




2020

## ANALYSIS OF INFORMATION VALUE CHAINS FOR GOUT SELF-CARE MANAGEMENT

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Digital Object Identifier: <https://doi.org/10.13023/etd.2020.358>

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### Recommended Citation

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ANALYSIS OF INFORMATION VALUE CHAINS FOR GOUT SELF-CARE  
MANAGEMENT

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DISSERTATION

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A dissertation submitted in partial fulfillment of the  
requirements for the degree of Doctor of Philosophy in the College of Communication  
and Information at the University of Kentucky

By  
Maranda Russell  
Lexington, Kentucky  
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## ABSTRACT OF DISSERTATION

### ANALYSIS OF INFORMATION VALUE CHAINS FOR GOUT SELF-CARE MANAGEMENT

This value chain analysis study sought to identify information needed by gout patients to successfully manage their disease, leading to a model for information extraction from patient health records. A scoping review was conducted to identify the types of information needed by gout patients. The findings of each included study were divided and analyzed according to the stages of the care delivery value chain. The results of the review were then used to create a gout information value chain as criteria for annotating the information deemed important for gout patients contained in publicly available patient education materials according to the stages of care delivery. The resulting annotations were used to develop a named entity recognition model capable of automatically labelling medical concepts from clinical notes by value chain stage. To identify concepts specifically relevant to gout patients, the concepts extracted from patient notes were used as candidate features in a phenotyping algorithm to identify concepts associated with gout flares. While this study was able to develop a model for identifying information relevant to gout flares, the findings suggest that there is information missing from patient education materials and their clinical notes that could be valuable to gout patients for self-management.

**KEYWORDS:** care delivery value chain, patient information, cNLP, gout management

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ANALYSIS OF INFORMATION VALUE CHAINS FOR GOUT SELF-CARE  
MANAGEMENT

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DEDICATION

*To Rocky and Nancy Russell, without whom I never would have stepped foot on a college campus.*

## ACKNOWLEDGMENTS

This dissertation, although an individual work, could not have been completed without the selfless support and constant encouragement of many people over the course of my academic career. I could have never completed this dissertation without each and every one of you that believed in me when I did not believe in myself. First, I want to specifically express my gratitude to Dr. Sujin Kim, who acted as my mentor and committee chair, for your commitment, support, and patient guidance throughout the entire process. I also greatly benefited from the constructive criticism and feedback provided by a flexible and helpful dissertation committee: Dr. Jeff Huber, Dr. Soohyung Joo, Dr. Ramakanth Kavuluru, and Dr. Debra Moser. Each of you challenged my thinking and provided valuable insights to improve this dissertation. In addition to all of the support and assistance I received from the faculty, staff, and fellow graduate students at the University of Kentucky, I am equally grateful to be the recipient of limitless support from family who continually encouraged and motivated me to continue my education. Thank you to my husband, Michael, for acting as a sounding board and providing critical technical assistance. All of the little things you do on a daily basis did not go unnoticed or unappreciated. Finally, my endless gratitude goes to all of my in-laws who provided childcare and other support throughout my many years of education. You all have helped me grow as a person and I am blessed to have you in my life.



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## CHAPTER 1. INTRODUCTION

The purpose of this study was to identify the information gout patients require to optimize their healthcare. Recent regulatory changes have made it impossible for health professionals to ignore health information technology, particularly electronic health record systems (EHRs) (Blavin, Ramos, Shah, & Devers, 2013). Studies have emerged indicating that these technologies can increase the ability of clinicians and patients to manage health care (Businger, et al., 2007). Initial studies on patient portals, a required feature of EHRs, have shown great potential for chronic disease management. These portals allow patients to access their health records through a secure website.

Early research demonstrated that patients with this easy access to their health information are more involved in their health care and this involvement can lead to long term benefits, especially for low income patients (Lake Research Partners, 2010). However, as illustrated in later chapters, gout patients have thus far been unable to consistently leverage available information to adequately improve health outcomes. Though much research has been done on related topics, particularly regarding patient education for effective treatment options, what information is valuable to gout patients throughout the continuum of care remains largely unanswered.

### 1.1 Background

In 2012, results from the National Health Interview Survey (NHIS) indicated that approximately fifty percent of adults in the United States had at least one chronic condition. Of those, roughly half identified as having multiple chronic conditions (Ward, Schiller, & Goodman, 2014). As life-long conditions, patients with chronic diseases tend to have multiple healthcare providers and higher consumption of health services (Centers for Disease Control and Prevention [CDC], 2009).

This is especially true for gout, the most common type of inflammatory arthritis which affects up to 6 million Americans (Lawrence et al., 2008). The risk of developing gout increases with age. It is also associated with several common clinical (e.g. diuretics, low dose aspirin, hypertension, cardiovascular disease) (Wallace et al., 2004) and behavioral (e.g. consumption seafood and beef) (Choi, Liu, & Curhan, 2005) factors.

Further complicating matters, gout treatment requires two different medication tacks, one for the acute symptoms (anti-inflammatory drugs) that arise when the disease is not properly managed and one for chronic disease management (urate-lowering therapies[ULTs]) designed to prevent the deposition of monosodium urate crystals in joints (Schlesinger, Dalbeth, & Perez-Ruiz, 2009).

Despite being considered the best understood of the joint diseases and the only chronic arthritis with the potential to be ‘curable’, gout still often goes undiagnosed and sub-optimally treated (Doherty et al., 2012). There are myriad reasons for this, all of which can be traced back to a lack of appropriate information needed for education. The complex nature of gout requires self-management for optimal treatment which must include medications and lifestyle changes. This makes identifying information values throughout the care continuum critical to encourage patient engagement in self-care (Fields & Batterman, 2018). However, this endeavor is often unsuccessful because there is no established consensus among stakeholders as to the goals and means of patient education in the various stages of care (Doherty et al., 2012).

## 1.2 Statement of Problem

With an initial promise of government financial incentives and technical assistance, and the threat of fines and other penalties in the future, the U.S. healthcare system slowly but surely began adopting electronic health records (EHRs) (Adler-Milstein & Jha, 2017). However, the goal of the HITECH Act was never mere adoption of technologies. The central tenet of the Act is the improvement of healthcare through the “meaningful use” (MU) of certified EHRs. HITECH identifies multiple ways to improve the quality, safety, and efficiency of healthcare (Blavin, Ramos, Shah, & Devers, 2013). One such way is through patient engagement. In order to make well-informed decisions, patients must be active participants in the management of their healthcare. Research has demonstrated that failure to supply patients with adequate information can contribute to poor adherence to treatment (Stevenson, Cox, Britten, & Dunder, 2004). To ameliorate this, the MU component of the HITECH Act requires that EHRs include functionalities that allow patients to easily access their personal health records (PHRs) (Ahern, Woods, Lightowler, Finley, & Houston, 2011). PHRs can contain various types of information from multiple

sources. To facilitate access to these records, MU mandates that EHRs provide a patient portal that is designed to support the communication of accurate information between patients and healthcare providers. As the portal is linked directly to their electronic medical record (EMR), from the perspective of the patient the information is provided automatically and is more personalized than a generalized search for health information through the Internet (Arnold et al., 2013).

Though results have been mixed, the general consensus is that patient portals provide a secure means of accessing relevant health information that can lead to higher patient involvement and engagement. The potential beneficial health outcomes include increased adherence to treatment, knowledge and understanding, and patient satisfaction, all of which can lead to better clinical outcomes (Kruse, Argueta, Lopez, & Nair, 2015). Of course, patients must use the portal to reap these benefits. Unfortunately, much of the initial research on patient engagement focused on deciding what patients could or should do rather than factors involved in actively engaging patients in their care.

Such findings are particularly relevant to patients with rheumatic diseases. The chronic, life-long nature of this disease group generates a multitude of information unique to each patient that could aid in self-management of the disease and its symptoms. However, there is a paucity of research specifically looking at the effects of health information available via patient portals on treatment of rheumatic diseases. The specific problem is that patients have access to an overwhelming amount of information without the knowledge or guidance to sort through, manage, or otherwise utilize said information to improve their health (Klerings, Weinhandl, & Thaler, 2015). A knowledge gap exists as to what personal health information is required to optimize care.

Some publications offer generic educational interventions that might help increase knowledge and understanding of gout and its treatment options. However, these studies focus on one or two aspects of disease management and do not include PHRs, which contain information personalized to the patient. In contrast, this study will look across the entire care continuum.



### 1.3 Study Purpose

Arthritis, a broad term generally used to refer to conditions in the rheumatic disease family, is considered to be one of the top ten chronic conditions. According to the European League against rheumatism (EULAR) (n.d.), rheumatism includes more than 200 diseases which can affect the entire musculoskeletal system, making it the most prevalent group of diseases in the industrialized world. Treatment of these diseases is usually complex, involving medications and lifestyle changes to decrease pain and preserve mobility. As such, patients with these diseases must actively engage in self-management to alleviate symptoms. Consequently, there is a plethora of information that patients must keep up with for effective self-care (Zhang et al., 2011). Much of this information is accessible via a PHR tethered to an EHR, making this an ideal disease group for cNLP research. On the other hand, each disease classed under this heading presents a unique set of opportunities and challenges.

Gout is an inflammatory disease caused by high uric acid in the blood (Schlesinger, 2004). It is the most prevalent form of inflammatory arthritis and continues to increase (Zhu, Pandya, & Choi, 2001). The most common symptom is gout flares which occur when uric acid crystalizes into needle-like formations within the joints (Suresh, 2005). Diagnostic codes have proven a poor source for flare identification in patients (Halpern, Fuldeore, Mody, Patel, & Mikuls, 2009). Furthermore, there is no standard definition for the symptom, leading researchers to search for better methods of identification using cNLP (Taylor et al., 2009).

The purpose of this study was to use clinical natural language processing (cNLP) techniques to determine the prioritization of patient health information and explore ways that health information technologies can best be utilized to provide that information for gout patients. The study included gout patients with available data in the University of Kentucky Healthcare (UKHC) EHR system.

The issues presented in this chapter highlight a fundamental problem with PHRs. In order to receive information, a user must first interact with the system. For various reasons, patients are not sufficiently motivated to engage with PHRs. This study sought to address this problem by performing a value chain analysis to identify the most relevant information that could be obtained through a patient's PHR and then using natural language

processing techniques to automatically extract information that patients could use to guide healthcare decisions. This is pertinent for several reasons.

First, tethered and integrated PHRs are populated with information from EHRs which were designed to meet the needs of healthcare providers. The average patient neither needs nor understands all of this information (Wilson, 2009). Furthermore, studies have found that access to such an excess of information has the potential to cause information overload (Wynia & Dunn, 2010).

Second, many studies focus on the effects of PHRs on health outcomes, with mixed results. Yet, the reasons for PHRs failing to produce the promised potential benefits largely remain a mystery (Giardina, Menon, Parrish, Sittig, & Singh, 2014). Health outcomes are the ultimate result of a complex set of processes. The value chain affords us the opportunity to view the entire continuum of care as a system to pinpoint where in the chain breakdowns are occurring.

Finally, value chain analysis can show us where value is not being created and evaluate if the gap can be addressed with the information available or if there is a patient need that current functionalities of PHRs are not able to fulfill.

#### 1.4 Study Importance

Patients have unprecedented access to their health records through patient portals. Such access is beneficial and necessary if patients are to be able to appropriately control their health care; however, the data is often offered without context or regard for individual background knowledge. This creates barriers to interpretation and optimal usage. This is especially troublesome for patients with chronic diseases who must deal with vast amounts of information over their lifespan.

It is expected that gout patients might benefit the most from this study, as they will have direct, tangible output to aid them in managing their health. By researching the information necessary for patients to successfully deal with issues faced by gout patients, potential solutions may be discovered for providing information currently lacking, encouraging more patients to persist in the management of their health conditions. Several other stakeholder groups may also benefit from the results of this study on automatically extracting valuable information from patient records. Clinicians may leverage findings to

institute personalized education programs by adapting templated patient education materials that typically lack information that is relevant to specific patients. This study may also benefit healthcare organizations, adding tools for more effective patient care via HIT because better information filtering can be provided for smoother workflow, educational enrichment, increased productivity, higher satisfaction, and reduction of costs and other resources (Clarke et al., 2013).

By understanding what information contributes to sustained engagement of patients in their care, leaders will be better equipped to understand the changes that are needed to further develop EHR systems. Lawmakers may also be encouraged to enact policy changes that continue to enable patients to access relevant health information, providing a platform for more efficient HIT tools and, in turn, paving the way for improved public health. These insights may also be helpful for creating strategies to close the health care gap by providing practical methods for incorporating information that can be used to minimize health disparities and target specific areas of inequity for engagement. Over time, these changes may impact an overall cultural change in the healthcare industry, providing an underlying foundation for patients to be better prepared for involvement in healthcare decision-making. These findings may also equip gout patients with useful guidelines for topics of discussion with healthcare providers. Patients educated according to study findings may become social and community sources of information and support. Their perspectives may offer guidance to others navigating an often-stigmatized disease while stemming the perpetuation of misinformation that currently abounds.

