high-risk medications due to their habit-forming properties and risk to vulnerable populations like children (Bailey et al., 2009; Gregorian et al., 2020; Kennedy-Hendricks et al., 2016; Lovegrove et al., 2015; Maughan et al., 2016; McCauley et al., 2013; Neill et al., 2020; Reddy et al., 2014; Silvestre et al., 2017). For the opioids' negative implications to the health and safety of patients, the concept was operationalized to examine the potential cause of the retention of the relevant medications and interventions that could minimize the retention practices. A few experimental interventions that promoted appropriate opioid disposal were also identified (Aliory et al., 2021; Bicket et al., 2021; Liu et al., 2020; Voepel-Lewis et al., 2020, 2022).

The literature explored various aspects of the retention of UUEL medications, but such effort was explorative and was not conducive to yield conceptually more in-depth and comprehensive results.

Overall - Evaluation of the Conceptual Maturity Based on the Pragmatic Principle

While most of the studies assessed medication hoarding and stockpiling as a part of the assessment of other phenomena, several studies specifically focused

on medication hoarding (Ellis et al., 2011; Furst, 1975; VanDyke & Steffen, 2017) and medication stockpiling (Donovan, 1990). The literature regarding UUEL medications often focused on the disposal of these medications. However, the concept analysis of the operationalization in these studies did not yield any meaningful results. This is likely because most operationalizations were explorative at best. The information presented in the literature did not include any theories or extensive qualitative exploration of the concepts, indicating that their quantitative or categorical assessment was too premature and may not be appropriate. The ambiguity in the operationalization may also be originated from the confusion in the definitions of the concepts.

In conclusion, most of the literature relied on a quantitative approach that could measure only a small scope of each concept without the foundations of broader qualitative exploration that could lead to a comprehensive overview of the concepts. No application of theories or frameworks in the conceptual operationalizations were identified. For this reason, the research efforts did not provide consistent or scientific meaningful findings. The lack of a precise definition and foundational understanding of each concept also seem to hinder compatible and accurate operationalization of the concepts.

Conceptual Contexts – All Three Concepts

All the three concepts appeared in the context of medication use assessment including their misuse and potential harm. In contrast to medication stockpiling, the other two concepts, most notably the retention of UUEL

medications, appeared in the context of medication disposal. Within the medication use assessment, only few studies specifically focused on medication hoarding (Ellis et al., 2011; Furst, 1975; VanDyke & Steffen, 2017), and medication stockpiling (Donovan, 1990). Compared to the other two concepts which were negatively narrated, medication stockpiling appeared more as a justifiable behavior in preparation for a threat to continuation of therapy.

Based on the traditional product consumption model shown in Figure 7 (Cross et al., 2018), the conceptual components of the three concepts were located with respect to four stages of medication consumption: acquisition, use, retention, and disposal (Figure 13). Compared to the traditional model, the medication consumption model had the retention stage. The addition of this stage was necessary, because all three concepts were most operationalized cross-sectionally and examined in this stage. Furthermore, the successful placement of the conceptual components along the cycle may also indicate that all three concepts are associated with the entire span of acquisition, use, and retention, and with disposal being associated with medication hoarding and the retention of UUEL medications.

Overall - Evaluation of the Conceptual Maturity Based on the Linguistic Principle

The three concepts appeared in the context of medication use assessment. Medication stockpiling notably appeared in the use assessment associated with other phenomena such as disasters and medication shortages. With stockpiled

medications utilized to prevent sudden and unnecessary discontinuation of therapy, the act of medication stockpiling was narrated positively. Unlike medication stockpiling, the other two concepts appeared in the context of medication disposal and the use of unserviceable medications. These two were often portrayed negatively in the literature.

Despite these findings, without a precise and consensus definition for each concept, it is difficult to understand when and how each concept should appear. Thus, the contextual appropriateness of the current findings could not be fully evaluated, and the conceptual contexts for all three were deemed immature.

Conceptual Antecedents - Medication Hoarding

The preconditions of medication hoarding included various original sources of the hoarded medications (R. Law & Chalmers, 1976; Tsiligianni et al., 2012), and the COVID-19 pandemic (Zhang et al., 2020), but this information did not lead to a significant conceptual pattern. These rationales also did not make up a conceptual pattern. The rationales were mainly concerned with their anticipated future use (Back et al., 2009; Ellis et al., 2011; Giovannoni et al., 2000; Henderson et al., 2015, 2015; Huang, 1996; Kaboré et al., 2021; Parimi et al., 2002; Slater et al., 1986). Some other less prominent rationales involved avoiding being wasteful (Martinez et al., 2012), using the hoarded medications for physician-assisted suicide (Emanuel et al., 1996, 2000), having a medical condition causing drug addiction (Giovannoni et al., 2000), having no knowledge about proper medication

disposal, and continuously receiving prescriptions from healthcare providers at each medical visit (Ellis et al., 2011).

Conceptual Antecedents - Medication Stockpiling

The preconditions of medication stockpiling were related to previous experiences with challenges such as natural disasters (Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012), medication shortages (Moriarty et al., 2018), and a dose pack missing medications that it was supposed to have (Larsen & Haugbølle, 2007).

The rationales for medication stockpiling were categorized into convenience, personal values, and self-harm. Convenience was related to ensuring medication stocks in the future. Some individuals were motivated based on the previous interruptions in medication supplies due to a natural disaster or medication shortage (Kadowaki et al., 2014; Kobayashi et al., 2016; Larsen & Haugbølle, 2007; Tomio et al., 2012). Some anticipated future financial challenges that would prevent them from obtaining additional stocks of medications (Patel et al., 2014; Unger et al., 2021). Some stockpiled extra to use or share them conveniently in the future (Al Zoubi et al., 2021). The personal value category entailed stockpilers' personal preferences and priorities. These included prioritizing family's health (Kabel & Chmidling, 2014) and household practices (Xu et al., 2023).

Conceptual Antecedents - Retention of UUEL Medications

The preconditions for keeping UUEL medications involved overprescribing (Jha et al., 2022; Slater et al., 1986; West et al., 2016), and having no education regarding proper medication disposal (Renny et al., 2022). The medications left behind by decedents were also kept by their family, but no proper regulations for controlling the distribution of these leftover medications was found (Reis et al., 2014). Other preconditions for having these medications was therapy change or its discontinuation for various reasons (Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015; Lystlund et al., 2014; West et al., 2016; Wieczorkiewicz et al., 2013). A potential cultural influence was noted by Aluko et al., as in Nigeria, females were responsible for medication and health management (Aluko et al., 2022).

The three categories of rationales, namely convenience, personal values, and negligence, appeared in the literature. The convenience category was concerned with the use of these medications and disposal. The use of these medications focused on their future use either by the current owners or their family, relatives and friends (Alhamad et al., 2022; Asmelashe Gelayee & Binega, 2017; Bettington et al., 2018; Bicket et al., 2021; Emanuel et al., 1996; Jha et al., 2022; Persson et al., 2009; Sapkota et al., 2022; Voepel-Lewis et al., 2020, 2022). When hesitating to dispose these medications, individuals seemed to compare the benefit or cost of the disposal and keeping them (Bettington et al., 2018; Voepel-Lewis et al., 2020, 2022). It is suspected those who kept these medications expressed that the cost of the disposal or inconvenience of going through the

process is too high (Bettington et al., 2018) or it does not upset the cost incurred for the initial acquisition of the medications (Voepel-Lewis et al., 2020, 2022).

The personal value category pertained to the behavioral tendencies and beliefs of the individuals with these medications. Their concerns about the environment and other individuals (Bicket et al., 2021; Jha et al., 2022), the disbelief in expiry dates, and keeping these medications as a reminder in the future (Bettington et al., 2018) were included in this category.

The negligence factor was more regarding the disposal of these medications and explained why individuals were hesitant to properly dispose them. Indifference (Bicket et al., 2021) and forgetfulness toward disposal (Bettington et al., 2018; Bicket et al., 2021), and the lack of knowledge regarding disposal (Alhamad et al., 2022; Bettington et al., 2018; Bicket et al., 2021; Gidey et al., 2020; Voepel-Lewis et al., 2020, 2022) were reported. The convenience category involved the rationales showing the intention of purposefully and actively retaining the medications. However, the negligence category involved the rationales showing some degree of intention to dispose and more passive retention of these medications.

Conceptual Characteristics – Mechanisms

Mechanisms - Medication Hoarding

The data regarding the mechanisms of medication hoarding explained its process of voluntary and involuntary acquisition. Seeking new prescriptions from

multiple healthcare providers (Ellis et al., 2011), and changing the liquid form to tablets for hoarding (Walcott, 2000) were the voluntary acquisition processes reported in the literature. The involuntary acquisition involved receiving stocks of medications that were no longer needed due to miscommunication between the pharmacy and clinic of the case subject (Martinez et al., 2012). Besides the behavioral mechanisms, the initial origins of the hoarded medications discussed under the preconditions were identified as mechanisms also.

The various original sources of the hoarded medications such as pharmacists, self-prescribed, general practitioners, doctors, and neighbors were identified as preconditions of the concept. Yet they were also identified as a hoarding mechanisms, pertaining to the acquisition stage of the behavior (R. Law & Chalmers, 1976; Tsiligianni et al., 2012).

Mechanisms - Medication Stockpiling

The three categories were extracted from the information about the mechanisms of medication stockpiling: “navigating across systems,” “paying for stockpiles,” and “keeping stockpiles.” The former two categories pertained to the initial acquisition process of stockpiling, and the last was concerned with storage of stockpiled medications.

The information categorized under “navigating across systems” illustrated how individuals interacted with different parts of healthcare and maximize the given situations to stockpile more medications. Stockpilers commonly reported their repeated medication acquisition process regardless of the immediate need to

intentionally gain access to more medications (Donovan, 1990; Moriarty et al., 2018; Patel et al., 2014). Another example of intentional acquisition included skipping doses to retain them for future use (Larsen & Haugbølle, 2007). In contrast, one stockpiler explained how they received more quantities of medications in the stock bottles from the manufacturers by luck (Moriarty et al., 2018). “Paying for medications to be stockpiled” was related to how to fully utilize one’s insurance benefit (Kabel & Chmidling, 2014; Patel et al., 2014) or forgo insurance coverage (Kabel & Chmidling, 2014) to be able to stockpile more. One stockpiler reported their experience of borrowing money to obtain more medications (Moriarty et al., 2018).

“Keeping stockpiles” explained how individuals inventoried their stockpiled medications by keeping track of the expiration dates (Kabel & Chmidling, 2014; Patel et al., 2014). Stockpiling medications in bottles and boxes for previous prescriptions was also reported in this category (Larsen & Haugbølle, 2007).