## 1.5 Research Questions

Value chain research can identify where value is being or could potentially be created. In reflection of this, the research questions for this study were:

RQ1: What are the major types of information required by gout patients according to the care delivery value chain?

RQ2: What information can be identified by mapping online gout patient education materials to the value chain?

RQ3: What gout information values can be identified from patient notes based on the value chain using cNLP techniques?

As there is no conclusive research for why gout patients are not getting necessary information, other research approaches may be too limiting. There are many layers and dimensions as to why gout patient outcomes remain suboptimal. A value chain analysis was used to try to uncover insights and develop a model for supplying gout patients with the best information for disease management at the most beneficial time in the care cycle.

## 1.6 Research Design Overview

This study was conducted in multiple phases, each with distinct output that feeds into the next. In the first phase, a literature review using Porter's care delivery value chain (CVDC) as a framework was performed. A value chain is a holistic approach that allows for looking at all stages of a process. As value is ultimately created and judged by patient well-being in healthcare, the CVDC essentially allows us to perform a needs assessment for patient information across the entire care continuum for gout. The information identified and categorized according to the stages of healthcare delivery served as the annotation guidelines for the second phase, where patient education materials were evaluated for information considered valuable to gout patients for managing the disease in each stage of care. Information chosen in this step was used to form our model for information extraction from clinical documents. Phase 3 saw the design and comparison of algorithms capable of identifying which factors included in this value chain were most predictive of gout flares. As the most common and often the first sign that gout is being poorly managed, information associated with and able to predict flares would be considered important and valuable (Suresh, 2005). More specific details about the design of the study are provided in chapter 3.

## 1.7 Summary

This study sought to understand what information helps gout patients engage in long-term self-management, using value chain analysis. As most previous work on gout patient information focuses on creating education and medication interventions for treatment, there is a knowledge gap as to other types of information that might aid in wellness goals, including what information is already available in EHRs that can be used

for this purpose. The results of this study may serve multiple stakeholders such as clinicians, healthcare policy makers, health IT developers, and most of all, gout patients.

Four more chapters follow. Chapter 2 is a review of the literature on the theoretical framework and principal techniques used in this study. The primary topic discussed for the next chapter is the gap in the literature related to a value chain model for patients to optimally manage gout long-term and clarifies how this study will fill this gap. Chapter 3 further discusses the research design and specific details of how the study was conducted. The remaining chapters focus on the output from the research conducted for this study. Results are reported in Chapter 4, followed by discussion and interpretation of the findings in Chapter 5.

## CHAPTER 2. LITERATURE REVIEW

### 2.1 Background

It is widely acknowledged that the United States spends over twice as much as other developed nations on health care. From 2004-2006, roughly \$1.8 trillion per year was spent on health care, about \$6,000 per capita (Anderson & Frogner, 2008). By 2008, that number had risen to \$7,681 per capita for a total of over \$2.3 trillion and continues to rise. The rise in health care costs has exceeded the rate of inflation while seemingly having a negative correlation with the quality of U.S. health care (Kaiser Family Foundation, 2010). For all the money spent, the United States has essentially the same life expectancy and mortality rates as countries like Germany, Canada, and Japan, which spend far less (Murray & Frank, 2010). This disparity between expenditures and outcomes has led to widespread analysis of the healthcare industry. These analyses have concluded that without some sort of major structural overhaul to reform healthcare, costs will continue to rise to an unsustainable degree (Council of Economic Advisors, 2009). This chapter will explore ways health information technology can turn the tide on those costs and/or offer more value for the money spent.

General consensus seems to be that, along with spending the most money, the United States has the best research and development, the best professional training and development, and a myriad of other superiorities in the healthcare field. Unfortunately, these advantages do not add up to a superior health care system, at least when it comes to things like population longevity and quality of life. Because healthcare systems exist within societies having differing cultural expectations and values, quality indicators can be rather subjective, making it difficult to compare economic value with other countries. However, with the Institute of Medicine reporting almost 100,000 inpatient deaths and two million ambulatory patient injuries due to errors, it would be irresponsible to discount the experiences and opinions of patients and their families (Brailer, 2005).

While the majority of businesses embraced technology-based information systems long ago, the medical field has been extremely reluctant to do so. This resistance continued in the face of numerous potential benefits until the government passed the Health

Technology for Economic and Clinical Health (HITECH) Act in 2009 (Blavin, Ramos, Shah, & Devers, 2013). This act provides monetary incentives to implement and use electronic health records to improve health care (Romano & Stafford, 2011).

The National Academy of Science has long recognized that information technology is essential to the dual goals of improving health care quality while cutting costs (Adams & Corrigan, 2003). Despite the health care industries reluctance to adopt information technology, much research has been done on ways clinical decision support systems can be used to reduce cost at the individual patient level. There are a multitude of systems that can help clinicians make the best choices for their patients and reduce errors through the use of checks, reminders, and alerts. Electronic health records, specifically, further reduce redundancy and errors by integrating patient data from multiple sources. These tools have the power to eliminate duplicate or otherwise unneeded testing and treatments (Payne et al., 2012).

Reducing expenses is only one side of the equation. If Americans were receiving equivalently superior health care to match the highly superior costs, there would not be such an issue. U.S health care needs to be safer, more patient-centered, more responsive, and much more cohesive. Research has shown that organizations that successfully manage costs do so through the use of information technology at the patient level and at the structural level to facilitate a more team like approach. Healthcare organizations accomplish this through technologies that allow patients to be more proactive in their care. This allows health care to take place in the patient's home or another lower cost location when possible. Health information technologies also provide more efficient communication allowing health care workers access to experts at any distance and the ability to share data with such experts quickly for consultations (Payne et al., 2012). There are multiple other ways technology can and does benefit health care such as maintaining records and making billing easier. However, there are reasons the industry has not embraced technology for health care purposes.

Cost reduction is the easiest way to prove a system's economic value. Dollar values can be placed on expenses that will be reduced over time and used to offset the cost to implement the new system. These numbers are based on estimates, which is risky, but is done in the business world all the time. Many healthcare organizations do not have the

capital to invest in an expensive system and wait for a return that may never materialize. The HITECH Act does mitigate this somewhat, but it only applies to certain systems.

It is much harder to put a monetary value on better health and, in actuality, better patient health outcomes do not directly benefit a health care organization's bottom line. Nor is there a financial return on investment for technology that facilitates those outcomes. Theoretically, better healthcare leads to repeat patronage and more patients. However, due to the current fee for use system, when an organization looks at its revenue, all it sees is less income from less testing and other services.

Information technology is essential to reducing health care costs while simultaneously improving quality. However, their benefits are not guaranteed. An organization must carefully choose system designs and functionality when adopting a new system and then successfully implement with an eye toward improving workflow and operations.

#### 2.1.1 Personal Health Records

In 2003, the Institute of Medicine (IOM) issued a report identifying the key features that an optimal electronic health records (EHR) system should have. Chief among them were that it provides knowledge and decision support to enhance patient care. To that end, the system should allow access of information to the proper users immediately. Two component systems considered integral to optimization are the electronic medical record (EMR) and the personal health record (PHR) (Tang, 2003). When PHRs are linked to an EHR in this manner, they are considered "tethered," as the information comes directly from the patient's EMR. This connectedness has many potential benefits.

Due to frequent usage for health and disease management, the majority of PHR research has focused on patients with chronic conditions (Bronwyn et al., 2018). In 2012, results from the National Health Interview Survey (NHIS) indicated that approximately fifty percent of adults in the United States had at least one chronic condition. Of those, roughly half identified as having multiple chronic conditions (Ward, Schiller, & Goodman, 2014). As life-long conditions, patients with chronic diseases tend to have multiple healthcare providers and higher consumption of health services (Centers for Disease Control and Prevention [CDC], 2009). Because PHRs provide patient access to



information along with tools for self-management and additional communication channels to healthcare providers, they are ideally situated to help with this process (Tenforde, Jain, & Hickner, 2011). However, PHRs are not a panacea and still have room for improvement. Many patients are still reluctant to adopt PHRs. Current barriers to effective PHR usage include low perceived value and usability, privacy and security concerns (Dontje, Corser, & Holzmer, 2014), and low health and technology literacy, especially in elderly populations (Lober et al., 2006). Prior research has made great strides, but these and other complex issues still must be dealt with in order to optimize patient education and care, particularly for those with chronic conditions.

### 2.1.2 Health Literacy

Advances in information and communication technologies (ICT) have made it possible to store and access the large amounts of data necessary for PHRs. However, PHRs demand that patients be able to adequately access, understand, and use the provided information to make appropriate health decisions in order to reap these benefits, making health literacy (HL) essential to improving healthcare (Bronwyn, Rollo, Georgiou, Balandin, & Hill, 2018). This requires a diverse set of literacy skills (cumulatively referred to as health literacy (HL)) that enable a patient to complete multiple tasks that involve reading and calculation, such as reading prescription labels and measuring medication dosages (Nielsen-Bohlman, Panzer, & Kindig, 2004). Lower HL is not only associated with adverse health outcomes, but also, specifically, less active self-management (Dewalt, et al., 2004).

In the case of musculoskeletal disorders, patients must have knowledge of their specific disease for optimal management and self-care. However, previous studies have demonstrated that many patients only know that they have arthritis and are unaware of any subtype (e.g. rheumatoid arthritis, osteoarthritis). Furthermore, patients often inaccurately self-report musculoskeletal diagnoses (e.g. gout, osteoporosis). While the diseases in this category require significant participation on the part of the patient for self-management, each has its own combination of medication and lifestyle intervention guidelines (Hill et al., 2015). This, coupled with the fact that most adults do not have the HL skills to accurately or consistently make use of health-related information, causes a disparity in the

self-management tasks patients are able to do and those that are required for optimal health outcomes (Kutner, et al., 2006). For gout patients specifically, health literacy is particularly low for medications, often leading to non-adherence. Encouragingly, patients seem to be aware of their knowledge gaps and want more information, especially about the whys and wherefores of treatment regimens (van Onna et al., 2015).

### 2.1.3 cNLP Methods

The HITECH Act of 2009 caused an upsurge in the adoption of electronic health records and researchers rapidly moved to take advantage of this data source (Blumenthal, 2010). Early studies largely focused on usability (Ellsworth, Dziadzko, O’Horo, Farrell, Zhang, & Herasevich, 2017) or using structured data for risk prediction modeling (Goldstein, Navar, Pencina, & Ioannidis, 2017). However, the data that is most useful for documentation and communication is usually in an unstructured, free-text format (Jensen et al., 2017). Yet, clinical natural language processing (cNLP) techniques for information extraction (IE) remain underutilized for clinical and translational research (Wang et al., 2018). Because the purpose of this study is to identify and examine the information contained in clinical notes, cNLP techniques of IE are the most appropriate choice.

#### 2.1.3.1 Pipelines/Algorithms

A natural language processing pipeline is simply a chain of processes to complete a task where each subtask feeds into the next. In other words, the output from one process becomes the input for the one directly following it. Different algorithms can be applied to each component of the pipeline (Nadkarni, Ohno-Machado, & Chapman, 2011).

In order to deal with the complexities inherent to rheumatic diseases, researchers have employed a variety of pipelines and algorithms sometimes within the same study. Lin et al. (2013) first used the clinical Text Analysis and Knowledge Extraction System to discover named entities with their accompanying concept unique identifier (CUI) from UMLS, assertion status, and context. The output was then fed into a pipeline that was designed to select optimal features using a three-step process comprising frequency cutoff, chi-squared, and correlation-based feature selection (CFS) which utilized the genetic algorithm. Erythrocyte sedimentation rate (ERS) and C-reactive protein (CRP) lab values

were then added to this output to create a data set for algorithm development which process utilized Weka to implement several classification algorithms: logistic regression, Naïve Bayes, Multilayer perceptron, and multiple Support Vector Machines (SVMs). The resulting models were then tested on a document set using 10-fold validation.

In contrast, Love et al. (2011) used a more simplified approach to feature selection that is not detailed in the paper. The chosen predictor variables were extracted from clinical notes using mySQL queries. The random forest method was then used to train three algorithms for testing.

Most studies fall somewhere in between these two, though most NLP studies of rheumatic diseases are fairly complex and detailed. While the paper only obliquely explains that a dictionary-based method was used for NLP, it does explicitly state the several ML algorithms that were tested: naïve Bayes, SVM, neural network, and decision tree (Zheng et al., 2014).

As demonstrated by these example works, while there is variation in specific pipelines and algorithms, rheumatology studies employing NLP tend to rely on dictionary-based methods for named entity recognition and supervised ML techniques. Likely due to this, researchers also tend to use similar measurements for performance evaluation of models. In contrast, our entity extraction pipeline included a sentence splitter, context sensitive tokenizer, part-of-speech tagger, section identifier (patient history, family history, etc.), a named entity recognition (ner) module created using the ML algorithms and terminology/ontology mapping from UMLS.

## 2.2 Theoretical Framework

The concept of a value chain was first introduced by Michael Porter as the set of activities that an industry specific firm uses to create value in the market. Value was originally defined as the amount consumers are willing to pay for a product or service. Thus, it would be measured by revenue generated. In order to encompass total value, the framework employs a process view of organizations in which firms are conceptualized as systems composed of subsystems, each with their own sets of inputs, transformation processes, and outputs (Porter, 1985).