Mechanisms - Retention of UUEL Medications

Any changes or discontinuation of therapy for various reasons and being left with the medications no longer needed were discussed as preconditions previously, and they were identified as the mechanisms of acquiring such medications as well. Various storage methods were also reported mainly regarding the storage locations. Such storage locations included on the kitchen counter, in a cupboard, in a desk, in a drawer, in the garage, in the attic, on a spice rack, near the recycling, in a closed storage area, in a locked cabinet, in a box or plastic bag

(Aldred Cheek, 2018; Persson et al., 2009). Some mechanisms described a temporal progression in the process as unused medications were kept until expired or those forgotten to be taken were accumulated over time (Bashaar et al., 2017; Gidey et al., 2020; Wajid et al., 2020).

Other Conceptual Characteristics – All Three Concepts

All three concepts contained some information that was categorized into "demographics," "socioeconomic status" and "comorbidities" or "comorbidities and health status." The names of these categories were representative of the characteristics included in them. Medication hoarding had characteristics related to certain disease states, while the other two contained information regarding more general health status such as the vulnerability level, physical disability (Tomio et al., 2012), and quality of life (Ewen et al., 2015). Hence, the similar "comorbidities" and "comorbidities and health status" categories were distinguished earlier in this paragraph.

The "medication use and management" was a category identified with medication hoarding which explained the number of prescribers (Kalyango et al., 2012) and medications stored at home (Sorensen et al., 2005). Similarly, "medication use" was a category extracted for the retention of UUEL medications. This category included, for instance, the history of self-medication (Asmelashe Gelayee & Binega, 2017), medication frequency of use (De Bolle et al., 2008), and history of prescription opioid misuse (Voepel-Lewis et al., 2020, 2022).

Medication hoarding and the retention of UUEL medications both had "awareness" as a category for their conceptual characteristics. This category was concerned with the awareness of different types of risks. For instance, having received formal information about the COVID-19 pandemic (Nam et al., 2023) and the perceived risk of medication stockpiling for a medication shortage (Al Zoubi et al., 2021) were associated with medication stockpiling. Educational interventions such as Scenario-Tailored Opioid Messaging Program (STOMP) which was developed to enhance perceived risk of opioids (Voepel-Lewis et al., 2020) were associated the retention of UUEL medications.

"History of trauma" was a category unique for medication stockpiling which entailed suicide attempts (de Sousa et al., 2020) and past disaster experience (Tomio et al., 2012). "Healthcare utilization" was another category uniquely extracted for the retention of UUEL medications, explaining the relationship between the cost and frequency of healthcare utilization and having the relevant type of medications (Maeng et al., 2017).

Conceptual Outcomes – All Three Concepts

All three concepts included medication sharing, self-medication, and self-harm. Disposal of the medications was reported in medication hoarding and the retention of UUEL medications. Extreme cases of self-medications such as non-medical use of prescription opioids by high school seniors (McCabe et al., 2013, 2019) and self-care with leftover antibiotics (Tomas et al., 2017) were also identified from the retention of UUEL medications. Medication stockpiling uniquely

included using the stockpiled medications as a backup (Larsen & Haugbølle, 2007; Moriarty et al., 2018).

Conceptual Boundaries - Medication Hoarding

The conceptual boundaries of medication hoarding were obscure. The current users and medications in current use were commonly excluded from the concept of medication hoarding. Nevertheless, the findings suggested that not only the definitions of “current use” varied, but “current use” may also be a misleading label. For instance, medications that were not taken on the day of assessment (Furst, 1975) and in the previous 48 hours (Slater et al., 1986) were excluded from current use in the literature. Besides the difference in the time frame for current use, both frames were too narrow that these medications labeled to be excluded from current use were well likely being used.

“Ongoing” medications were also excluded from medication hoarding (Ekedahl, 2006), which could seem equivalent to those in current use. However, based on the definition and context, ongoing medications meant concurrent therapy. To avoid any confusion in the interpretation of its meaning, more product-based labels were made to group different types of medications efficiently. Such labels were namely “serviceable” and “unserviceable” medications. The serviceable medications were defined as the medications being used for their initial intention. Thus, some of those medications that were not in current use based on the strict time frames would be considered serviceable. The unserviceable medications were those which ceased to function for their original intention. These

medications included those “discontinued” (Eichenberger et al., 2011; Kalyango et al., 2012; Martinez et al., 2012), “no longer required” (Sorensen et al., 2005), “not currently in use” (Ewunetei et al., 2021), leftover (Alhomoud, 2020; Ellis et al., 2011; VanDyke & Steffen, 2017), and expired medications (Ekedahl, 2006; Martinez et al., 2012; Sorensen et al., 2005; VanDyke & Steffen, 2017). Furthermore, when serviceable medications were left unused and disposed or expired, then they were deemed unserviceable. For prescription medications, when serviceable medications were shared with someone other than the patient for which it was prescribed, then they were considered unserviceable as well. A visual representation of the conceptual involvement of the serviceable and unserviceable medications can be found in Figure 9.

Both voluntary and involuntary acquisition processes were observed with medication hoarding. For example, intentionally seeking care from multiple physicians to obtain extra medications (Ellis et al., 2011; Giovannoni et al., 2000), and unintentionally receiving refills of discontinued prescriptions accidentally dispensed by the pharmacy (Martinez et al., 2012) were observed.

The concepts of medication adherence and disposal also appeared in association with medication hoarding. Skipping doses was identified as a mechanisms of medication hoarding (Walcott, 2000), and medication disposal (Ellis et al., 2011) was identified as an outcome of the concept.

Conceptual Boundaries - Medication Stockpiling

Medication stockpiling more prominently included the serviceable medications. The concept did include the unserviceable medications but minimally. Skipping doses was identified as a mechanism of medication stockpiling, indicating its conceptual association with medication adherence. Unlike with medication hoarding, medication disposal and involuntary acquisition were not observed with medication stockpiling. Voluntary acquisition, however, was observed as individuals obtained extra medications for anticipated disasters (Kabel & Chmidling, 2014), financial difficulties (Patel et al., 2014), suicide (Donovan, 1990), and medication shortages (Larsen & Haugbølle, 2007; Moriarty et al., 2018).

Medication stockpiling was referred as “panic storing.” This was presented as an act distinguished from panic buying (Nam et al., 2023). It was suspected that in this research, medication stockpiling excluded the process of medication acquisition and only pertained to storage. However, the other studies contrasted this view. For example, in a study examining the use of stockpiled medications in anticipation of HIV medication shortages, the act of stockpiling was illustrated as an overarching process that included both acquisition and retention (Moriarty et al., 2018). This notion was also confirmed during the evaluation of the conceptual context where the conceptual components were located along the medication use cycle.

Conceptual Boundaries - Retention of UUEL Medications

UUEL medications were often incorporated to describe the functionality of the hoarded or stockpiled medications (Table 1). Despite the seemingly close associations, without precise definitions explaining the relevance of these medications in each concept, delineating the boundaries among them would be difficult. On the other hand, similar to the mechanisms for the other two concepts, inappropriate medication adherence was determined as a mechanism for having unused medications (Addis, 2023; Ewen et al., 2015; A. V. Law et al., 2015). Forgetting to take medications (Addis, 2023; A. V. Law et al., 2015) and being unable to take medications as scheduled (Ewen et al., 2015) were specific examples of such mechanism. Medication reuse uniquely appeared as a potential outcome along with the retention of UUEL medications. Various standards for reuse of the medications of the current concept were suggested (Bekker et al., 2018) and individuals' willingness to reuse unused medications was examined (Alhamad et al., 2022).

With the medication-oriented nature of the three concepts, the types of medications constituting each concept was determined to hold greater importance in identifying them compared to the other components. Thus, based on the degree of involvement of the serviceable and unserviceable medication, the retention of UUEL medication was more similar to medication hoarding. It mainly covered the unserviceable medications, and marginally involved the serviceable medications.

The concept of medication disposal also appeared in both concepts. The various disposal methods were reported in association with this concept (Table 7

and 8). The retention of UUEL medications also involved involuntary acquisition, while medication hoarding involved both voluntary and involuntary acquisition. Based on these similarities and slight differences, medication hoarding seemed to be a greater concept that encompassed the concept of the retention of UUEL medications.

Along with the concept of medication disposal, the concept of medication waste also appeared with the retention of UUEL medications. However, medication waste is another concept that is not firmly defined yet, blurring the boundaries with its competing concept: the retention of UUEL medications.

This close association with medication waste is reasonable as the concept of medication disposal was profoundly observed in the retention of UUEL medications. However, the definitions of medication waste found during the concept analysis did not reach a consensus. West et al. agreed with this finding, and in their research, they attempted to find a consensus definition of medication waste with an expert panel through rounds of the consensus-based Delphi-technique. In consequence, their definitions of medication waste were

> *"Medication wastage refers to any medication which expires or remains unused throughout the whole medicines supply chain."*
>
> *"Medication wastage also refers to the unnecessary or inappropriate consumption of medications by patients, or the unjustified non-adherence to treatment guidelines by healthcare professionals. Medication wastage poses a financial burden on patients themselves and the state's economy*

and requires adequate education of all people concerned." (West et al., 2015).

The concepts of medication waste and the retention of UUEL medications are similar in their involvement of "any medication which expires or remains unused" and the unserviceable medications. The definitions by West et al., however, reflect the nature of economical and therapeutic losses medication waste. These losses, however, were the suspected implications of the UUEL medications, but they not explicitly reported its conceptual components in the literature.

Various aspects of medication waste in the UK were also assessed by the York Health Economics Consortium, and the University of London in 2010. In their report, medication waste was defined as "unused medicines not intended for future use" as shown in Figure 12 (Trueman et al., 2010). This definition also aligns well with the definition of the unserviceable medications. In contrast, the retention of UUEL medications involved both serviceable and unserviceable medications. Hence, the two concepts may be related but may not be equivalent.

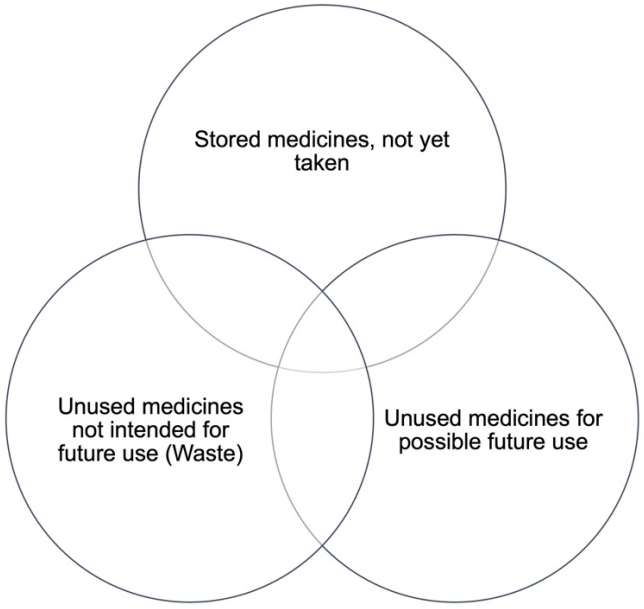

Figure 11 Boundaries between Medication Waste and Medications in Use (Trueman et al., 2010)

The UK research report also listed various causes for medication waste or stocks of the unserviceable medications through an extensive literature review. The literature referenced to support their claims especially assumed that inappropriate medication adherence led to medication waste. These cited references did not empirically measure the relationship between inappropriate medication adherence and medication waste (Trueman et al., 2010). However, the current study was able to identify inappropriate medication adherence was a mechanism for having the unserviceable medications (Addis, 2023; Ewen et al., 2015; A. V. Law et al., 2015). Hence, the assumption of the UK report team was validated.