## 2.3 Overview

Originally applied to a manufacturing context, Porter theorized the myriad activities that organizations must perform in order to transform inputs into outputs as primary or secondary activities. Primary activities are those considered essential for the creation of value and competitive advantage. Secondary activities are those undertaken to support and improve primary activities. Value activities are identified and classed according to technologic and strategic distinction. Thus, Porter proposed that primary activities consist of five generic components (inbound logistics, operations, outbound logistics, marketing and sales, and service) with the idea that every discrete activity that a firm engages in can be categorized for the purpose of identifying areas of competitive advantage. Support activities can be similarly classified into four broad categories (procurement, infrastructure, technological development, and human resources (HR) management) with the proposition that increased efficiency in any of the four will lead to beneficial results in at least one of the primary components. All activities contribute to a firm's profit margin, which is determined by the extent that value exceeds costs (Porter, 1985). This is considered the traditional, physical value chain model.

### 2.3.1 Healthcare Applications

Porter (1985) originally posited that his generic value chain could be used to compare and differentiate competing businesses. While the value added by each category may vary by industry, each component was considered integral to some extent in distinguishing competitive advantage. Therefore, though the model could be applied to any industry, including services, it was only relevant at the business unit level. That is, value chain analysis should be performed on competing firms within the same industry. However, much work has been done to expand the model in the intervening decades, much of it by Porter himself.

Porter's (1985) original assertion that industry-level and sector-wide value chains would be too broad to parse out sources of competitive advantage did not deter researchers. Buttigieg, Schuetz, and Bezzina (2016) employed qualitative research methods to create and compare value chains for public and private healthcare sectors in

Malta. This analysis was used to evaluate the feasibility of recommendations for maximizing the provision of healthcare services.

Porter (1985) similarly objected to applying the value chain to subsets of a business. Segmenting and analyzing a firm according to lines such as products or geography would not be useful. Due to the interrelated nature of an organization's subsets, it would not be possible to fully understand the value chain without the view provided by the firm-level value chain. Nevertheless, researchers have continued to do so, especially in the realm of health information. Frisse (1999) believed that the framework provided a lens for evaluating the value of information technology (IT) for various stakeholders. Through this lens, the study factored in the experiences of providers and patients to identify the support activities made possible by IT. These activities were then compared to analogous activities in other industries to demonstrate how improvements accomplished using IT, such as "just-in-time" logistics, can be applied to healthcare. Fetterolf (2006) adapted the value chain model to create a "disease management" value chain. In this study, knowledge distribution was the ultimate goal with the model demonstrating the flow of processes required to do so, starting with the acquisition of raw data. This type of model could help demonstrate the value in creating comprehensive disease management (or similar) programs throughout an organization. Finally, Theyel (2017) presents a bit of a conundrum with a value chain for biomedical products. The article advocates and proposes technologies to track products throughout their lifespan in order to identify areas within the value chain for improvement and innovation. Though specific to certain products, these products are not tied to any particular firm. The complete value chain for biomedical products, such as drugs and medical devices, can span multiple industries and encompass numerous organizations and could potentially be considered a global value chain. Research in these areas continues today with no clearly accepted value chain emerging.

The above examples highlight the complexities inherent in healthcare and demonstrate potential applications of the value chain to identify ways to successfully utilize information technologies to address that complexity. There is still much work to be done, not the least of which is validating previously proposed models. The Wharton School of business developed a value chain representative of a conventional approach to

value chain analysis which involves mapping the activities involved in delivering a good or service (Burns, 2010). From a patient perspective, however, lab tests by themselves have no value, even though they still must pay for them. A tests value is in being able to connect the patient to needed treatment. Even treatment itself is not the ultimate goal, but patient well-being. Thus, to analyze value in healthcare delivery, the focus must shift from products and services provided to outcomes achieved. In this manner, value for health outcomes cannot be attributed to a specific intervention at one point in time but must be redefined as the total outcomes achieved per costs over the total cycle of care. According to Kim, Farmer, and Porter (2013), primary value is created by delivering care for specific medical conditions and they created the care delivery value chain (CDVC), which emphasizes the interrelated nature of healthcare and highlights the need for integrated care.

Figure 2.1: Adapted Care Delivery Value Chain

Screening	Diagnosing	Preparing	Intervening	Recovering	Monitoring
<b>medical history</b>	<b>medical history</b>	<b>choose care team</b>	<b>drug therapy</b>	<b>recovery</b>	<b>condition</b>
family history	<b>tests</b>	connect patient with care team	educate about effects on disease progression and potential side effects	<b>fine-tune therapy</b>	ID important clinical and lab values
<b>screening</b>	<b>data</b>	connect patient with other resources	assess medication readiness	manage associated illnesses	manage acute attacks
test high risk patients	<b>expert/specialist consultations</b>	<b>intervention preparation</b>	<b>procedures</b>	nutrition modifications	<b>therapy</b>
<b>risk factors</b>	<b>management plan</b>	limit co-morbidities that affect disease progression	<b>counseling therapy</b>	maintain primary care	manage treatment side effects
ID high risk patients	schedule follow up visits	improve disease progression and prognosis awareness		<b>discharge plans</b>	initiate second or third line drug therapies
<b>prevention</b>		<b>pre-treatment</b>			<b>lifestyle modifications</b>
modify behavioral risk factors		create treatment plan			provide additional support (community/social)
promote risk reduction strategies					

The CDVC is divided into six categories of primary activities. The initial stage of the value chain (preventing/monitoring) contains information pertinent to the pre-diagnosis phase including critical signs and symptoms and risk factors for the disease. For gout, this stage is more accurately called screening. If such factors are present in a patient, this phase is followed by Diagnosing, where diagnostics exams and tests are performed. In the case of a confirmatory diagnosis, a patient moves into the preparing

stage where they are given information for treatment options. The chosen treatment is then administered in the intervening stage. For gout, there is no recovering/rehabbing stage in the traditional sense. Instead, this phase is dedicated to fine-tuning therapies to minimize side effects while keeping gout symptoms in remission. Monitoring and managing acute gout attacks and other complications is continuous and constitutes the final stage of the value chain. Figure 2.1 shows the adapted model that will be used as a framework for this study.

## CHAPTER 3. METHODS

The purpose of this chapter is to introduce the research methodology for this exploratory study regarding what information gout patients require to optimize self-management.

This approach allowed for a deeper understanding of patient experiences treating and managing gout and provided a way to develop a conceptual framework from the data in order to understand what information is available to motivate patients to engage in long-term self-care.

The applicability of value chain analysis and natural language processing techniques for this study are discussed in-depth in this chapter. The research plan, including the methodology, study participants, procedures, and analysis methods are also primary components of this chapter.

### 3.1.1 Research Questions

This study sought to build a model in order to answer the following questions:

RQ1: What are the major types of information required by gout patients according to the care delivery value chain?

RQ2: What information can be identified by mapping online gout patient education materials to the value chain?

RQ3: What gout information values can be identified from patient notes based on the value chain using cNLP techniques?

### 3.2 Selected Methodology

This study was conducted using value chain analysis and cNLP techniques with a broad aim to investigate whether the value chain is suitable for application to patient health information, specifically as a tool to optimize gout management. This research study sought to develop a model using ML techniques that could automatically extract pertinent information from clinical notes. Using Porter's care delivery value chain, emphasis was placed on the stages at which information is most useful.



Porter and Teisburg (2006) are adamant that value is a measure of health outcomes. Gout flares are the most common outcome associated with poorly controlled gout and, as such, are the best proxy for evaluating the value of the information provided by the proposed model. Thus, this study will examine the relationship between the information extracted by our model from clinical notes and adequacy of disease control.

Due to the reasons mentioned above, identifying gout flares presents a challenge that retrospective claims analysis alone has not been able to meet. Because the goals of this study include using NLP techniques to further improve this endeavor, algorithms from previous studies that have been used with some success were adapted for defining clinical surrogates for use in identifying gout flares using only structured claims codes for comparison to our NLP model. Hence, gout flare episodes were identified and counted using one of two criteria that utilize coded data available in the EHR. A gout diagnosis and at least one of the following within seven days: a medication commonly prescribed for acute gout attacks, a joint radiograph, magnetic resonance imaging of an extremity, joint aspiration, joint fluid evaluation, or serum urate testing qualified as a gout flare (Halpern et al., 2009). A diagnosis of joint pain accompanied by a prescription for colchicine within seven days would also qualify (Wu et al., 2012). When used together, these two algorithms have demonstrated high positive predictive value ( $PPV > 0.8$ ) (Zheng et al., 2014).

### 3.3 Phase One Methods

#### 3.3.1 Aim

Despite extensive research on patient education and counseling, there is relatively little on the overall information requirements of healthcare consumers, especially regarding gout. A preliminary search yielded no systematic reviews of the comprehensive health information needs for those impacted by gout. Given the increasing availability of health information and its sources, an extensive review of the current literature seemed pertinent to identify relevant topics and key information for aiding in the management of gout. Therefore, this review aimed to identify and examine the available research concerning or related to the information needs of gout patients.

Therefore, a literature review was conducted using a scoping protocol. As the aim was not to evaluate the quality of the available literature, but rather the span of the

subject knowledge and the extent of specific topic focus for a field that had not been widely reviewed, this seemed the ideal methodological approach (Khalil et al., 2016)

### 3.3.2 Inclusion Criteria

In accordance with previously published methods for scoping reviews (Peters et al., 2015), the eligibility criteria for this review included any study where health information was specifically or tangentially mentioned concerning patients seeking or receiving information for the purpose of treating and managing gout. Due to gout being rare in children, the minimum age for patient inclusion was 18 years. Studies that did not clearly distinguish between patients and non-clinical health information consumers seeking to aid patients, such as family members, were also included.

Only lay consumers of health information were of interest to the study. Thus, studies that only investigated the role of professionals, such as healthcare or information providers, in the use of gout information were excluded. Furthermore, studies investigating non-health related information were excluded, even if such studies explored or measured the health effects related to searching for, receiving, or otherwise utilizing that information in the context of gout treatment and management. Only studies published in the English language were included, however, there were no restrictions based on geographic area or publication date.

### 3.3.3 Search Strategy

The scoping review was conducted by performing a comprehensive search for relevant literature using online databases. The research team included a library and information science expert that was involved in the development and refinement of the search strategy. The strategy was designed to adhere closely to the previously mentioned approach (Khalil et al., 2016). The resulting search strategy steps and the information sources utilized are detailed below.

1. The initial search utilized only two databases believed to be able to provide the broadest overview of results pertinent to the scoping review topic. PubMed was chosen for its range of biomedical literature and CINAHL was included for perspectives from the allied health professions. The results were used to modify

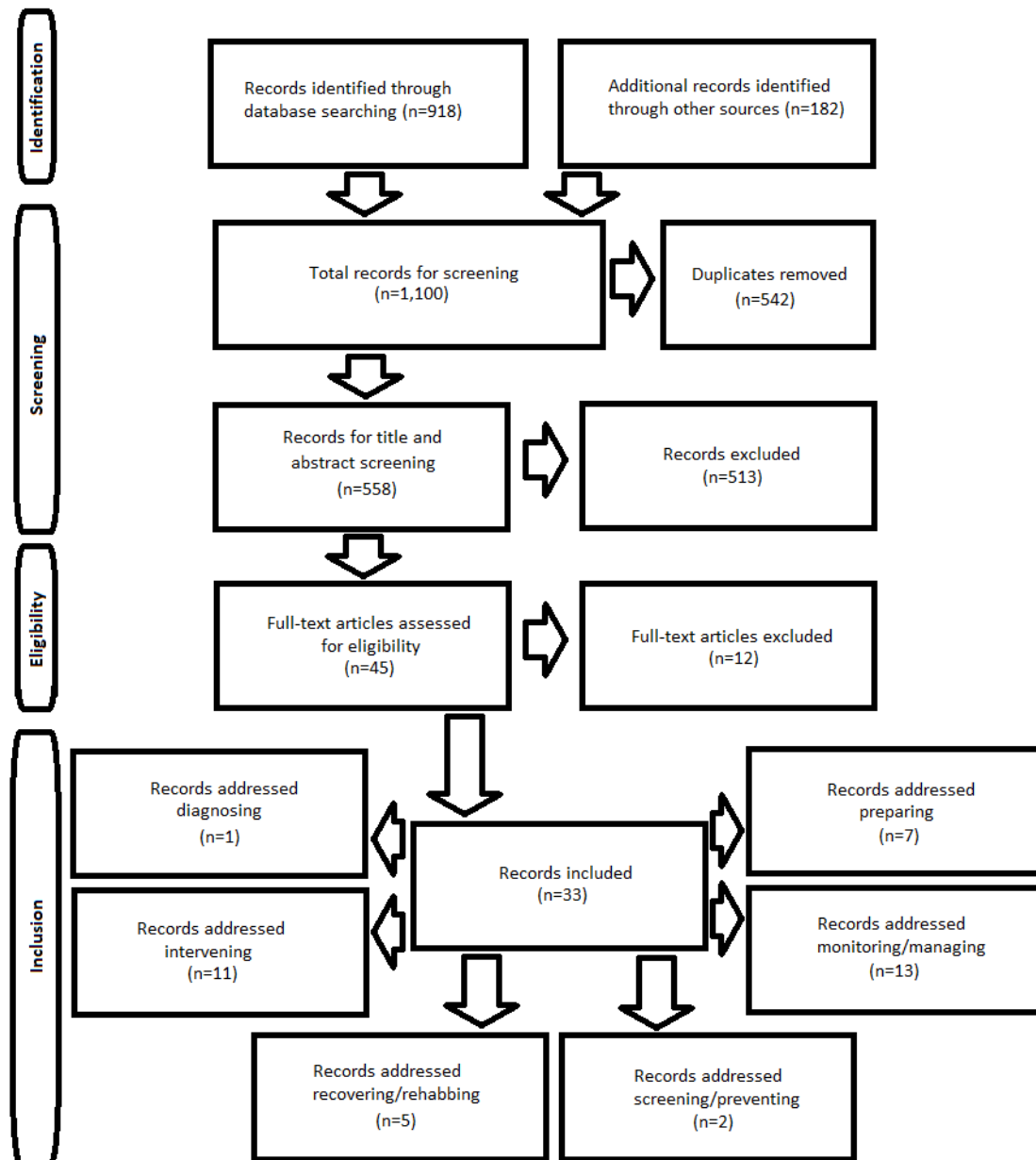
the initial search terms for the purpose of expanding the range of relevant results. Additional terms identified in this manner were used to create the final search strategy: ("gout"[MeSH Terms] OR "gout"[All Fields]) AND ("patients"[MeSH Terms] OR "patients"[All Fields] OR "patient"[All Fields]) AND ("Information (Base)"[Journal] OR "information"[All Fields]).