Overall - Evaluation of the Conceptual Maturity Based on the Logical Principle

The concept of the retention of unused, unwanted, expired or leftover medications was often used to describe the concept of medication hoarding or stockpiling. However, their boundaries were murky due to the lack of precise definitions of the concepts.

Despite the ambiguous boundaries, based on the loose trends in the data, the relationships of the three concepts could be deduced. The concept of the retention of UUEL medications was more similar to medication hoarding, based on their greater degree of involvement of unserviceable medications, and inclusion of involuntary acquisition and medication disposal. In fact, medication hoarding seemed to hold a greater conceptual scope covering involuntary acquisition. Based on the similarities and differences, medication hoarding and the retention of UUEL medications are determined to be inequivalent, but the latter concept seems cover the former. The two concepts were significantly different from medication stockpiling, as medication stockpiling involved a greater degree of the serviceable medications and did not include medication disposal.

Overall Conceptual Maturity

Based on the evaluation of the four principles, the three concepts were deemed to be immature. The confusion in the concepts of interest was apparent in all the contexts in which they appeared. The variations in the definitions and the lack of a consensus definition of medication hoarding and stockpiling undermined

the firm establishment of their precise meanings. Unused, unwanted, expired, and leftover medications were the terms often constituting the definitions of medication hoarding and stockpiling. These terms also lacked consistent and clear definitions and may also attributed to the confusion in the meanings of medication hoarding and stockpiling.

Medication hoarding and the retention of UUEL medications found to mainly involve unserviceable medications, while medication stockpiling was more concerned with serviceable medications. Medication stockpiling was more often justified within the context of preparing for a disaster or medication shortage than the behaviors related to the other two concepts. However, as some studies asserted, medication stockpiling could lead to negative or potentially harmful consequences, such as overdoses and self-medication. Furthermore, the concept of medication disposal did not appear only with medication stockpiling. The other two concepts seemed to be more closely related. Despite the similarities, medication hoarding seemed to cover a greater scope including voluntary and involuntary acquisition, while the retention of UUEL medications only covered involuntary acquisition. Thus, the former concept seemed to encompass the latter.

Although some distinctions could be drawn based on the concept analysis, the limited and explorative operationalization prevented the comprehensive understanding of the nature of the concepts. No theoretical framework was applied for the assessment of the concepts, except for the pathological view of medication hoarding. Adopting the framework for hoarding disorder to the assessment of medication hoarding was illogical based on the prevalence of the phenomena. It

also neglected the aspects of medication hoarding potentially as a consumer behavior. Hence, based on the explorative nature of the relevant literature, the pathological approach also seemed premature.

In conclusion, the three concepts are conceptually immature in the literature. Most of the confusion among the concepts seem to stem from the lack of clear and precise definitions. Also, their assessment needed more in-depth exploration of the concepts, and the application of more appropriate theoretical frameworks.

4.2 Discussion for Objective 2 – Concept Analysis of Medication Accumulation

The concept analysis for the current section examined medication hoarding, medication stockpiling, and the retention of UUEL medications altogether. For this process, the three concepts were perceived as one concept: medication accumulation at home. Based on the conceptual components of such medication accumulation and their main trend, its theoretical definition (Figure 10) was constructed.

The theoretical definition involved two main mechanisms of acquisition: voluntary and involuntary acquisition. The voluntary acquisition was driven by either acquisition barriers or use intent. The acquisition barriers pertained to the anticipated incidences that could interrupt the therapy such as financial difficulties, medication shortages, and natural disasters (Al Zoubi et al., 2021; Kabel & Chmidling, 2014; Kaboré et al., 2021; Kadowaki et al., 2014; Moriarty et al., 2018; Patel et al., 2014). The use intent was driven by the purposes of the behavior such as self-harm, or self-sabotage (Lester, 2014; Wu et al., 2012), suicide (Donovan, 1990; Emanuel et al., 2000; Kabel & Chmidling, 2014), being in immediate need of medications (Al Zoubi et al., 2021), and the anticipated use by the family (Kabel & Chmidling, 2014; Patel et al., 2014). The medications voluntarily acquired were kept serviceable until being used for their initial intent (Asmelashe Gelayee & Binega, 2017; Ewunetei et al., 2021; Larsen & Haugbølle, 2007; Moriarty et al., 2018). The serviceable medications could turn into unserviceable, when they were not taken as prescribed, or disposed as unused or expired (Addis, 2023; Bashaar

et al., 2017; Ellis et al., 2011; Ewen et al., 2015; Gidey et al., 2020; A. V. Law et al., 2015; Wajid et al., 2020).

The leftover medications from others and of one's own were identified as the catalytic conditions for the involuntary acquisition. Some medications were left behind by those who moved and deceased (Braund et al., 2009; Ekedahl, 2006; A. V. Law et al., 2015; Lystlund et al., 2014; Regenthal et al., 2002; Reis et al., 2014; West et al., 2016). Other leftover stocks were formed after changes or discontinuation in one's therapy or receiving oversupplies. Such oversupplies came from multiple sources such as those prescribed by healthcare providers (Addis, 2023; Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022; Braund et al., 2009; Ho et al., 2018; Jha et al., 2022; West et al., 2016), accidentally dispensed by pharmacies (Martinez 2012), or packaged by manufacturers (Moriarty et al., 2018).

The medications acquired involuntarily were either kept as unserviceable or disposed. These medications were kept because of the barriers in disposing them or one's intent to use them. The disposal barriers included the lack of knowledge about disposal (Alhamad et al., 2022; Bettington et al., 2018; Bicket et al., 2021; Ellis et al., 2011; Gidey et al., 2020; Voepel-Lewis et al., 2020), its inconvenience (Voepel-Lewis et al., 2022), and being indifferent or hesitant about it (Bettington et al., 2018; Bicket et al., 2021; Persson et al., 2009; Sapkota et al., 2022). The unserviceable medications kept for future use were shared (Addis, 2023; Adedeji-Adenola et al., 2022; Al Zoubi et al., 2021; Alfian et al., 2021; Alhomoud, 2020; Althagafi et al., 2022; Gascoyne et al., 2014; Gidey et al., 2020; Inciardi et al., 2009;

McCabe et al., 2019; Omae et al., 2018; Patel et al., 2014; Reis et al., 2014; Sapkota et al., 2022; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013), and consumed for self-harm (Buykx et al., 2010), their non-medical use (McCabe et al., 2013, 2019), and self-medication (Amenta et al., 2022). When they were not used for these purposes, they were eventually disposed.

As noted in the outcomes in the theoretical definition (Figure 10), sharing of OTC medications was categorized differently from sharing of prescription medications. This differentiation was necessary, because OTC medications, unless expired, would stay serviceable until their consumption (Adedeji-Adenola et al., 2022; Alfian et al., 2021; Alhomoud, 2020; Asmelashe Gelayee & Binega, 2017; Sapkota et al., 2022; Wieczorkiewicz et al., 2013). Unlike prescription medications, medications purchased as OTC are not intended for the use by a particular patient. Unexpired OTC medications still serve their only intention of self-care, even when they are shared.

On the other hand, the negative or potentially negative outcomes such as sharing of prescription medications, self-harm, nonmedical use, and self-medications were preceded by the accumulation of the unserviceable medications. The negative implications of self-harm were intuitive. Besides such outcome, the other outcomes can also be problematic, because medication consumption without provision of healthcare practitioners can lead to misuse, abuse, and a delay in treating a serious medical condition (Hughes et al., 2001; McCabe et al., 2013, 2019). Self-medication with antibiotics and their misuse especially can lead to antibiotic resistance (Gualano et al., 2015; Lebanova et al., 2023). Non-medical

use of prescription medications especially with habit-forming opioids, sedatives, and stimulants has higher risk of developing dependence (Blanco et al., 2007; McCabe et al., 2013, 2019; National Institute of Health, 2020).

To prevent such negative consequences, a few areas in the theoretical definition can be systematically targeted. These areas include the formation of leftover stocks, and acquisition and disposal barriers. The disposal barriers and the formation of leftover stocks can directly lead to the retainment of the unserviceable medications through involuntary acquisition. The acquisition barriers can do the same but indirectly only when the retained serviceable medications turn unserviceable. The use intent also can intensify the retainment of unserviceable medications. The use intent, however, was based on the need. Such need can be driven by various factors and these motivational factors were not studied in the literature. For instance, self-harm could be motivated by various events in one's life, one's personal propensity for the behavior, or their mental well-being. Hence, for the current study, it was deemed difficult to be targeted by external systemic interventions.

The interventions reducing the formation of leftover medications should focus on minimizing the initial oversupply. In the current study, an antecedent to medication accumulation involved receiving oversupplies (Addis, 2023; Adedeji-Adenola et al., 2022; Alshehri & Banjar, 2022; Althagafi et al., 2022; Braund et al., 2009; Ho et al., 2018; Jha et al., 2022; West et al., 2016). This oversupply seems to amplify the formation of leftover stocks in the event of sudden and unexpected changes or discontinuation of therapy. Such changes or discontinuation can occur

due to adverse effects (Addis, 2023; Adedeji-Adenola et al., 2022; Althagafi et al., 2022; Braund et al., 2009; Gidey et al., 2020; A. V. Law et al., 2015), ineffective therapy (Braund et al., 2009; A. V. Law et al., 2015), feeling worse on therapy (Lystlund et al., 2014), unpleasant taste (Addis, 2023). To minimize the amount of medications which do not become fully consumed or leftover, providing trial scripts for a short duration at the initiation of the therapy may work effectively. For OTC medications, making them available in low-quantity packaging may also help reducing oversupplies (Ruhoy & Daughton, 2008).

The disposal barriers entailed the lack of knowledge about proper medication disposal (Alhamad et al., 2022; Bettington et al., 2018; Bicket et al., 2021; Ellis et al., 2011; Gidey et al., 2020; Voepel-Lewis et al., 2020), inconvenience associated with disposal (Voepel-Lewis et al., 2022), and being indifferent or lazy about it (Bettington et al., 2018; Bicket et al., 2021; Persson et al., 2009; Sapkota et al., 2022). However, before discussing the solutions for lowering the disposal barrier, the status-quo of the currently available proper medication disposal channels is explored.