2. A targeted search was conducted on the basis of the expanded vocabulary using five databases chosen to provide a complete picture of gout patient information requirements. Boolean operators and controlled vocabulary terms were used whenever possible. MeSH (Medical Subject Headings) terms found in PubMed formed the base for controlled vocabulary equivalencies found in the other electronic databases. CINAHL and their Major Headings (MH terms) were included in this search, as well. In addition, ERIC was searched using Descriptors (DE terms) for patient education research and PsychINFO was searched using Index Terms for psychology-related literature. Scopus, which does not provide a controlled vocabulary search option, was included for a comprehensive review of available research literature.
3. A gray literature search was conducted through WorldCat using the keywords and phrases that had been mapped to the controlled vocabularies for the final search strategy. Results were limited to the English language.
4. The reference lists of all literature that met the inclusion criteria were reviewed for any additional studies related to the topic. In turn, the references of each additional relevant article were reviewed until saturation was reached.

#### 3.3.4 Study Selection

All search results were imported into EndNote, where duplicates were removed before a two-step screening process was conducted to determine inclusion eligibility. During the first stage of screening, only the titles and abstracts were read. Articles determined to be relevant on the basis of this screening were then read in full to assess their ultimate inclusion or exclusion. The diagram for this process is presented in figure 3.1 below.

Figure 3.1: Flow chart of study selection process.



### 3.3.5 Data Extraction

The final included articles were examined according to scoping review protocol (Khalil et al., 2016) and summarized in tabular format according to the stage of the care cycle the information would be most relevant. Publication details (author surnames, publication date), research objectives, methods, key findings, and conclusions drawn are

summarized for each study. The information involved in each study was also categorized according to patient need to provide additional context in aid of the aims of this review.

### 3.3.6 Data Synthesis

This study utilized both tabular and narrative approaches to integrate and synthesize data. The great variation in research design, focus, and quality between the included studies lent itself to the use of narrative integration for data synthesis. Thus, while tables were used to summarize the extracted data, narratives were used to evaluate the data and explain key findings.

## 3.4 Phase Two Methods

### 3.4.1 Gout Data Mart

Our research first identified potential gout cases by utilizing two distinct types of EHR data. First, we searched the structured data from the EHR at the University of Kentucky Healthcare Systems (UKHC). UKHC is a large academic tertiary referral center which contains the detailed records of >1 million patients since 2004 stored in an electronic data warehouse with a relational database structure readily available for research purposes. We then screened the structured EHR data to create a highly sensitive dataset containing all potential patients with gout. The gout data mart consists of all patients with  $\geq 1$  ICD-9/-10 code for gout (274.9, M10.0, M10.2, M10.3, M10.4, M10.9). Patients aged <18 years at the time of the first ICD-9/-10 code were excluded. Our preliminary search of UKHC's EHRs yielded 5590 potential patients. This study was approved by the University of Kentucky Internal Review Board.

### 3.4.2 Potential Gout Features

Based on a preliminary literature reviewed, we created a comprehensive list of variable types for the gout flare phenotyping algorithm classified by the six divisions of the CDVC. Whenever possible, the list of terms was then converted to structured data readily available from our EHRs. Along with diagnostic codes as forms of ICD-9 or ICD 10 claims codes, the codes include current procedural terminology codes (CPT) for procedural claims, national drug codes (NDC) for electronic medication prescriptions, and

Logical Observation Identifiers Names and Codes (LOINC) for laboratory tests. In addition, encounter records further identified dates of outpatient visits and inpatient stays.

For unstructured EHR data, we obtained narrative data from all types of commonly available clinical notes. These included outpatient notes, rheumatology notes, discharge summaries, radiology, pathology reports, etc. For our purposes, a note is defined as any type of healthcare narrative which contained more than 500 characters. Pre-processed narrative data was analyzed with CLAMP cNLP software to extract clinical variables at the patient level for patients with more than 2 notes (~4000) to ensure they have enough documentation for classification.

The entity extraction pipeline included a sentence splitter, context sensitive tokenizer, part-of-speech tagger, section identifier (patient history, family history, etc.), a named entity recognition (NER) module created using ML algorithms (Brown clustering, word embedding, etc.) and terminology/ontology mapping from UMLS. Thus, this pipeline was able to provide us with all of the information needed to further classify extracted concepts according to our value chain. For example, a condition extracted from the family history section of a document and marked as screening could be easily identified and included under the family history grouping of the screening/preventing stage of the value chain.

### 3.4.3 Concept Collection

Text articles describing gout were identified from publicly available knowledge sources (Wikipedia, Medscape (eMedicine), Mayo Clinic, MedlinePlus, the American College of Rheumatology (ACR), WebMD, and Up-to-Date). Researchers then used the gout value chain above as criteria for annotating the information deemed important for gout patients contained in each article according to the stages of care delivery. The annotated documents were used with the previously mentioned machine learning algorithms to create a named entity recognition model; however, the low number of articles included in this study (N=7) did not provide enough data to produce a model capable of reliably extracting the desired information from future documents. Therefore, after applying the poor performing model to the total set of articles, the extracted terms were used to develop a keyword dictionary. The output from this model provided us with a list of 494 terms that

could be used as a beta dictionary. The list was reviewed and revised to exclude overly generic (e.g. symptoms, effects) and non-useful terms (e.g. and, no). The resulting 450 terms made up the final dictionary. This dictionary was then used in a pipeline as the named entity recognition module and applied to the same seven text articles to label the keywords found. The resulting annotations were used with the same ML algorithms to create a much better model (Table 3.1). Terms were not case sensitive, and stemming was used to ensure variations of terms (such as different tenses or plurals) were included as much as possible. Both models were created using 5-fold cross-validation.

Table 3.1: Summarized results of 5-fold for gout value chain model.

<i>Summarized results of n-fold:</i>						
<i>correct</i>	<i>predict</i>	<i>gold</i>	<i>P</i>	<i>R</i>	<i>F1</i>	<i>semantic</i>
72	84	85	0.857	0.847	0.852	Recovering
57	62	109	0.919	0.523	0.667	Screening
113	130	180	0.869	0.628	0.729	Diagnosing
194	214	248	0.907	0.782	0.84	Intervening
28	33	53	0.848	0.528	0.651	Preparing
206	237	322	0.869	0.64	0.737	Monitoring

### 3.4.4 Data Processing

The final ‘gout value chain’ model was used to process all of the available clinical notes (310,519) for our gout cohort. Each mention of a concept per care phase was counted at the patient level. Because terms and their associated CUIs could appear labeled as more than one phase of the value chain, the CUIs for each extracted term were first aggregated by CDVC phase before occurrences were counted for each patient using a Perl script. For example, a symptom might be labeled diagnosing if it serves as diagnostic criteria for the disease or intervening if it is a side effect of a medication used to treat the disease. It could also be included in any of the other phases depending on the context in which it was used in the clinical note. Therefore, multiple instances of the CUI in the screening phase are aggregated and counted as ‘symptom CUI; screening’. The same concept appearing in other phases would be similarly aggregated and counted according to the number of times it appears for each patient with the associated phase’s label. These methods allowed for an easier comparison of NLP concepts extracted from patient education materials versus patient notes in terms of frequency, value chain stage, etc.

## 3.5 Phase Three Methods

### 3.5.1 Algorithm Training and Evaluation

This study utilized a modified version of the surrogate-assisted feature extraction (SAFE) procedure outlined by Yu, et al. (2016). In order to train and evaluate algorithms to predict gout flares, this study utilized an available R package (PheCAP) that allows the



use of various classification methods. Using gout flares as the outcome variable, the PheCAP algorithm allowed us to identify which of our candidate features are most closely associated with flares at each stage of care delivery.

In addition to NLP concepts extracted from patient notes in the previous stage, we included frequency of codified data readily extracted from structured EHR data using MySQL as candidate features. These features include the phenotype for gout, competing diagnoses (such as rheumatoid arthritis), and medications (allopurinol, colchicine, febuxostat) that were determined by our clinical domain expert to be relevant to the target phenotype. The identified terms and concepts were then mapped to their associated diagnosis (ICD-9/10) and drug codes (NDC) and counted for each patient. We also counted the total number of unique billing codes (ICD), the total number of healthcare visits, and the total number of clinical documents per patient as potential measures of patient healthcare utilization to round out our candidate feature set.

Gout flares were identified and counted using an adapted version of a previously published algorithm (Zheng et al., 2014). Using a Perl script, patients in our cohort were classified as having a flare if they had either a diagnosis code for gout in the system (ICD-9: 274.xx; ICD-10: M10.0x, M10.1x, M10.2x, M10.3x, M10.4x, M10.9x) followed by at least one code for any medication (colchicine, nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids) or procedure (radiograph of a joint, magnetic resonance imaging (mri) for any part of an extremity, joint aspiration, microscopic examination of joint fluid, urate testing) commonly prescribed for gout flares within seven days or a medical claim with a diagnosis code for joint pain (ICD-9:719.4x; ICD-10: M25.5x) followed by a code for colchicine within seven days. Consistent with prior studies, care for gout flares is expected to last for thirty days. Therefore, any codes indicating repeated flares within that time frame were counted as one flare, with the date associated with the first applicable diagnosis code being considered the flare start date.

PheCAP relies on surrogate variables to act as “silver standard labels”. These are features that are believed to be highly predictive of textbook cases of a condition. For this study, surrogate variables were chosen using concepts identified as priority in our gout value chain. For instance, any concepts identified as specifying or ordering labs or tests will be used as surrogate variables for the diagnosing stage. This applies to both the NLP

concepts extracted from clinical documents and the structured codes identified as candidate features. These features were then used as response variables to choose potential features using penalized logistic regression for final algorithm training. In this manner, PheCAP provides an automated method for reducing uninformative variables.

### 3.5.2 Metrics

The selected features were then used to train models for each care stage using adaptive lasso penalized regression (ALASSO). The performance of each model was evaluated and compared using the area under the receiver operator characteristic (ROC) curve (AUC) along with false positive rate (FPR), true positive rate (TPR), positive predictive value (PPV), negative predictive value (NPR), and F1 scores.

### 3.5.3 Summary

This study uses several novel approaches to answer the research questions. First, in order to identify the types of information needed by gout patients, this is the first application of the value chain to patient information and the first to apply the care delivery value chain to gout. It is also the first to use a scoping review of previous research to construct the value chain. Second, no previous studies using patient education materials to create a named entity recognition model were found. Using the stages of the value chain as named entities gives a framework for comparing the information found in patient education materials and patient clinical notes. The use of an NLP pipeline featuring the created NER model to identify information mapped to each stage of the care delivery chain allows for a type of automated content analysis. Third, this is the first study to use PheCAP as a prediction model for a health outcome rather than a disease. Whereas the value chain enables the identification of medical concepts over the entire continuum of care, which necessarily includes comorbidities and other risk factors which must be managed along with gout for optimal care, PheCap was utilized in this manner to identify information in clinical notes that could be considered more specifically associated with gout at each stage of care. The innovations used in this study were designed to help determine the information patients need and what they currently have access to.

## CHAPTER 4. RESULTS

This chapter contains the results of the value chain methodology study to answer the research questions:

RQ1: What are the major types of information required by gout patients according to the care delivery value chain?

RQ2: What information can be identified by mapping online gout patient education materials to the value chain?

RQ3: What gout information values can be identified from patient notes based on the value chain using cNLP techniques?