Among these channels, returning unused and expired medications, or similarly unserviceable medications, to a collection or take-back service for incineration seems to be the most commonly recommended disposal method (MEDS DISPOSAL, 2020; United States Environmental Protection Agency, 2023; United States Food and Drug Administration, 2021). Most of the out-of-home disposal methods identified as an outcome of medication accumulation followed this recommendation.

The Food and Drug Admonition also provides the “flush list,” recommending certain medications of high abuse potential to be flushed down the toilet or sink when a take-back service is not readily available. The list contains, for example, hydromorphone, meperidine, methadone, and methylphenidate (United States Food and Drug Administration, 2020). Khan et al. evaluated the theoretical environmental concentrations of the 15 medications on the flush list when disposed via sink or toilet. The study determined that the concentrations of these medications in the water systems would be marginal and would not affect humans negatively. However, as the study noted, opioid use in the US had continuously been increasing and the water systems were incapable of removing the flush list medications entirely . Hence, a trace amount of pharmacal may increasingly accumulate, and the continuous feasibility of the protocol for the flush list is questionable. The Environmental Protection Agency also recommends against following the flush list procedure from the FDA (Ernst, 2016; Khan et al., 2017).

For the medications which are not on the flush list, when a take-back program is not readily available, mixing them with undesirable substances such as dirt and coffee grounds before throwing them in the trash is recommended by the FDA (United States Food and Drug Administration, 2021). Such procedure can be effective in removing the medication sources that can be abused or taken for poisoning (Ruhoy & Daughton, 2008). The medications disposed this way would be incinerated eventually. Some, however, would be buried in the landfills and can leak into the water systems (Cook et al., 2012).

Outside of the US, most countries in Europe recommend returning pharmaceutical waste to a pharmacy for incineration (MEDS DISPOSAL, 2020). However, many developing countries seem to lack provisions and the infrastructure for handling household pharmaceutical waste and take-back procedures (Rogowska & Zimmermann, 2022). The current concept analysis indicated that the most common at-home disposal methods were flushing down the toilet or sink and disposing in the trash. Some reported burning or burying them in the ground at home on their own. Considering the reported inadequacy in processing of pharmaceutical waste around the world makes the at-home disposal methods (Table 7 and 8) more alarming.

The medications collected at a return facility seem to be incinerated ultimately (Khan et al., 2017; MEDS DISPOSAL, 2020; Rogowska & Zimmermann, 2022; United States Food and Drug Administration, 2021). Although incinerating medications does not introduce much of the active pharmaceutical ingredients into the environment, it may introduce other pollutants formed during the combustion. However, Cook et al. found that flushing medications in the sink or toilet would introduce the most amount of pollutants into the environment, compared to those incinerated after take-back, and disposed in landfill or incinerated after trash disposal (Cook et al., 2012). Thus, the commonly available medication disposal channels may not entirely be environmentally friendly, but the channels for incinerations seem to be a little more environmentally friendly.

In the recent years, at-home medication disposal kits which chemically deactivate medications have become available in the market. Such kits are, for

example, Deterra, Drug Buster, Rx Destroyer, and DisposeRx (Imarhia et al., 2020) and are advertised to be “environmentally friendly.” However, no data regarding the pollutants that can be emitted during the manufacturing or shipping process of these products were found. These also do not seem to be much convenient, as only a few kits are available for free upon request, but others cost a fee.

Based on their potential effects on the environment, the take-back services seem to be the most appropriate disposal option. The home disposal kits may be an adequate option once their actual effects on the environment are examined throughout their life cycle. However, these two channels seem to release the least amount of active pharmaceutical ingredients into the environment.

With these confusing recommendations and options for “proper” medication disposal, the public needs to be guided with better education. The public should be educated about the importance of proper medication disposal and relevant community resources. The disposal kits and take-back services also need to be better promoted. The cost and inconvenience of proper medication disposal were identified as the barriers in the concept analysis. Thus, home kits which are not free, and need be requested may only heighten the disposal barrier even more. Although providing the kits at no cost and at pharmacies would be most ideal, educating patients more about the availability of these kits may be the first step to follow. To educate the public, healthcare practitioners should be educated. Education regarding medication disposal was shown to be effective in encouraging patients to discard their medications safely (Aliory et al., 2021; Voepel-Lewis et al., 2022). However, the lack of education about proper medication disposal was

identified in the current study (Addis, 2023; Aliory et al., 2021; Alshehri & Banjar, 2022; Althagafi et al., 2022; Braund et al., 2009; Gidey et al., 2020; Haughey et al., 2019; Jha et al., 2022; Renny et al., 2022; West et al., 2016; Wieczorkiewicz et al., 2013). Some studies reported that healthcare practitioners were not well aware of proper medication disposal methods (Jankie et al., 2022; Mahlaba et al., 2021). When the healthcare practitioners do not recognize medication disposal as a critical issue, expecting the public to do so is unreasonable. Hence, to promote proper medication disposal, thoroughly educating the healthcare practitioners and encouraging them to counsel patients on proper disposal is necessary.

Furthermore, Cook et al. indicated that take-back facilities were located mostly in metropolitan areas and sparsely in rural areas in the US. Those residing in a rural area may pollute the environment more by traveling with a gas vehicle to a take-back location (Cook et al., 2012) . Thus, more take-back locations should become available to the public. A mail-back service like Takeaway Medication Recovery System may be another solution that can lower the disposal barrier (Imarhia et al., 2020).

The acquisition barriers in the theoretical definition pertained to gaining medication access when future access was unknown. Hence, such acquisition barrier may be minimized through interventions that can enhance medication access. Most of the literature and interventions focus on healthcare access, and medication access is seldom specifically discussed. Most interventions related to medication access found in the literature focus only on the medication costs and insurance coverage (Bias et al., 2023; Cooper et al., 2023; Sobeski et al., 2021).

The cost seems to be a great barrier, but medication access is a multi-faceted concept and may require a more comprehensive approach to overcome any associated obstacles. The Pharmacy Quality Alliance (PQA) published a conceptual framework illustrating the journey of a patient in accessing their medications. The research team identified barriers in seeking medication access, based on extensive literature reviews and consensus-building discussions and a Delphi survey with subject matter experts. The identified barriers were organizational health literacy, provider competencies and beliefs, medical conditions including chronic diseases, health literacy, insurance types, patient attitudes and beliefs, race/ethnicity, gender, provider availability, language, public support, transportation, costs of care, disability status, income, and education levels as the barriers to medication access (Holland et al., 2021; Pharmacy Quality Alliance, 2019). More detailed explanations about these barriers can be found in Appendix 3. The characteristics of medication accumulation identified in the concept analysis, in fact, align with the barriers to medication access identified in this report by PQA.

The characteristics of medication accumulation categorized under “predisposition” were health literacy (Renny et al., 2022), having information about disasters (Al Zoubi et al., 2021; Nam et al., 2023; Tomio et al., 2012), medication disposal (Maeng et al., 2017), medication misuse (Voepel-Lewis et al., 2020), and having medical background (Al Zoubi et al., 2021; Nam et al., 2023). This category closely aligns with the barriers associated with health literacy, defined as “the ability to make health decisions and to navigate the healthcare system,” and

patient attitudes and beliefs or their “values towards the healthcare system.” The characteristics categorized under “demographics,” and “socioeconomic status” seem to be associated with the insurance, race/ethnicity, gender, rural/urban, costs, and income barriers. The characteristics categorized under “comorbidities and health status” seem to align well with the barriers around medication conditions and disability. The “healthcare utilization” characteristics pertaining to medical care utilization frequencies, number of prescribers and dispensaries seems to contextually align with the provider availability barrier. Such barrier is concerned with the adequacy of medical infrastructure, facilities, and workforce to provide care.

The close alignment between the characteristics of medication accumulation and the medication access barriers suggest that issues associated with medication access may manifest as medication accumulation. This is a reasonable conclusion, considering the reports of storing their medications to ensure access to medications in the future, as the antecedents of the concepts. By examining this relationship, more comprehensive and targeted interventions enhancing medication access may be developed.

Unlike the interventions that target access and disposal barriers separately, medication reuse seems to target both types of barriers. Medication reuse programs allow for redispersing of medications once obtained by a patient or healthcare facility. The expansion and better promotion of such programs may open up more channels for disposal of unserviceable medications and increase medication access by providing medications for reuse at no cost or significantly

discounted prices. In the US, as of 2023, 44 states, Washington D.C., and Guam have laws establishing prescription medication reuse programs. However, only 28 states have operational programs with varying regulations, with some states accepting donations only from healthcare facilities or cancer drugs. The eligibility for donated medications is governed by strict rules, and they must be unopened and in sealed, tamper-evident packaging and have no signs of adulteration (National Conference of State Legislatures, 2023).

To help expand the reuse programs, more medications should become eligible for donation, and better payment systems for medication reuse should be established. The stringent regulations around the conditions of the donated medications are reasonable, as the quality of the medications once possessed by others is questionable. However, unit dose packaging may help alleviate this logistical burden without compromising the quality of the medications. When stored inside of the unit dose packaging, the variability of the storage conditions is less of a concern, and more medications may become eligible for reuse (Pomerantz, 2004). An innovation system like Supporting initiatives to Redistribute Unused Medicine (SIRUM) can also facilitate the donation process. SIRUM is a non-profit organization based in California, and streamlines mail-donation packaging and shipping processes (Supporting initiatives to Redistribute Unused Medicine (SIRUM), 2022).

In the US, sales of donated medications are prohibited. However, the reuse programs cannot continuously rely on the external funding or donations to keep themselves operational. If the healthcare system aims to implement a better value-

based system, the financial benefit of reusing medications and improved health outcomes due to the enhanced medication access should be better examined. With this information, payers and benefit managers should devise a payment structure that incentivizes the establishment or expansion of reuse programs. A payment structure may also offer patients healthcare credit to encourage them to donate their medications for reuse. For expansion of medication reuse, the regulations around the liability of the reuse service and patient safety should be established. If a donated medication, for instance, harms a patient, more explicate regulations on what procedures can exempt the reuse programs from being liable for such even or how the patient can be protected in this case (Briones, 2020).

In conclusion, medication hoarding, medication stockpiling, and the retention of UUEL medications were treated as one concept: medication accumulation. The data of the three concepts were combined for concept analysis. Based on the conceptual components identified in the concept analysis, a theoretical definition was constructed. In this definition, the accumulation of the unserviceable medications notably resulted in consequences with negative implications. The acquisition barriers, formation of leftover medication stocks, and disposal barriers were determined as areas to be targeted to prevent such accumulation. The interventions tarting these areas included promotion of drug take-back and home disposal kits, lowering medication cost, and medication reuse.