This chapter also includes discussion on how the analysis ties back to the research questions. Additionally, this chapter includes sample demographics, using tables to complement the summary. The process used to analyze the model is described in detail in this chapter. Included in this chapter are tables and other graphic representations used to present detailed theme data.

### 4.1 Phase One Results

#### 4.1.1 Study Selection

Overall, 1100 records were retrieved using the outlined search strategy. More specifically for each of the five databases, Scopus yielded the most results (n=487), followed by PubMed (n=297), then CINAHL (n=122), with ERIC (n=1) and PsycINFO (n=11) both producing far fewer results. WorldCat produced an additional 182 results.

#### 4.1.2 Study Characteristics

All of the included studies were published during the 21st century, with the vast majority having a publication date in the current decade. Much of the literature were themselves literature reviews (n=13). The studies were predominately qualitative (n=17) with many of the more quantitative studies also including and analyzing qualitative data. One study did not discuss methodology.

Well over half of the included studies with a focus on information pertaining to treatment, either alone or with other topics. Only the screening/preventing phase did not contain any articles regarding gout treatment information. In this category, Doherty et al.

(2012) and Richardson et al. (2015) both focused solely on information regarding pathophysiology. Most of the studies included several types of information, with information about treatment appearing the most often by itself in studies (n=9), especially in articles classed in the intervening stage.

Included studies were subsequently divided into 6 groups according to the stage of the care delivery cycle their research most closely pertained to: screening (n=2), diagnosing (n=1), preparing (n=7), intervening (n=11), recovering (n=5), and monitoring (n=13). A study could be included in more than one group if it contained separate findings and conclusions relevant to more than one stage of care.

#### 4.1.3 Screening

Although containing information pertinent to the pre-diagnosis phase of gout, neither study categorized in this stage of care specifically focused on screening. Table 4.1 shows the results for this stage. Richardson et al. (2015) was a qualitative study of gout knowledge in female gout patients, while Doherty et al. (2012) was a literature review searching Medline with general gout terms along with more specific phrases relating to the treatment and management of the disease.

Table 4.1: Preventing/Screening literature results

Publication	Objective	Methods	Findings	Information Type	Conclusion
Doherty, et al. (2012)	Identify and address why a 'curable' disease is so poorly managed.	Literature review searched the Medline database for articles published in English language using the search terms 'gout', 'hyperuricaemia', 'hyperuricemia', 'tophi' and 'monosodium urate' published after 1 January 1980, searched keywords 'therapy', 'management', 'cure', and 'treatment' alone and with the previous terms, other materials judged relevant.	Perception of gout as benign, humorous, self-inflicted disease.	pathophysiology	Patients need to understand the genetic and other risk factors of the disease.
Richardson, et al. (2015)	Explore and better understand the experience women with gout.	Semi-structured interviews of female gout patients using a narrative approach	No knowledge of gout before diagnosis, inability to find information relevant to women.	pathophysiology	Diagnosis is likely to be missed due to lack of knowledge about gout in women and its perception as a man's disease.

#### 4.1.4 Diagnosing

The sole article concerned with information pertaining to gout diagnosis was included in a journal supplement is displayed in table 4.2. Perez-Ruiz (2009) reads like material for gout education that is mainly concerned with treating and curing gout and contains no information about methodology. Any information related to other phases of care is included as a means of providing understanding and support for the targeted treatment recommendation.

Table 4.2: Diagnosis stage literature review results

Publication	Objective	Methods	Findings	Information Type	Conclusion
Perez-Ruiz (2009)	Review practices for long-term gout management w/emphasis on MSU crystals in pathogenesis and treating to target SUA level.	No explicit methodology.	Patients need to understand the role of MSU crystal observation for definitive diagnosis and the need for long term therapy to eradicate these crystals.	labs, pathophysiology, treatment	Patients need to be educated about diagnosis, the disease, and their contribution in long term treatment,

#### 4.1.5 Preparing

The studies featured in this group (n=7) displayed the greatest variety in topics with all studies featuring <2 types of information as recorded in table 4.3. Lack of information and knowledge relating to gout pathophysiology was highlighted in all studies concerning patient education. Zhang et al. (2011) was the only quantitative study. While the qualitative studies were designed to elicit feedback from patients through interviews for the purpose of thematic analysis to aid understanding about gout perceptions and knowledge, Zhang et al. (2011) aimed to create an instrument that could evaluate such knowledge. Harrold et al. (2012) highlights that knowledge gaps are not due to a lack of desire for information on the part of the patient and Chandratre et al. (2015) specifies that patients want more of this type of information from their healthcare providers. Patients also express a desire for more time with healthcare providers with Khanna et al. (2012) specifying that patients want healthcare providers to spend more time explaining the disease progression in particular. There is also a general lack of knowledge concerning treatment options, especially urate-lowering therapies (ULTs). Lindsay et al. (2011) found a general perception among men that gout is a disease the must be simply endured. Similarly, Spencer et al. (2012) found that patients are unaware of the existence of allopurinol, a urate-lowering drug (ULD) that can prevent acute gout attacks. Moreover, according to Perez-Ruiz (2009) patients are unaware that ULTs commonly cause gout flares upon treatment initiation and have no knowledge of prophylactic therapy as an option to reduce this side effect.

Table 4.3: Preparing stage literature review results

Publication	Objective	Methods	Findings	Information Type	Conclusion
Lindsay, et al. (2011)	Explore the experience and attitudes of men with gout, especially those affecting outcomes w/emphasis on barriers to urate-lowering therapy.	Qualitative grounded theory interviews of 11 men with gout. Categorized by themes using NVivo.	Lack of understanding of pain severity, disease progression, disease mechanisms and causes of attacks (model of gout). Lack of knowledge about long term treatment. Perception of gout as something that must be endured.	disease progression, pathophysiology	Patients need a "pathophysiologic model of gout" that aids understanding and destigmatization.
Khanna, et al. (2012)	Identify conceptual gaps for patients that lead to poorly controlled gout.	In-depth focus groups.	"1) Patients did not have a clear understanding of the natural history of gout; 2) patients did not realize that recurrent acute flares resulted in chronic joint damage; 3) there was lack of knowledge regarding treatment options and duration of therapy for acute and chronic gout; 4) patients felt that physicians did not spend enough time explaining the progression, i.e. natural history of the disease and its long-term effects; 5) patients did not grasp the need for chronic ULT to avoid complications and disability; and 6) patients were not aware of treatment goals for hyperuricemia, as evident by adherence to their gout medications."	pathophysiology, disease progression, treatment, labs	These are the key variables that need targeted in patient education resources.

Table 4.3 (continued)

Zhang, et al. (2011)	Design and test a survey to evaluate patient gout-related knowledge and identify targets for patient education.	Survey of gout knowledge in 3 hospitals.	Most patients know about too much uric acid in the blood but are unaware of actual crystals in joints. Poor knowledge of optimum SUA levels and duration of use for SUA lowering drugs.	pathophysiology, disease progression, treatment, labs	Need to design more effective educational materials similar to those for diabetes.
Spencer, et al. (2012)	Explore patient and provider perceptions of gout to improve management practices.	Semi-structured interviews of gout patients between age 30 and 100 analyzed using a grounded theory approach.	Patients do not understand that crystals continue to accumulate while symptom free. Unaware of existence of allopurinol which can prevent gout attacks.	disease progression, treatment, pathophysiology	"universal lack of knowledge and understanding about the cause and consequence of gout and the importance of making adequate lifestyle changes and adherence to lifelong ULT"
Perez-Ruiz (2009)	Review practices for long-term gout management w/emphasis on MSU crystals in pathogenesis and treating to target SUA level.	No explicit methodology.	Explain to patients that mobilization flares are 'price to pay' for cure and risk can be reduced through prophylactic therapy	pathophysiology, treatment	Patients need to understand the importance of therapy adherence to obtain sUA targets and eradicate crystals.
Harrold, et al. (2010)	Explore patient and provider views of ULDs for gout management.	Qualitative in-depth phone interviews of gout patients	Lack of details about what causes gout. Perception of gout as condition that must be adapted to rather than one that can be controlled through lifestyle and medication.	pathophysiology, treatment	Patients want more information and more time from providers.
Chandratre, et al. (2015)	Explore patient perspectives on how gout impacts HRQOL.	Thematic analysis of focus group interviews about HRQOL.	Confusion concerning role of diet in cause and treatment, lack of 'trusted' sources of information, self-discovered sources considered overwhelming/frightening. Gout not viewed as disease.	pathophysiology, treatment	Patients concerned about quality of Internet sources found and desire more information from healthcare providers.

#### 4.1.6 Intervening

Studies included in this group (n=11) understandably focused on information related to disease treatment, specifically pharmacological interventions. Information about these studies is included in table 4.4. This phase of care featured the most quantitative studies and the only intervention studies. Rees et al. (2012) featured an



education intervention and tested SUA levels 12 months later. Two studies were follow-ups to previous education interventions with Mikuls et al. (2017) being a randomized evaluation of a pharmacist-led intervention, while Abishek et al. (2016) featured a five year follow up questionnaire for a nurse-driven intervention. Serawate et al. (2006) was a retrospective claims analysis using logistic regression. Each of these studies also used SUA levels as outcome measures. There were two systematic literature reviews included in this category. Galo et al. (2014) focused exclusively on treatment, while Reach (2011) discussed disease progression along with treatment information as a means to understand why side effects occur when commencing ULT. Dalbeth et al. (2011) similarly concluded that patients with greater understanding of gout had higher adherence to ULTs. However, Robinson and Schumacher (2013) found that this type of information was missing from the majority of patient education materials that they analyzed. Beyond long term pharmacological treatments, patients are only aware of very limited treatment options for symptom relief during acute attacks (Lindsay et al., 2011). Likewise, only Singh (2014) included information pertaining to lifestyle modifications, as diet was identified as a concern for their target population of African Americans and women with gout.

Table 4.4: Intervening stage literature review results

Publication	Objective	Methods	Findings	Information Type	Conclusion
Lindsay, et al. (2011)	Explore the experience and attitudes of men with gout, especially those affecting outcomes w/emphasis on barriers to urate-lowering therapy.	Qualitative grounded theory interviews of 11 men with gout. Categorized by themes using NVivo.	Patients learn treatment methods from other family members with gout. Lack of knowledge about long term treatment. Perception of gout as something that must be endured.	treatment	Patients only aware of anti-inflammatories and diet and exercise as symptom management options.
Abhishek, et al. (2016)	Explore the effects of nurse-led intervention on ULT adherence.	Proof of concept study: 5 year follow up questionnaire to patients that had participated in a previous intervention.	Very high proportion of responders had excellent ULT adherence and EULAR target SUA level.	treatment	Personalized interactive education can have long term effects on ULT persistence.
Mikuls, et al. (2017)	Examine the impact of pharmacist-driven intervention to optimize allopurinol therapy.	Randomized evaluation of pharmacist led intervention via telephone	Intervention patients showed increased adherence and met SUA goals.	treatment	Shows that simple interventions can be effective, but most patients still failed to reach the low SUA levels generally recommended.
Serawate, et al. (2006)	Determine treatment patterns, specifically for allopurinol.	Retrospective claims analysis using multivariable logistic regression for factors associated with adherence to allopurinol therapy.	Previous diagnosis was positively associated with treatment compliance, while post index SUA flares indicated less compliance	treatment	Newly diagnosed and flare patients may require more education to promote therapy compliance.
Galo, et al. (2014)	Identify and assess medication adherence intervention studies for rheumatic diseases.	Systematic literature review: "searched Medline (1946–June 2014), Embase (1974–June 2014) and International Pharmaceutical Abstracts (1970–June 2014). We used Medical Subject Headings for concepts underlying our search, 'medication adherence', 'intervention' and 'inflammatory arthritis' and applied keywords for concepts that did not map."	All interventions that had an effect on adherence included an education component and were tailored to the patient.	treatment	Patients need personalized education about therapies including proper administration and risks/benefits and

Table 4.4 (continued)

<p>Dalbeth, et al (2011)</p>	<p>Examine the relationship between illness perceptions of gout patients and disease outcomes, particularly medication adherence and musculoskeletal disability.</p>	<p>Questionnaire for patients with gout for under 10 years.</p>	<p>Patients with greater understanding of gout also reported a higher need for, less concern about, and stronger adherence to ULT.</p>	<p>treatment</p>	<p>Interventions to improve disease understanding may reduce concerns about ULT and increase adherence.</p>
<p>Robinson &amp; Schumacher (2013)</p>	<p>Examine characteristics, including readability, content, and construction, of gout patient education materials from different countries and organizations.</p>	<p>Analysis of written patient information content.</p>	<p>"treating serum uric acid (SUA) to target and prophylaxis against acute flare during urate-lowering therapy (ULT) initiation and titration" were absent in 60% of the studied resources.</p>	<p>treatment</p>	<p>Information content coverage is generally good, but the most commonly missing information is important." Failure to understand that SUA needs to be below a certain threshold (the target) may prevent patients from returning to their doctor for assessment of their SUA and titration of their ULT. Being unaware of the importance of using anti-inflammatory prophylaxis against acute flares could reduce adherence during ULT initiation and titration. This lack of such prophylaxis would allow more flares and cause patients to stop ULT and/or lose confidence in their doctors.:</p>

Table 4.4 (continued)

Rees, et al. (2012)	Test effectiveness of nurse-led intervention based on 'best practices' delivered in a hospital-based gout clinic setting.	Proof of concept study: education intervention followed by measurement of sUA at 12 months.	Package of care' that includes patient education, individualized lifestyle advice and slow upward titration of ULT according to serial SUA levels achieved target levels in over 90% of patients.	pathophysiology including cause of gout, its risk factors and prognosis (including the risk of chronic joint damage), and available treatment strategies that can eliminate the crystals	Given proper education, knowledge of their therapeutic target, and regular contact with a nurse specialist,
Aung, et al. (2017)	Review and discuss intervention strategies to improve ULT adherence and gout outcomes.	Review of treatment interventions	Patients are concerned about lack of information and understanding about treatment strategy.	Pathogenesis, treatment	Patients feel that healthcare visit time is too short to provide adequate information and discussion about gout, leading them to rely on Internet sources.
Reach (2011)	Discuss reasons for gout treatment strategies and review literature on adherence.	Literature review	Patients often stop taking medications because they believe they are not working or bring on attacks when attacks occur early in therapy.	treatment, disease progression	Patients need to be informed about the reasons for increased attacks upon treatment initiation and understand that long term adherence decreases the risk of attacks.
Singh (2014)	Assess barriers to treatment.	NGT study of African Americans and women with gout diagnosis code about gout treatment.	Patient worries about medication interactions and side effects. Not sure which medications for every day vs. during attacks. All groups indicated concerns about dietary modifications.	treatment, lifestyle	Patients need provider advice about diet. Medication concerns are common for chronic conditions and not specific to gout.

#### 4.1.7 Recovering

As a chronic disease, articles included in this group (n=5) pertain to topics related to the fine-tuning of long-term therapies and continuous management of gout. All studies in table 4.5 highlight a lack of understanding regarding short-term side effects, ultimate goals, and expectations of treatments leading to poor adherence to long-term medications

and treatment plans. Most of the studies focus on ULDs, while several specifically mention allopurinol. Coburn et al. (2010) has the most specific target population, focusing on a population of VA patients that have recently initiated allopurinol therapy. While all studies contain information pertaining to treatment, Becker and Chohan (2008) offer an editorial review that contains the most variety with information relevant to pathophysiology, disease progression, and labs, as well. Doherty et al. (2012) is the only literature review in this category and the only study that refers to lifestyle advice. The two qualitative studies have only treatment information for this category; however, Chandratre et al. (2015) explores gout's impact on quality of life (QOL), while Harrold et al. (2010) is more concerned with general perspectives on ULDs.

Table 4.5: Recovering/Rehabbing literature review results

Publication	Objective	Methods	Findings	Information Type	Conclusion
Harrold, et al. (2010)	Explore patient and provider views of ULDs for gout management.	Qualitative in-depth phone interviews of gout patients.	Patients understand use of allopurinol for reducing serum uric acid and preventing gout attacks, not clear on planned duration of therapy. Belief that allopurinol triggers or worsens gout, concerns about side effects.	treatment	Patients unaware of potential for flares upon ULD initiation as short-term side effect.
Coburn, et al. (2016)	Examine patient knowledge of gout, especially SUA goals including factors associated with that knowledge and the effects on health outcomes.	Survey of gout knowledge for VA patients over 19 that had started allopurinol in the previous 6 months.	Correct knowledge was high in patients for all topics except SU goal.	treatment, labs	SU goal knowledge was associated with more SU measurements during the first 2 years following ULT initiation.
Becker & Chohan (2008)	Identify and discuss factors contributing to suboptimal gout management with emphasis on immediate opportunities for improvement.	Editorial Review	Education about the disease is key: "diagnosis and course, the distinctive therapeutic modalities employed, circumstances likely to promote or mark progression, the significance of comorbid associations, and means to monitor therapy and maximize adherence to therapeutic recommendations".	pathophysiology, disease progression, treatment, labs	Patient education is key to improving clinical outcomes.
Chandratre, et al. (2015)	Explore patient perspectives on how gout impacts HRQOL.	Thematic analysis of focus group interviews about HRQOL.	Lack of information about acute attacks as side effect of allopurinol, interactions between medications for comorbidities. Incorrect advice to discontinue treatment.	treatment	Lack of knowledge about ULT benefits may lead to poor HRQOL.

Table 4.5 (continued)

<p>Doherty, et al. (2012)</p>	<p>Identify and address why a 'curable' disease is so poorly managed.</p>	<p>Literature review searched the Medline database for articles published in English language using the search terms 'gout', 'hyperuricaemia', 'hyperuricemia', 'tophi' and 'monosodium urate' published after 1 January 1980, searched keywords 'therapy', 'management', 'cure', and 'treatment' alone and with the previous terms, other materials judged relevant.</p>	<p>Belief that gout refers to the acute attacks.</p>	<p>Lifestyle, treatment</p>	<p>Patients underestimate the importance of long-term ULT.</p>
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#### 4.1.8 Monitoring

As the largest group of articles (n=12), this phase reflects the long-term, slow build up which results in sudden acute attacks and other complications. This care phase has the most information concerning lifestyle modifications. As with all phases of care, an overall lack of education and understanding is highlighted by table 4.6, with a particular emphasis on non-pharmacological interventions and managing co-morbidities. In line with Perez-Ruiz's (2009) contention that knowledge of non-pharmacological approaches and lifestyle modifications is essential to gout management, only Ogdie et al. (2012) does not include lifestyle advice, instead focusing on the long-term monitoring of SUA levels. The needs assessment conducted by Rifaat et al. (2016) indicates that this type of information, specifically dietary guidelines, is the most sought after in this phase of care, at least by highly educated patients. Interestingly, the patients involved in Harrold et al. (2010) did recall being told to avoid certain foods, but the patients involved in Harrold et al. (2012) were largely unaware of dietary triggers of gout attacks. In contrast, Vaccher et al. (2016) found that most patients do know some personal triggers for acute attacks, but do not recall receiving this information from their general practitioner and instead, sought it out online. However, Johnston et al. (2015) found that all 30 of the patient education

materials they reviewed contained lifestyle information, including diet, particularly foods to avoid. Other types of information were not included as consistently and Jimenez-Liñan et al. (2016), who analyzed similar resources, points to a distinct lack of emphasis on the importance of ULTs. This category also features the British Society for Rheumatology’s recommended guidelines for gout management (Hui et al, 2017) as it relates to health information, as well as EULAR’s patient education recommendations for inflammatory arthritis (Zangi et al., 2015). Both of these sources advocate for what Fields and Batterman call a multifaceted approach to gout patient education and management.

Table 4.6: Monitoring/Managing literature review results

Publication	Objective	Methods	Findings	Information Type	Conclusion
Roddy, Zhang, & Doherty (2007)	Compare practices for chronic gout management in the UK to EULAR recommendations, including lifestyle advice and ULT therapy.	Questionnaire mailed to all patients over 30 in 2 general practices. Self-reported gout or acute arthritis attacks invited for clinical assessment.	Infrequent lifestyle modification advice.	lifestyle advice regarding weight loss, alcohol reduction, diet.	Advocates dissemination of EULAR recommendations for management.
Harrold, et al. (2010)	Explore patient and provider views of ULDs for gout management.	Qualitative in-depth phone interviews of gout patients.	Patients recall being told to reduce certain foods, suggest follow up after initiating treatment.	lifestyle, treatment	Patients want more information about natural remedies.
Harrold, et al. (2012)	Identify and understand patient gout knowledge, beliefs, and barriers to management.	Questionnaire about gout knowledge and beliefs.	Lack of knowledge regarding dietary triggers, ULT dosing during flares, risk of causing flares upon initiation. Deficit greater in those with active gout.	Lifestyle, treatment	Provide oral and written information regarding short- and long-term effects of ULTs and dietary factors throughout care.



Table 4.6 (continued)

<p>Hui, et al. (2017)</p>	<p>Revise and update recommendations for gout management in the UK.</p>	<p>The British Society for Rheumatology/British Health Professionals in Rheumatology guideline for the management of gout</p>	<p>"All patients with gout should be given verbal and written information about the following: the causes and consequences of gout and hyperuricaemia; how to manage acute attacks; lifestyle advice about diet, alcohol consumption and obesity; and the rationale, aims and use of ULT to target urate levels. Management should be individualized and take into account comorbidities and concurrent medications. Illness perceptions and potential barriers to care should be discussed"</p>	<p>treatment, lifestyle</p>	<p>Updated recommendation due to better understanding of barriers to effective care</p>
<p>Ogdie, et al. (2010)</p>	<p>Describe key points of intervention and propose educational improvements.</p>	<p>Review-no details</p>	<p>Patients need to understand that SUA levels under 6 mg/dl means unlikely to have gout and goal of therapy should be to maintain that level.</p>	<p>labs</p>	<p>Patient education may be most effective method to change physician behavior. Campaign with slogans to get patients to check their SUA levels.</p>
<p>Perez-Ruiz (2009)</p>	<p>Review practices for long-term gout management w/emphasis on MSU crystals in pathogenesis and treating to target SUA level.</p>	<p>No explicit methodology.</p>	<p>The role of lifestyle changes and non-pharmacological approaches to gout management is essential information</p>	<p>lifestyle, treatment</p>	<p>These types of measures might only have a modest effect on sUA levels but are very beneficial for general health.</p>

Table 4.6 (continued)

Johnston, et al. (2015)	Review internationally available gout education resources to investigate content and ease of reading.	Analysis of written patient information content in 30 gout sources from several countries.	All sources noted role of uric acid, lifestyle factors such as weight, alcohol, and diet, including foods to avoid. Other topics not covered consistently.	Lifestyle, treatment, pathophysiology	"informing patients with gout of their increased risk of heart disease and diabetes is important for encouraging screening as well as modifying diet and lifestyle factors to manage risk. Providing patients with a target level for SUA may also prove important for tracking progress and maintaining motivation to take urate-lowering therapy during intercritical periods of gout."
Vaccher, et al. (2016)	Investigate gout understanding and explore barriers to optimum care.	Inductive thematic analysis of semi-structured interviews about understanding of gout management.	Most patients have basic knowledge of gout and know some personal triggers of attacks, but do not understand medications or the earliest signs of an attack.	Pathophysiology, lifestyle, disease progression, treatment	Most patients do not recall receiving information about gout from their GP, leading them to research gout themselves and expressed a desire for more informative sources.
Jimenez-Liñan, et al. (2016)	Assess content, readability, and accuracy of free online patient education materials as related to current gout knowledge.	Review of 30 online gout education resources	education resources often contain no or inaccurate information about pathogenesis and fail to emphasize the importance of ULT.	pathophysiology, treatment	Not many web-based sources provide accurate and easy to read information about gout.
Zangi, et al. (2015)	Develop patient education recommendations for those with inflammatory arthritis and identify areas for further research.	An extensive systematic literature search in Medline, Embase, PsycINFO, Cochrane Library and CINAHL from January 2003 up to September 2013 of publications in English, German, French or Spanish describing any kind of PE activities, was conducted	Trend toward emphasis of behavioral, cognitive, and emotional processes in patient education	lifestyle, pathophysiology, disease progression	Eight recommendations with the overarching principle that patient education should enable people to manage their life and optimize health and well-being
Rifaat, et al. (2016)	Identify patient knowledge gaps and concerns for inclusion in education initiative.	Needs assessment given to highly educated patients being seen by rheumatologists	Information of most interest was diet guidelines.	lifestyle	Major gaps in knowledge essential to self-management.

Table 4.6 (continued)

<p>Abhishek &amp; Doherty (2018)</p>	<p>Highlight common knowledge gaps, recommend core knowledge for education, and review non-pharmacological strategies for gout management.</p>	<p>Systematic literature review: searched PubMed from inception to 28 March 2017</p>	<p>Gout patients have significant knowledge gaps. Lack of time to provide individualized education is one of the many barriers to care of gout.</p>	<p>pathophysiology, disease progression, treatment, lifestyle</p>	<p>"People with gout should be educated about the pathogenesis, associated comorbidities and management of gout, including both pharmacological and non-pharmacological management."</p>
<p>Fields &amp; Batterman (2018)</p>	<p>Explore literature on gout patient education suggest future research directions.</p>	<p>Literature review</p>	<p>Key concepts highlighted in the literature include genetic and metabolic causes of gout, the risk of progressive damage with inadequate treatment, goal serum urate levels and why they are monitored, rationale for short- and long-term management, impact of comorbidities, and dietary management.</p>	<p>pathophysiology, disease progression, treatment, lifestyle, labs</p>	<p>Optimal patient education requires multifaceted approach.</p>

#### 4.1.9 Gout Information Value Chain

On the basis of these results, the gout information value chain (figure 4.1) was created to define the types of information needed by gout patients throughout the continuum of care. This value chain will be used throughout the remaining phases of the study to identify important information that is available to gout patients in both patient education materials and their own clinical notes.