4.3 and 4.4 Discussion for Objective 3 and 4 – Discursive Psychology of Medication Hoarding and Stockpiling and Its Congruence with Principle-based Concept Analysis

The decision was made to discuss the findings for Objective 3 and 4 in a cohesive context, leading to their presentation in the same section.

The principle-based concept analysis revealed confusing use of the terms, medication hoarding and stockpiling, undermining the conceptual understanding of the two. To examine the grounds for this confusion, discursive psychology was applied to the literature which utilized medication hoarding and stockpiling interchangeably. Based on what the discourses around medication hoarding and stockpiling accomplished in the literature, the reasons for the discursive confusion could be further elucidated.

Four interpretative repertories (IR), namely, “medication hoarding and stockpiling as negative behaviors” (IR-1), “medication stockpiling as a consumer behavior” (IR-2), “empiricist repertories” (IR-3), and “conjectural repertories” (IR-4) were identified in the literature. IR-1 involved negative descriptions of both medication hoarding and stockpiling, reflecting their similar perceptions by the researchers. Medication stockpiling was associated with negative consequences such as antibiotic resistance (Buchholz et al., 2007), deliberate self-harm (Wu et al., 2012), and increased healthcare costs, medication poisonings, and medication diversion (Plummer, 2013). It was also used in place of “panic buying” with a negative connotation (Tomas et al., 2017). Medication hoarding also was framed

together with other negative behaviors, such as binging medications and being "treatment resistant" (Lester, 2014).

Despite the negative narratives, medication stockpiling was also described neutrally as a consumer behavior in other studies. This pattern was recognized as IR-2, but within these repertories, some confusion in medication stockpiling was observed. In one study, medication stockpiling was described as an act of purchase, and storage in one study (Buchholz et al., 2007). In contrast, in another study, the meaning of medication stockpiling only pertained to the purchase and was regarded separately from the act of storage (Thach et al., 2013). In another case, medication stockpiling was portrayed negatively only when done excessively, indicating that this was not always a negative behavior (Tomas et al., 2017). Hence, the contrasting descriptions of medication stockpiling IR-1 and IR-2 may indicate its various interpretations and the resultant confusion by the researchers.

As the discourses for the analysis were sampled from scientific literature, the empiricist repertoires were readily identified as IR-3. The empiricist repertoires are often composed of discursive devices used to construct descriptions as factual (Potter, 1996; Wiggins, 2017). In the current study, the discursive devices such as neutral or distant footing, footing shifts, detail, and narrative organization entailed IR-3. Neutral or distant footing was mostly composed of the usage of third-person nouns and minimized the involvement of the authors in the discourses. This footing shifted especially when the validity of the presented information could be enhanced by reporting of its sources and their identity. For instance, when referencing the

work by Daughton and Ruhoy, Plummer referred to them as “researchers” and their work as “seminal” (Plummer, 2013).

Although the style of writing contained the devices for the empiricist repertoires (IR-3), some parts of the discursive reality were composed of conjectures. This pattern of the usage of conjectures was noted as IR-4. These conjectures were made without supporting information, for instance, assuming people “often” unintentionally stockpiled unused or expired medications (Thach et al., 2013). Likewise, these conjectures relied on the authors’ assumptions for what people would do or often did.

The meanings of medication hoarding and stockpiling were also assumed and interchangeably utilized. In the studies which utilized medication stockpiling as the main descriptor for the phenomenon of interest, hoarding was used in place of stockpiling. The intent of this substitution seemed to be either to avoid redundant word usage or to clarify the meaning of stockpiling. However, IR-1 indicated the similar negative perceptions of the two behaviors, while IR-2 regarded medication stockpiling as neutral. Based on the inconsistent interpretations of the behaviors, such interchangeable use of the terms would worsen the confusion around their meanings. A similar trend was observed in the principle-based concept analysis with many conceptual definitions being imprecise and inconsistent, or their meanings being assumed. Hence, the lack of precise definitions of medication hoarding and stockpiling seems to be the cause of the confusion in the interpretation of their meanings and their confusing narrations. In this sense, the

results of the principle-based concept analysis and discursive psychology were logically congruent.

Another cause of the conceptual and discursive confusion in medication hoarding and stockpiling can be inferred from a greater contextual scope. As consumer behaviors which do not only pertain to medications, hoarding and stockpiling also seem to be misinterpreted and mischaracterized in literature.

The consumer hoarding behavior is characterized by its excessive acquisition, clutters caused by the hoarded items in the living space, and difficulty to discard them (Shaeffer, 2017). These characteristics can be explained by a few different theoretical frameworks. For acquisition, the commodity theory explains hoarding of scarce resources. Based on the theory, scarce commodities are perceived more desirable and possessing these items confers the feeling of personal distinctness and more value. The prospect theory explains how people hoard “just in case,” based on the principle of loss aversion. The principle suggests people experience a greater degree of discomfort with losses than with gain. With uncertain availability of an item in the future, people will hurry to purchase the item “just in case.” The item may not be available indefinitely, so consumers choose to gain now to avoid their loss in the future (King & Devasagayam, 2017). Economically, the risk minimization theory (McKinnon et al., 1985) illustrates hoarding in terms of averting a high risk of product deprivation. In other words, people hoard when the risk of product shortages is higher than the cost of maintaining inventory of the hoarded item (Cherrier & Ponnor, 2010; McKinnon et al., 1985).

The clutters of hoarding can be sociologically explained, as consumers furnish themselves or their surroundings to represent their social status or the higher status desired (Shaeffer, 2017). Furthermore, the endowment effect explains the difficulty discarding experienced by hoarders as they tend to endow a higher value, including the emotional merit, on objects they own compared to objects they do not possess (King & Devasagayam, 2017). The difficulty is also sociologically explained and can be associated with frugality, thrift, gleaning, avoidance of guilt of being wasteful (Arnould 2003), and environmentalism (Shaeffer, 2017).

These theories can also be applied to explain medication hoarding. For instance, the rationales for medication hoarding were mostly for “future use.” Only one study specified the reason for keeping for future use as “in fear of not being able to get more in the future” (Kaboré et al., 2021). This aspect can be explained by the prospect theory where people acquire additional stocks just in case. In another incidence, patient hoarded medications to not be wasteful (Martinez et al., 2012). Such rationale may be a way of avoiding guilt and can be sociologically explained (Arnould, 2003; Martinez et al., 2012).

The theories discussed thus far rationalize hoarding. In contrast, the medicalization of hoarding or perceiving the behavior pathologically has instilled a general perception of the behavior as “deviant” (Shaeffer, 2017), creating a stigma around it. Compulsive hoarding or hoarding disorder is now a clinical condition hallmarked by the acquisition of worthless objects or those with limited value, difficulty discarding them, and clutters in living areas caused by the saved objects

(Frost & Hartl, 1996; Kalogeraki & Michopoulos, 2017). These characteristics are similar to the characteristics of the consumer hoarding behavior. However, hoarding disorder is far more intense and causes distress in the hoarders, themselves. They keep acquiring objects of less value or being worthless without disposing them. The hoarded objects then cause clutters making their living space inhabitable (Shaeffer, 2017; Snowdon, 2015).

This pathological view neglects the possibility that hoarding can be an adaptive consumer behavior. However, as Snowdon suggests, hoarding only becomes a disorder, when the behavior is excessive, causes distress, and interfere with one's life. Hence, hoarding does not exist in a dichotomy. It can take a form located on a continuum from being an adaptive behavior and to being a disorder (Snowdon, 2015).

The pathological perspective of hoarding was also observed in the medication hoarding literature. Both principle-based concept analysis and discursive psychology identified medication hoarding frequently being negatively reported or perceived in the literature. In addition, VanDyke et al. developed a scale for medication hoarding, based on Savings Inventory-Revised (SI-R), a hoarding disorder scale. In this study, the hoarding consumer behavior was regarded equivalent to hoarding disorder and they shared the same three main characteristics discussed earlier (VanDyke & Steffen, 2017). This prevalent pathological perspective does not consider that medication hoarding can be adaptive and is not always a negative behavior. The one-sided perspective may also cause stigma toward medication hoarding, hindering its research.

The consumer stockpiling behavior is defined as “buying large quantities of a product and/or shifting purchase times to buy before the expected time of next purchase” (Bose et al., 2013). This behavior has been studied mostly in the context of building safety stocks for pricing and promotional benefits (Bose et al., 2013; Heslin et al., 2013; Mela et al., 1998). Stockpiling for a rational consumer behavior is a cost minimization strategy, since they stockpile more with the higher deal magnitude, lower inventory cost, and higher usage rate (R. C. Blattberg et al., 1981). Hence, deal proneness, brand loyalty, the product consumption rate, deal frequency, price, product inventory level, and depth of price discount may influence stockpiling (Beasley, 1998; R. Blattberg et al., 1978; R. C. Blattberg et al., 1981). Stockpiling is also studied in the context of disaster situations, including the recent COVID-19 pandemic. Before, during, or after a disaster, perceived scarcity of goods, perceived severity of the situation, doomsday prepping beliefs, the fear and expectations of shortages (Ahmadi et al., 2022), and past experience in crisis circumstances (Fernando et al., 2021; KURIHARA et al., 2012) may also influence stockpiling.

Medication stockpiling showed similar patterns. For instance, medications were stockpiled in anticipation of a threat to the continuation of therapy. Such threats include disasters, financial challenges, and medication shortages (Al Zoubi et al., 2021; Dunn, 2017; Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Moriarty et al., 2018; Nam et al., 2023; Tomio et al., 2012). Though their study was excluded from the current analyses, Skipper also observed a surge in the population insulin sales before the increase in its copay. (Skipper, 2012).

Hoarding and stockpiling are similar in that they both can involve extreme acquisition. However, in their comparison, stockpiling is regarded as an "acceptable" consumer behavior, while hoarding is not (Bose et al., 2013). Similarly, a systemic review of stockpiling reports that hoarding is associated with having depression, anxiety, and impulse control difficulties unlike stockpiling (Fernando et al., 2021). Hoarding is framed as irrational based on its association with these traits. This perspective only considers hoarding pathologically. Also, it neglects that stockpiling can involve these traits as well (Ahmadi et al., 2022; Dammeyer, 2020; Fernando et al., 2021). Hence, the rationality does not seem to be the distinguishing feature between the two behaviors.

This brief literature review indicates that the consumer hoarding and stockpiling behaviors both exist on a continuum ranging from being rational and irrational. Hence, perceiving and portraying them as only positive or negative may not appropriate. To better understand these behaviors, this range of rationality involved in each behavior should be better defined and studied.