Figure 4.1 Gout Information Value Chain

Primary Care Cycle	Screening	Diagnosing	Preparing	Intervening	Recovering/Rehabbing	Monitoring
Priority	signs/symptoms:	<i>Specifying/Ordering Labs/Tests:</i>	<i>Intervention Options Education: (Hui et al., 2017)</i>	<i>Ordering/Administering Drug Therapy: (Hui et al., 2017)</i>	<i>Therapy Fine Tuning: (Hui et al., 2017)</i>	<i>Monitoring/Managing to Avoid Complications:</i>
	painful joints (big toe), redness, warmth, swelling (Ragab, Elshahaly, & Bardin, 2017)	synovial fluid analysis (Sivera et al., 2014)	side effects, compliance, efficacy	acute attacks	ULT	acute attacks (Hui et al., 2017)
				ULT	prophylaxis	
Further Details	<i>Medical History: Comorbidities</i>	<i>Interpreting Test Results: serum uric acid levels, imaging:ultrasounds (Hui et al., 2017; Ragab, Elshahaly, &amp; Bardin, 2017)</i>	<i>Existing Medications/ Comorbidities: pregnancy, renal insufficiency (Hui et al., 2017)</i>	<i>Treatment: (Hui et al., 2017)</i>	<i>Non-pharmacological Interventions: (Hui et al., 2017)</i>	<i>Complications:</i>
	kidney disease, cvd, obesity, diabetes (Khanna et al., 2012)	<i>Consulting with Experts: (Khanna et al., 2012) ex.</i>	interactions/counter effects	efficacy, side effects, compliance	rest	kidney stones (Kramer et al., 2003)
	<i>Risk Factors (Khanna et al., 2012; Hui et al., 2017)</i>	PCP/GP	<i>Choosing Care Team: (Hui et al., 2017)</i>	injection guidance	topical ice	recurrent gout flares (Hui et al., 2017)
	behavioral causes: alcohol (beer)	Rheumatologist	rheumatologist/gout specialist/PCP/NP		encourage cherry/skim milk powder intake	<i>advanced gout: tophi, joint deformity (Khanna et al., 2012)</i>
	current medications: diuretics, low dose aspirin, immunosuppressant	<i>Determining Treatment Plan: Acute vs. Chronic (Hui et al., 2017)</i>		<i>Performing Procedures:</i>	increase vitamin C/ omega-3 fatty acids	<i>Monitoring Therapy Compliance:</i>
	family history: gout (Kuo et al., 2015)	NSAIDS		joint aspiration (hui et al., 2017)	<i>Clinical Procedures: bariatric surgery</i>	ULT (Sivera et al., 2014)
	etiology: hyperuricemia (Hui et al., 2017)	ULT (dosage)				<i>Life Style Modifications: (Khanna et al., 2012; Hui et al., 2017)</i>
	genetics (Hui et al., 2017; Ragab, Elshahaly, & Bardin, 2017)	<i>Medical History: (Perez-Ruiz, 2009; Sivera et al., 2014)</i>				reduce alcohol/red meat intake/soft drinks
		confirmatory signs/symptoms (bony erosions, tophi)				avoid low temps/dehydration
		<i>Confusing Conditions:</i>				
		psuedogout (Ragab, Elshahaly, & Bardin, 2017)				

## 4.2 Phase Two Results

### 4.2.1 Data Collection

The NLP concepts extracted from patient notes and patient education materials served as the primary source of research data. The demographics and medical claims data served as supporting research data. At each step of the process, output was coded according to the stages of the CDVC and reviewed for emerging themes. This method ensured that value chain analysis was embedded throughout the data collection process. The original PEM output used to create the keyword dictionary and the subsequent output from patient clinical notes using the final model are provided in Appendix A and B.

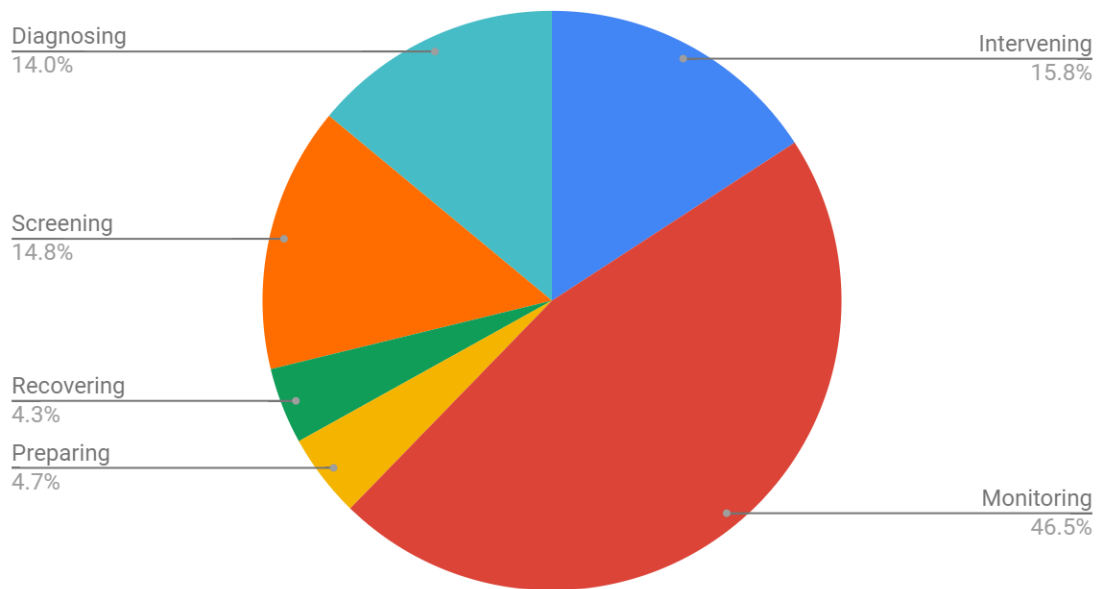
### 4.2.2 Data Analysis

All collected concepts were divided into one of two categories: medication or diagnosis and procedure related terms. The original dictionary and the final model output were then compared and analyzed for categories or themes. The model successfully retrieved 3892 terms and phrases that were able to be mapped to CUIs in the UMLS (512 medication terms and 3380 diagnosis/procedure terms). 105 of these terms matched both CUIs and value chain phases in the keyword dictionary. An additional 51 terms matched CUIs appearing in the dictionary but were labeled with different value chain phases. In line with the proportions of all terms appearing in the PEMs, the most matching terms appear in monitoring (figure 4.1). The medications that were also extracted from clinical notes for this phase are all commonly prescribed for gout flares. Surprisingly, diagnosing has the second most matches. Although screening, diagnosing, and intervening are close in proportion, the diagnosing stage contains no medication terms in the keyword dictionary and only one medication related term in the clinical note output. While screening has very few keyword terms categorized as medication related (n=3), clinical notes produced 32 medication terms for the stage. The majority of keyword terms classified as medication appear in intervening and this is the only stage with more medication related terms than diagnosis/procedure terms. The terms also appearing in patient clinical notes are all commonly associated with gout except 'fenofibrate', a cholesterol medication. The matching terms in the screening stage largely consist of risk factors including behaviors

(‘beer’) and medical history (‘family history of gout’, patient comorbidities, genetic factors). For the diagnosis stage, terms matching the stage in the keywords and clinical notes consist of procedure related terms for confirmatory diagnosis (‘synovial fluid analysis’, ‘radiographic findings’, ‘urate crystals’), symptoms used for diagnosis (‘joint damage’, ‘tophi’), and similar diseases that can be confused for and must be differentiated from gout (‘calcium pyrophosphate disease’).

Figure 4.2: Percentage of Words Appearing for Each Stage in Keyword Dictionary.

### Count of Semantic



The preparing and recovery stages have the lowest number of keywords. Preparing had six medication related terms, however, three were considered generic. Interestingly, two of the remaining three appeared in patient notes (‘blood thinners’ and ‘take NSAIDs’). Recovering has exactly one less concept than preparing for both medication and diagnosis/procedure terms. None of the medication related keywords were extracted from the clinical notes by the model. One concept was considered generic and four concepts were also found in the patient notes for each stage. The concepts common to the keywords list and those extracted by the model were all possibly related to the kidneys or diet.

Although there were a high number of keywords that the model did not extract from patient notes (table 4.7), many of these are combinations or longer versions of concepts that appear separately in the NLP note output, such as ‘allopurinol and probenecid’. The

medications that do appear by themselves in the keyword list that were not found in the notes are not commonly associated with gout treatment and are often prescribed for comorbidities. In fact, most of the concepts that the model did not identify in any clinical notes are long phrases typical of the writing style found in PEMs. Thus, while we might expect to find phrases like ‘under a microscope’ or ‘inject a corticosteroid directly into your joint’ when explaining concepts to patients, they are not likely to appear in clinical notes under the same context. Therefore, when similar concepts appear in the clinical notes, they are assigned different CUIs. For example, the CUI for ‘after acute attacks’ was not identified in any of the patient notes by the model. However, numerous variations of ‘acute’ and ‘attack’ were extracted and assigned the appropriate CUI.

Table 4.7: Keywords not Extracted from Patient Clinical Notes

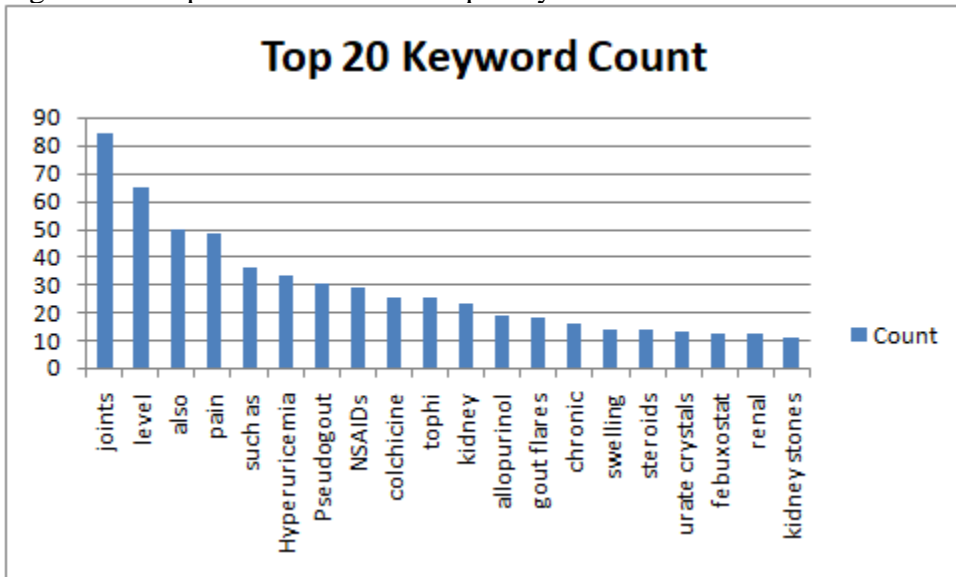
Diagnosing	under a microscope C0395796, dual energy computed tomography C4055114, are most often affected C3808454, joint appears warm C0575034, attacks often C1867940, chalky C3267206, monosodium urate monohydrate C0037564, Monoarticular involvement C0427254, Posterior interosseous nerve syndrome C1696572, Location outside C2016008, Ultrasonographic C1301497, crystals within the joint space and deposition of crystals C1401835, too much uric acid in the blood C2029412, crystals in the joint fluid C0200652, in one or more of your joints C0162296
Intervening	or use other medicines C0678312, inject a corticosteroid directly into your joint C2137753, blood levels of uric acid to normal C0855643, oral corticosteroids plus colchicine C0775883, Lesinurad C3886073, prevent disease C0679698, deposition of urate crystals in the renal medulla or uric acid crystals C0522574, Xanthine oxidase inhibitors C0302609, benzbromarone C0005035, allopurinol or probenecid C2194181
Monitoring	meats and fish C0335766, deposit in the joints C0541866, Alcohol in excess C0159070, Sugary drinks and foods C0453425, but because it can help C3827771, uric acid levels in the blood may lead to deposits of urate crystals C0522574, crystals can be found in uric acid C2022384, anakinra C0245109, after acute attacks C3279118, inflammation are under C0877470, when starting these C3166682, acid in the blood C1287384, Secondary infections C0442886, Urate or uric acid C0851010, Increased susceptibility to infection C0236171, Nerve or spinal cord impingement C0751463, kidney stones or urate C2109382, increased overall likelihood of C2015876, increased risk for any vascular event C2673803, medicines are working and you are taking C3176475, high levels in the blood C1399735, skim milk C0349375, call your doctor C3476384

Table 4.7 (continued)

Preparing	Treatment choices depend on C2069130, production of uric acid C3653539, do not overproduce uric acid should take C3476381, inflammation in the joints C0574941, uric acid to break down a chemical C0041980, crystals form and collect in your joints and cause gout C0809978, Uric acid buildup also can lead to disfiguring lumps called tophi C3806613, crystals accumulate in the urinary C0151579
Recovering	on this medicine long term to prevent C2922112, eating foods that are rich C3898963, damage to joints C0269891, table salt C0206136, joint destruction C0541875, Pembrolizumab C3658706
Screening	painful swelling in single joints C0311222, Esidrix C0700694, and its complications occur more often C2073319, to run in some C3810163, run in C3274438, more common in men C1867966, people become older C3826770, Sickle cell anemia and other anemias C0029738, Leukemia and other blood cancers C1516238, hydrochlorothiazide and other water pills C3217109, Hypertriglyceridemia Hypercholesterolemia C0543517 metabolic abnormalities C4021768, base of the big toe C0224039, high levels of uric acid C0948643, presenting as slight C4036274

On the surface, there is little variation in the types of concepts extracted from the PEMs and the patient notes. The PEM output is more gout specific with the NLP output featuring more terms related to comorbidities. The most frequent keywords also highlight more technical terms, such as ‘hyperuricemia’, ‘pseudogout’, and ‘urate crystals’ (figure 4.2).