In healthcare, on the other hand, medication hoarding and stockpiling were portrayed in a similar fashion with only medication stockpiling being regarded as a more justifiable behavior. In the principle-based concept analysis, such narrative was observed in the context of earthquakes, medication shortages, and the COVID-19 pandemic (Al Zoubi et al., 2021; Dunn, 2017; Kadowaki et al., 2014; Kobayashi et al., 2016; Moriarty et al., 2018; Nam et al., 2023; Tomio et al., 2012). In contrast, medication hoarding was referred as "aberrant" (Back et al., 2009), "inappropriate" (Kalyango et al., 2012), or as a "problem" (Huang, 1996). In the

discursive psychology, two relevant interpretative repertoires, “medication hoarding and stockpiling as negative behaviors” (IR-1), and “medication stockpiling as a consumer behavior” (IR-2) were identified. In this discursive reality, hoarding and stockpiling were perceived negatively, whereas stockpiling could also be interpreted neutrally as a consumer behavior or hence, being more justifiable.

The results of the principle-based concept analysis and discursive psychology indicated that medication hoarding and stockpiling may also involve a range of rationality. However, how the consumer behavior concepts are adopted in healthcare and in the context of medications is unknown. If these concepts are to be adopted in healthcare, firmer conceptual foundations for the consumer behaviors should be established first and translate these findings in terms of medications.

The literature reviewed thus far attempts to distinguish hoarding and stockpiling based on their rationality. However, instead of the rationality, the product consumption process included in each behavior is a more appropriate distinguishing feature. As noted by the three main characteristics, hoarding encompasses acquisition, retention as indicated by the clutters, and disposal. Also, as its definition suggests, stockpiling only pertains to acquisition. The two behaviors may be confused often, because both involve acquisition. Evidently, a description of the acquisition in hoarding aligns with the definition of stockpiling provided earlier: “hoarding exists when the consumer’s current inventory of an item exceeds his inventory in previous periods while his expected consumption rate…remains constant” (Stiff et al., 1975). Likewise, the principle-based concept

analysis found that medication hoarding involved the entire span of medication consumption cycle, while medication stockpiling included acquisition and retention only. Unlike stockpiling as consumer behavior, medication stockpiling involved retention, potentially because it was cross-sectionally operationalized during the retention phase.

Furthermore, the precise understanding of medication hoarding and stockpiling, and their rationality may be important for the betterment of science. However, to consolidate the research effort and gain more practical implications, it may be more significant and effective to refer both medication hoarding and stockpiling as medication accumulation. Such perception was also applied for the second phase of the concept analysis.

Comprehensively framing medication hoarding, medication stockpiling, and UUEL medications as medication accumulation has notable advantages. In most cases, medication hoarding is perceived negatively, potentially causing a stigma around the behavior. Such stigma may hinder research regarding the behavior and, for instance, expose study subjects to a great degree of social desirability bias. The term, medication accumulation, however, may be perceived more neutrally and may circumvent such stigma. This comprehensive framing also enables the narrations of the relevant issues from a behavioral perspective. As noted in the context of UUEL medications, the current narratives focus on the solutions for the end results like medication waste and the negative consequences but fail to connect them to the behaviors like medication hoarding and stockpiling. Without connecting the two sides, it is difficult to grasp the process of the behaviors leading

to their outcomes. The understanding of the process, however, is imperative in systematically guiding patients for better medication acquisition, use, and disposal.

In conclusion, the discursive psychology revealed four interpretative repertories around medication hoarding and stockpiling. These repertories were “medication hoarding and stockpiling as negative behaviors,” “medication stockpiling as a consumer behavior,” “empiricist repertoires,” and “conjectural repertoires.” This finding suggested that the discursive reality was confusing, similar to the conceptual confusion identified in the principle-based concept analysis. The confusion seemed to originate from the inadequate understanding of hoarding and stockpiling as consumer behavior. For instance, the two both can be rational and irrational, but hoarding is far more prevalently perceived negatively. To promote and consolidate future research effort, comprehensively framing the phenomena as medication accumulation is strongly recommended.

CHAPTER 5: CONCLUSIONS

5.1 Limitations

The findings of the dissertation should be reviewed with considerations of the following limitations:

1. The principle-based concept analysis integrated the known knowledge about medication hoarding, medication stockpiling, the retention of UUEL medications. However, it did not advance these concepts, as the advancement of such knowledge was not the intended purpose of the method or the current study. To clarify, the theoretical definition from the study did not involve conjectures or theorization done by the researcher. The definition was constructed only based on the observable empiric data identified in the literature. Despite this limitation, based on the baseline understanding established from the analysis, further theorization, conceptualization, advancement of the concepts may be more feasible for further research.

2. The integration of the knowledge about medication hoarding, medication stockpiling, and the retention of UUEL medications led to the formation of the concept of medication accumulation at home. The three concepts may be the major constituents of medication accumulation, but they may not represent it entirely. For instance, rationing of medications which may lead to the accumulation of medications was observed in lay media by the researcher. Medication rationing, however, was not identified during the literature search. Introducing such external

understanding or bias would undermine the systemic search process and so this concept was not included in the study.

3. Discursive psychology is often utilized in analyzing the discursive reality based on more dynamic social interactions like a dialogue (Wiggins 2017). Though such social context was not apparent, the current discursive psychology was conducted under the assumption that scientific literature was a form of social interaction. In other words, the researchers of the sampled literature were assumed to have done due diligence in reviewing and interacting with scientific media before publishing their work. Their published work was perceived as their means of communicating with other authors. However, the degree of their involvement in this scientific communication prior to the publication could not be determined.

4. Although the sampled literature included studies from various countries, the regional and cultural difference was not examined. These countries may have different rules, regulations, and infrastructures governing their healthcare systems, affecting the concepts of interest. Such difference, however, was not reported in detail in the literature. Furthermore, the current study aimed to establish a comprehensive understanding of the three concepts of interest by identifying the general trend in the data. The tedious process of distinguishing the regional differences would have hindered the identification of such trend embedded in the disparate literature.

5. The current study sampled the literature which examined medication hoarding, medication stockpiling, and the retention of UUEL medications by

individuals. Any population, organizational, and institutional data were excluded from the analyses. Thus, the findings do not reflect population trends or similar concepts observed in organizational or institutional settings.

6. Some of the characteristics of medication accumulation closely resembled the medication access barrier reported by the Pharmacy Quality Alliance ((Holland et al., 2021; Pharmacy Quality Alliance, 2019). Based on the close similarity, medication accumulation may be related to these access barriers, but this relationship should be further clarified. Clarifying such relationship may explain, for instance, how medication access manifest as medication accumulation. Such hypothesis seemed reasonable as the current study also found that medication accumulation could be driven by acquisition barriers.

7. Discursive psychology was conducted to clarify the reasons for the confusion between medication hoarding and stockpiling identified in the principle-based concept analysis. If the sequence of these two methodologies were switched, the nuances in the analyses may be different, but the outcomes of the research would have still stayed the same. If discursive psychology were conducted prior to the concept analysis which involved a denser set of data, the principal investigator would have been less biased regarding the relevant phenomena. Despite this bias, since the conceptual knowledge bases for the study subjects were so insubstantial, the outcomes and consequences would not have changed.

5.2 Future Research

Despite these limitations, the current study provided a knowledge baseline for more effective future research. The following are the recommendations related to the study objectives.

5.2a Recommendations Related to Objectives 1, 3, and 4

Under Objective 1, the current study evaluated the conceptual maturity of medication hoarding, medication stockpiling, and the retention of UUEL medications. Under Objective 3 and 4, it also identified the conceptual and discursive confusion between medication hoarding and stockpiling and theorized the potential cause of such confusion. The outcomes of the analyses led to the following recommendations for future research:

Recommendation 1: The terminologies such as medication hoarding, medication stockpiling, and UUEL medications should be clearly defined. Their inconsistent and imprecise definitions were identified as the main cause of the conceptual immaturity and confusing discursive practice. In scientific literature, precisely defining the phenomenon of interest aligns the understanding of the author and audience. Such alignment leads to more accurate scientific communication and the formation of concrete knowledge baseline conducive for consolidated research endeavors.

Recommendation 2: A better understanding of hoarding and stockpiling as consumer behaviors is needed. Some confusion in the two consumer behaviors may have transitioned into medication hoarding and stockpiling. For instance,

hoarding can vary along a continuum from being adaptive to being a disorder. However, a framework that encompasses both perspectives is not available. Stockpiling which is assumed to be a rational and economical consumer behavior can also involve irrationality. When a framework which can account for this variability is successfully established, its adoption in medication hoarding and stockpiling can be strategized.

Recommendation 3: Medication hoarding and stockpiling as well as UUEL medications should be comprehensively regarded as medication accumulation. Such framing will consolidate the research effort in this field, minimize any stigma around a particular behavior, and enable the understanding of the issues from a behavioral perspective. The behavioral perspective and the corresponding research will lead to more clues to systematically guiding patients for better medication acquisition, use, and disposal.

5.2b Recommendations Related to Objective 2

Within the confusing paradigm of the data, some loose trends were integrated together to construct a theoretical definition of medication accumulation under Objective 2. Based on this theoretical definition, the following are recommended for future research:

Recommendation 4: The current study determined that the accumulation of the unserviceable medications could lead to negative outcomes. However, the extent to which it contributes to the negative outcomes is not clearly delineated in the literature and should be further researched. Based on how medication

accumulation affects the negative outcomes, resources can be utilized more effectively to develop interventions to target medication accumulation and prevent such outcomes.

Recommendation 5: A comprehensive study that examines and validates the findings of the current study needs to be conducted. Such effort will also have to clarify the gaps identified in the current study such as when the behaviors of interest should be perceived positively or negatively through a more in-depth analysis like a grounded theory study. In the process of theory generating, the relationship of the constituent concepts such as medication hoarding, medication stockpiling, and the retention of UUEL medications can also be delineated.

5.3 Recommendations for Patients, and Healthcare

This study is the first comprehensive overview delineating the behaviors that lead to the accumulation of potentially problematic medications (i.e. unserviceable) at home. The unserviceable medications were determined to pose a higher risk and associated with negative consequences. The study also consolidated the empiric evidence of how the serviceable medications could turn unserviceable. The previous literature assumed such transition based on conjectures or described it based on the fragmented data. Based on this relationship, the acquisition barriers and use intent of the medications voluntarily acquired were recognized as the indirect drivers of the accumulation of the unserviceable medications. The direct drivers of the accumulations were identified

as the formation of leftover stocks, disposal barriers, and use intent of the medications involuntarily acquired.

Medication take-back and reuse programs, and at-home disposal kits were determined as effective strategies to lower the barriers to acquisition and disposal and prevent the accumulation. The expansion of these programs would be facilitated when the society recognizes or expresses the need for them. This bottom-up approach driven by the public would only be possible if they recognize the significance of the accumulation of the unserviceable medications. To do so, healthcare practitioners should be aware of these currently available resources. With this information, they can educate patients and promote these services better.

An effective top-down solution would involve a system which incentivizes the use of these programs. The available resources often cost a fee or are sparsely located and cannot be conveniently assessed by the public. Financially incentivizing proper disposal or medication donations for reuse can be a strategy, easing their utilization. Implementing unit-packaging may also make more medications become eligible for donations for reuse.

The formation of leftover medications was recognized as another area which could be improved. The leftover medications were patients' own or received from someone who moved or passed away. To reduce the amount of these leftover stocks, the prescribers should be mindful of avoiding overprescribing. Providing patients with a short course of trial prescriptions at the initiation of therapy is another prescribing strategy. While being on the therapy, patients can be supported by healthcare practitioners to adhere to their therapy better. Telephone-

based reminder interventions, and medication reviews are some of the examples of this approach.

It is important to note that these recommendations are based on the US where the study was conducted. Narrowing the regional scope will allow for a more focused and precise narrative.

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Appendix 1: Literature Search Records

Search Date: 02/10/2023

Search Platform: Ovid

#	Searches	Results
1	exp Hoarding Behavior/ or exp Hoarding Disorder/	343
2	(medication* or medicine* or drug* or prescription*).tw.	2718415
3	((medication* or medicine* or drug* or prescription*) adj3 hoard*).tw.	36
4	((medication* or medicine* or drug* or prescription*) adj3 stockpil*).tw.	155
5	(stockpil* or hoard*).tw.	4041
6	1 or 5	4047
7	3 or 4	190
8	2 and 6	630
9	7 or 8	630
10	limit to english language	551
11	limit 11 to humans	474

Upon reviewing the abstracts, 65 articles were identified to potentially contain relevant information. Among the 65 articles, 24 were excluded for being letters, opinions, commentaries, articles with irrelevant information, population data studies, and institutional and organizational hoarding.

Search Date: 02/13/2023

Platform: PsychInfo

#	Searches	Results
1	exp Hoarding Behavior/ or exp Hoarding Disorder/	1390
2	(medication* or medicine* or drug* or prescription*).tw.	393451
3	((medication* or medicine* or drug* or prescription*) adj3 hoard*).tw.	18
4	((medication* or medicine* or drug* or prescription*) adj3 stockpil*).tw.	15
5	(stockpil* or hoard*).tw.	2546
6	1 or 5	2705
7	3 or 4	33
8	2 and 6	177
9	7 or 8	177
10	limit 10 to english language	164
11	limit 11 to humans	164

Upon reviewing the abstracts, 41 articles were identified to potentially contain relevant information. A total of eight articles identified from the search on Ovid were also found on PsychInfo. Among the 33 articles, 19 were excluded for being letters, opinions, commentaries, articles with irrelevant information, population data studies, institutional stockpiling, and studies regarding syringes and illicit drugs.

Search Platform: Ovid

#	Searches	Results
1	((medication* or medicine* or drug* or prescription*) adj1 unneeded*).mp.	15
2	((medication* or medicine* or drug* or prescription*) adj1 leftover*).mp.	131
3	((medication* or medicine* or drug* or prescription*) adj1 expired*).mp.	252
4	((medication* or medicine* or drug* or prescription*) adj1 unused*).mp.	333
5	((medication* or medicine* or drug* or prescription*) adj1 unwanted*).mp.	260
6	((medication* or medicine* or drug* or prescription*) adj1 returned*).mp.	110
7	((medication* or medicine* or drug* or prescription*) adj1 residual*).mp.	409
8	1 or 2 or 3 or 4 or 5 or 6 or 7	1378
9	exp Prescription Drugs/	6965
10	exp Nonprescription Drugs/	6633
11	8 and 9	78
12	8 and 10	20
13	11 or 12	93
14	Limit 13 to English language	87
15	Limit 14 to humans	80

Upon reviewing the abstracts, 53 articles were identified to potentially contain relevant information. A total of three articles were already found from the previous searches on Ovid and PsychInfo. Among the 50 articles, 16 articles were excluded for having information regarding the implementation of various disposal methods, veterinary medicine, patients' perspectives on medication reuse and waste, and UUE medications in non-home environments.

Search Date: 02/17/2023

Search Platform: PsychInfo

#	Searches	Results
1	((medication* or medicine* or drug* or prescription*) adj1 unneeded*).mp.	2
2	((medication* or medicine* or drug* or prescription*) adj1 leftover*).mp.	14
3	((medication* or medicine* or drug* or prescription*) adj1 expired*).mp.	17
4	((medication* or medicine* or drug* or prescription*) adj1 unused*).mp.	37
5	((medication* or medicine* or drug* or prescription*) adj1 unwanted*).mp.	25
6	((medication* or medicine* or drug* or prescription*) adj1 returned*).mp.	14
7	((medication* or medicine* or drug* or prescription*) adj1 residual*).mp.	37
8	1 or 2 or 3 or 4 or 5 or 6 or 7	135
9	exp Prescription Drugs/	6210
10	exp Nonprescription Drugs/	516
11	8 and 9	29
12	8 and 10	0
13	11 or 12	29
14	Limit 13 to English language	29
15	Limit 14 to humans	29

Upon reviewing the abstracts, 24 articles were identified to potentially contain relevant information. A total of three articles were already found from the previous searches on Ovid and PsychInfo. Among the 21 articles, 10 articles were excluded for having information regarding the implementation of various disposal methods, and patients' perspectives.

Search Date: 03/25/2023

Search Platform: Web of Science

	Searches
	medication* or medicine* or drug* or prescription*) NEAR/1 unused (Topic)
OR	(medication* or medicine* or drug* or prescription*) NEAR/1 unneeded (Topic)
OR	(medication* or medicine* or drug* or prescription*) NEAR/1 leftover (Topic)
OR	(medication* or medicine* or drug* or prescription*) NEAR/1 expired (Topic)
OR	(medication* or medicine* or drug* or prescription*) NEAR/1 returned (Topic)
OR	(medication* or medicine* or drug* or prescription*) NEAR/1 residual (Topic)
OR	(medication* or medicine* or drug* or prescription*) NEAR/1 unwanted (Topic)
NOT	Discussion OR Editorial Material OR Excerpt OR Letter (Document Type)
AND	English (Languages)
results	2176

The results were sorted by relevance and the first 10 articles were downloaded for analysis. The analysis stopped after the 7th article, because no new patterns were observed.

Search Date: 05/22/2023

Search Platform: Business Source Premier

	Searches
	(medication* or medicine* or drug* or prescription*).TX
AND	((medication* or medicine* or drug* or prescription*) n3 hoard*).TX
results	124

The results were filtered for English only and academic journals, and 15 abstracts were reviewed. A total of 2 articles were identified to potentially contain relevant information, but none of them did.

Search Date: 05/25/2023

Search Platform: Web of Science

	Searches
	(medication* or medicine* or drug* or prescription*) NEAR/3 hoard* (Abstract)
results	32

Upon reviewing the abstracts, 8 articles were identified to potentially contain relevant information. A total of one article was already found during the previous searches. Among the 8 articles, 7 articles were excluded for being review articles, veterinary medicine, and studies with irrelevant information.

Search Platform: Business Source Premier

	Searches
	(medication* or medicine* or drug* or prescription*).SU
AND	((medication* or medicine* or drug* or prescription*) n3 stockpil*).AB
results	33

The results were filtered for English only and academic journals, and 4 abstracts were reviewed. A total of two articles potentially contained relevant information, and one of them was excluded for having irrelevant information. The other article was found from PsychInfo in the earlier searches, and it was mistakenly excluded from the analysis then. However, upon reviewing the article again, the article ended up being included in the analysis.

Search Platform: Business Source Premier

	Searches
	((medication* or medicine* or drug* or prescription*) n3 unused).AB
OR	((medication* or medicine* or drug* or prescription*) n3 unneeded).AB
OR	((medication* or medicine* or drug* or prescription*) n3 leftover).AB
OR	((medication* or medicine* or drug* or prescription*) n3 expired).AB
OR	((medication* or medicine* or drug* or prescription*) n3 unwanted).AB
OR	((medication* or medicine* or drug* or prescription*) n3 returned).AB
OR	((medication* or medicine* or drug* or prescription*) n3 residual).AB
results	315

The results were filtered for English only and academic journals, and 69 abstracts were reviewed. A total of 9 articles were determined to potentially contain pertinent information. Among the 9 articles, seven were excluded because they involved population data.

Search Date: 05/26/2023

Search Platform: Web of Science

	Searches
	(medication* or medicine* or drug* or prescription*) NEAR/3 stockpil* (Abstract)
results	141

Upon reviewing the abstracts, 5 articles were identified to potentially contain relevant information. Among the 5 articles, one article was excluded for having irrelevant information.

Search Date: 08/10/2023

Theoretical Sampling

“Parkinson’s medication hoarding” searched on Google Scholar

Appendix 2: Identification of Conceptual Components in Medication Use Cycle

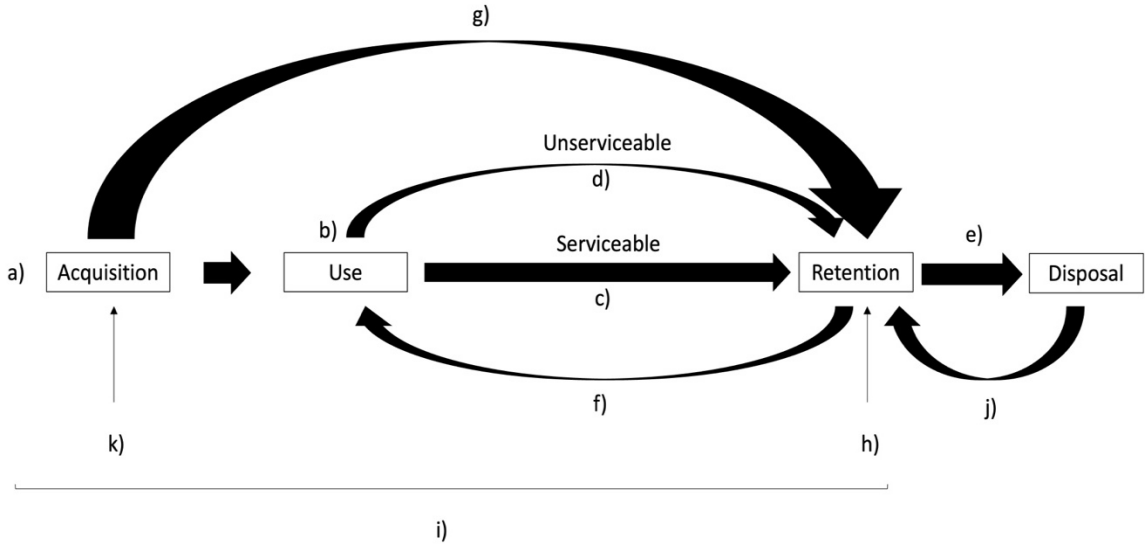

Figure 12 Medication Use Cycle with Four Stages: “Acquisition,” “Use,” “Retention,” and “Disposal”

The conceptual components of medication hoarding, medication stockpiling, and the retention of UUEL medications were located along the medication use cycle. The locations of the conceptual components were labeled with letters. The retention phase was added to the traditional product consumption model, since most studies operationalized the concepts cross-sectionally during this phase (Figure 13).

Medication Use Cycle – Medication Hoarding

Acquisition – Medication Hoarding

k) The stage of acquisition was composed of the original sources of the hoarded medications: “pharmacist,” “self-prescribed,” “general practitioners,” “doctors,” and “neighbors” (R. Law & Chalmers, 1976; Tsiligianni et al., 2012). Hoarding of medications, food and daily supplies was measured during the COVID-19 pandemic, but whether the pandemic preceded the act of hoarding was not clearly reported (Zhang et al., 2020).

Retention – Medication Hoarding

c) The transition from the use to retention was identified in the non-cancer chronic pain patients hoarding medications “in fear of not being able to get more in the future” (Kaboré et al., 2021). These patients would use constantly and chronically consume pain medications and they were storing an extra stock of the serviceable medications.

d) Some reported the patients hoarded, because they had not had the illness for which medications were prescribed (Ellis et al., 2011). This information indicated that the hoarded medications were once in use, but it became unserviceable once the illnesses for which the medications were indicated were resolved.

h) Any information describing the status or conditions of the hoarded medications helped identifying the retention phase. This information includes the

purposes and storage locations of hoarded medications. Any phenomena or attributes proven to be associated with the hoarded medications or hoarders belong to this phase.

j) Some medications were left behind by decedents and re-possessed by their family members (Ekedahl, 2006; Regenthal et al., 2002), indicating a transition from the disposal to retention.

Use – Medication Hoarding

f) Borrowing and lending of hoarded medications (Alhomoud, 2020) and using them for committing suicide (Walcott, 2000) and for self-medication (Ewunetei et al., 2021) denoted the retention or hoarded medications being repurposed for some other use.

Dispose - Medication Hoarding

e) The transition from the retention to disposal was recognized when a patient was asked about the fate of their hoarded medications, and they reported, “if they’re old and funny, drop ‘em down the dunny” (Ellis et al., 2011).

Acquisition, Use, and Retention – Medication Hoarding

i) The entire cycle was portrayed as

“just keep taking something, they went to some other doctor, they prescribed something else, they kept taking” (Ellis et al., 2011)

A patient expected to be prescribed something new at each physician consultation and kept visiting different physicians, and "taking" the prescriptions.

i) Another example was showcased by an inmate who hoarded his tablet medication in the prison and committed suicide. After the first suicide attempt, the facility started giving him the liquid form of the medication to prevent hoarding. However, during the transition to a different prison, the medication form was converted back to tablets accidentally. As a result, the inmate ended up hoarding the medication and succeeding in ending his life on his own. These two cases illustrated how patients progressed through the cycle of the acquisition, use and retention.

Medication Use Cycle – Medication Stockpiling

Acquisition – Medication Stockpiling

a) The past experiences with disasters (Kadowaki et al., 2014; Kobayashi et al., 2016; Tomio et al., 2012), and medication shortages, borrowing money for more medications, counseling from health practitioners about stockpiling for shortages (Moriarty et al., 2018), implementation of the automated dosing dispensing schemes (Larsen & Haugbølle, 2007) were reported to precede the acquisition of stockpiled medications. Some of the rationales associated with stockpiling came before the acquisition.

"My son is a type 1 diabetic, and this is something that I have pondered for a while. Insulin is my son's lifeblood, so whatever it took to get it, I would try" (Kabel & Chmidling, 2014).

In these cases, the health of the family motivated them to "get" the medications.

Retention – Medication Stockpiling

c) Patients reported stockpiling extra of their medications that were already in use and could be used (Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Larsen & Haugbølle, 2007; Patel et al., 2014; Tomio et al., 2012).

d) The medications that were no longer being used or those from previous prescriptions were also stockpiled (Larsen & Haugbølle, 2007). The medications that were not needed immediately were stockpiled for future use (Unger et al., 2021).

g) The extra supplies of medications that were already in use and only acquired for retention were reported for the forementioned disasters (Heslin et al., 2013; Kadowaki et al., 2014; Kobayashi et al., 2016; Patel et al., 2014; Tomio et al., 2012) and during the COVID-19 pandemic (Al Zoubi et al., 2021; Nam et al., 2023). Another example was obtaining more medications regardless of immediate use for potential financial challenges in the future (Patel et al., 2014).

h) Any information describing the status or conditions of the stockpiled medications helped identifying the retention phase. This information includes the purposes and storage locations of stockpiled medications. Any phenomena or

attributes proven to be associated with the stockpiled medications or stockpilers belonged to this phase.

Use – Medication Stockpiling

f) The various uses of stockpiled medications signified the transition from the retention to use. The uses included sharing of stockpiled medications with others (Al Zoubi et al., 2021; Patel et al., 2014), using as a backup (Larsen & Haugbølle, 2007; Moriarty et al., 2018), self-medication (Amenta et al., 2022), and suicide attempts (Donovan, 1990).

Acquisition, Use, and Retention – Medication Stockpiling

i) The sequence was illustrated as the mechanisms of stockpiling. The "Repeated acquisition without being in need" and "Navigate across systems" categories identified for the mechanisms allowed for the identification of the phase.

Medication Use Cycle – Retention UUEL Medications

Acquisition- UUEL Medications

a) The attributes of the individuals storing these medications that were proven to precede the acquisition enabled the identification of these phase. These attributes included but were not limited to the history of opioid misuse (Renny et al., 2022), and lack of medication disposal education (Reis et al., 2014).

k) Overprescribing was a process that helped identifying the acquisition phase (Braund et al., 2009; Ho et al., 2018; Jha et al., 2022; West et al., 2016).

Use - UUEL Medications

f) The repurposed use of these medications, including medication sharing or diversion (Bashaar et al., 2017; Beyene et al., 2019; Gascoyne et al., 2014; Gidey et al., 2020; Omae et al., 2018; Sapkota et al., 2022; Wajid et al., 2020; West et al., 2016; Wieczorkiewicz et al., 2013), and non-medical use of opioids (Inciardi et al., 2009; McCabe et al., 2013, 2019) denoted the transition from the retention to use. Self-medication (Asmelashe Gelayee & Binega, 2017; Tomas et al., 2017) was also recognized in this context.

Retention - UUEL Medications

c) or d) Forgetting to take their medications or forgetfulness (Addis, 2023; A. V. Law et al., 2015), and having doses that were not taken as scheduled (Ewen et al., 2015) indicated the transition from the use to retention of unused

medications or stockpiling. However, the transitions through c) and d) could not be distinguished, because the literature did not specify whether the medications that were not taken could function as serviceable.

d) The medications that were used but discontinued or expired at one point noted their transition from being used to becoming unserviceable and retained. Some of the related information pertained to the reasons for the discontinuation of therapy (Braund et al., 2009; Buykx et al., 2010; Gidey et al., 2020; Ho et al., 2018; A. V. Law et al., 2015; Lystlund et al., 2014; Metz et al., 2022; Voepel-Lewis et al., 2020, 2022; West et al., 2016; Wieczorkiewicz et al., 2013).

g) Some medications were “unopened” (Bekker et al., 2018; Bettington et al., 2018; Vogler & de Rooij, 2018) or ended up being left unused (Braund et al., 2009), noting that they were acquired, never used, and retained.

h) Any information describing the status or conditions of the unused, unwanted, expired, leftover, or returned medications helped identifying the retention phase. This information includes the purposes and storage locations of these medications. Any phenomena or attributes proven to be associated with these medications or stockpilers belong to this phase. Furthermore, the reasons that these medications had not been disposed suggested the potentially stagnant nature of the transition from the retention to disposal (Bettington et al., 2018; Bicket et al., 2021; Gidey et al., 2020; Persson et al., 2009; Sapkota et al., 2022; Voepel-Lewis et al., 2020, 2022).

j) The medications left behind by a decedent or someone who moved out from the same residence were retained by their friends or family members

(Alshehri & Banjar, 2022; Braund et al., 2009; A. V. Law et al., 2015; Lystlund et al., 2014; Reis et al., 2014; West et al., 2016). This information indicates those disposed by one can be retained by someone else.

Dispose - UUEL Medications

e) The various “at-home” and “out-of-home” medication disposal methods shown in Table 7 and 8 suggests the transition from the retention to disposal.

Appendix 3: Medication Access Barriers and Their Definitions

Barrier	Definition
Organizational Health Literacy	Organizational Health Literacy is how health literate healthcare systems are in providing patient care. This encompasses everything from management, organizational systems and interoperability, and the healthcare work force.
Provider Competencies and Beliefs	Provider competencies and beliefs can impact patient access to care (e.g., lack of current medical knowledge, ability to provide culturally competent care, outlook on stigmatized conditions.)
Medical Conditions	Diseases and/or chronic conditions that can impact access to healthcare and medications.
Health Literacy	Health literacy characterizes the capability of the public to obtain and understand health information. It also includes the ability to make health decisions and to navigate the healthcare system in order to obtain medical services.
Insurance	Patient access to medical care/medications based on the type of medical insurance.
Patient Attitudes and Beliefs	Patient attitude and values towards the healthcare system and how negative attitudes can lead patients to not utilizing medical services, creating a barrier to accessing care.
Race/Ethnicity	Racial or ethnic background and how it impacts access.
Gender	How gender impacts patient access to medical care and medications.
Provider Availability	Includes adequate medical infrastructure, facilities, and competent workforce to provide healthcare and medication after a need is identified.
Language	Examination of barriers experienced by patients whose primary language is

	not English in gaining access to needed medical care and medications.
Public Support	Examines if taxpayer funded healthcare programs that provide access to certain forms of medical care and medications.
Transportation	Availability of transportation to medical care and medications. This includes car ownership and the adequacy of public transportation.
Rural/Urban	Examines barriers that are unique to urban and rural communities.
Costs	The costs of obtaining healthcare services. This includes the indirect costs of receiving care (e.g., transportation, time off work.)
Disability Status	The unique issues that patients with disabilities can face in accessing healthcare and medications.
Income	Barriers related to the income of patients.
Education	Barriers related to patient's educational level.

Table 13 Medication Access Barriers and Their Definitions (Holland et al., 2021; Pharmacy Quality Alliance, 2019)