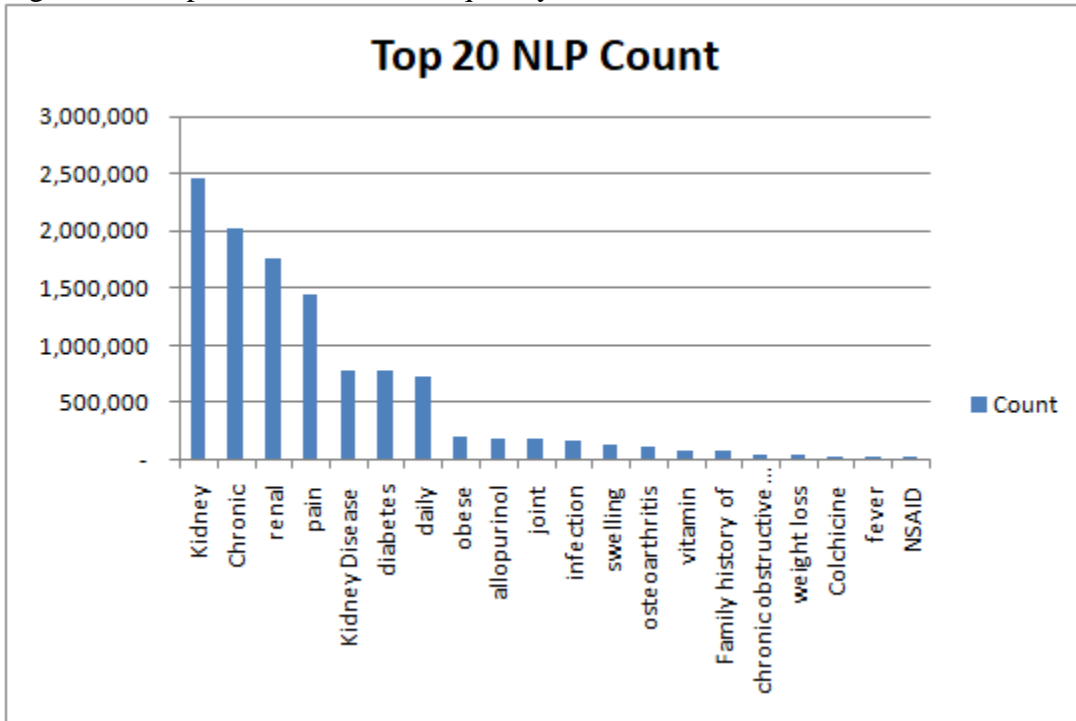
Figure 4.3: Top 20 Terms Most Frequently Found in Gout PEMs.





The NLP counts show a sharper decline among the most frequently extracted terms. The top four terms appear in patient notes over a million times, while the remaining top 20 terms show up at least half as frequently. The top four terms are also in the top 20 keywords; however, they rank much lower in frequency except for ‘pain’, which is fourth for both sets of output. The medications featured in the keywords output were all also extracted from patient notes, however, ‘febuxostat’ did not make the top 20 list for clinical notes (figure 4.3).

Figure 4.4: Top 20 Terms Most Frequently Found in Gout Patient Clinical Notes.



The model extracted exponentially more terms in both frequency and amount from the patient notes. 14 terms were considered generic and not medically relevant. These terms were excluded from further processing. Many other terms, while potentially medically relevant, are not necessarily related to gout (‘history of adopted child’). Therefore, we set a threshold wherein a concept needed to have been extracted from the notes of at least 4 patients to be included for final analysis. This was done to minimize noise and maximize sample size in the final analyses. 2020 terms appeared for only one patient. A further 521 terms only appeared in two patient records. An additional 252 terms were removed for appearing in only three patient records. The remaining 1094 terms were examined for associations to gout flares in the next step of the project.

## 4.3 Phase Three Results

### 4.3.1 Sample

Data for 3964 patients was included for this study. The demographics presented represent patients that met the minimum requirements sought as described in Chapter 3. 71% of the population was male (n=2827) and 29% female (n=1137). All but 15 patients had information about race available in the database. 83% of the sample was identified as white (n=3276), 16% as black/African American (n=627), and 1% as Asian (n=40). There were also two patients identified as Hawaiian/Pacific Islander and four patients as American Indian/Alaskan. Additionally, 98% were designated non-Hispanic/Latino. The median age for the study cohort is 59 with the majority of patients being between the ages of 55 and 69.

### 4.3.2 PheCAP Analysis Results

High-throughput phenotyping using a common automated pipeline was conducted using the chosen concepts combined with the structured EHR data for each patient. This initial complete dataset included 3964 patients with 1206 variables. 2702 patients had been identified with flares and 1262 patients were identified as not having had any gout flares. Patients were divided into a training sample (n=2378) and a validation sample (n=1586).

As the purpose of this first analysis was to create an overall, general model for gout flares, surrogates were selected to be specific to the target phenotype. Subsequently, ‘gout flares’ was chosen for the NLP surrogate. As there is no diagnosis code for gout flares, we used the ICD codes for gout as an ICD surrogate. The SAFE algorithm identified the CUI, ICD-9 gout code 274.xx, and the ICD-10 codes M10.0, M10.2, and M10.9 for use as outcome variables in the training algorithm. The algorithm chose only those identified by SAFE to be used in the model. Though the ICD codes as a group had a strong association with outcomes, when considered in combination with the gout flare CUI there was a weak, negative association. When considered individually, only M10.0 and M10.9 had non-zero beta coefficients. The training model had an AUC of .735 and the validation set AUC was .733 (figure 4.5). When evaluating the model over 20 different threshold values for determining gout flare designation, the PPV stayed high (>.85) but the NPV was fairly low

(<.5). The FPR was low (<.2) but the TPR was relatively low (<.6), as well. The lowest threshold cutoff (.698) had the highest F1 score (.671).

In the same manner, models were created separately for each stage of the value chain along with a comprehensive model combining all stages to explore the differences in information provided in patient notes between the care stages more thoroughly and determine whether certain stages contain information that could be considered more predictive of or closely associated with gout flares. Results for each model are similarly presented below and statistics for all models at a fixed FPR are included in table 4.8. Overall, the models have little negative predictive value and low sensitivity.

Figure 4.5: Area Under the Curve for Training and Validation Data Sets Featuring NLP Variables From all stages of CDVC.

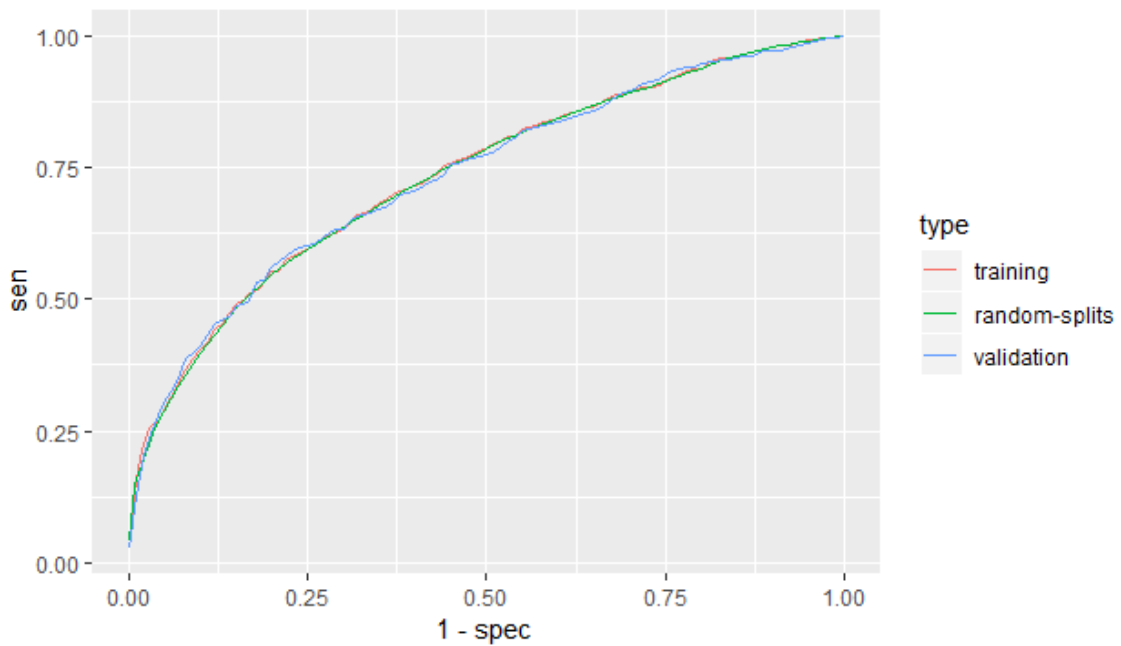


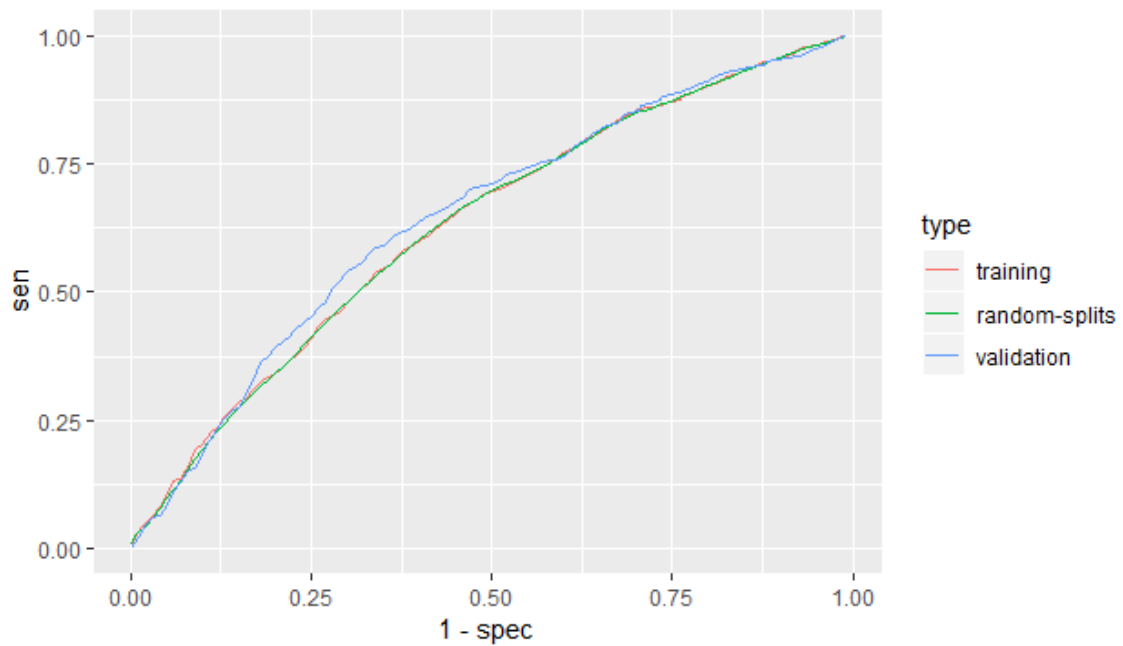
Table 4.8: TPR, PPV, NPV, and F1 scores for all models at FPR of .2.

Model	TPR	PPV	NPV	F1
General	0.533	0.854	0.454	0.656
Screening	0.34	0.78	0.367	0.473
Diagnosing	0.357	0.788	0.374	0.492
Preparing	0.376	0.797	0.381	0.51
Intervening	0.519	0.844	0.444	0.643
Recovering	0.361	0.79	0.375	0.496
Monitoring	0.514	0.843	0.441	0.638
Comprehensive	0.669	0.875	0.537	0.758

### 4.3.3 Screening

For the screening stage, there were 329 potential variables. The priority information for this stage was signs and symptoms. Therefore, ‘high fever’, ‘warm skin’, and ‘during the night’ were chosen as NLP surrogates. There are ICD codes associated with joint pain (719.4x, M25.5x). As one of the most common symptoms of gout, the general, unspecified versions of those codes were used as surrogates, as well. The model developed using these variables as surrogates did not perform well (training AUC=.632), although it did do slightly better on the validation dataset (AUC=.646) (figure 4.6). None of the NLP CUIs by themselves contributed to the model. As a group, the CUIs and ICD codes showed a weak association (all beta coefficients  $< \pm .1$ ). This models .5 F1 score (.463) occurred at the lowest cutoff (.743). PPV (.78) was lowest at this point. While all other metrics were highest at this cutoff, all were  $< .5$ .

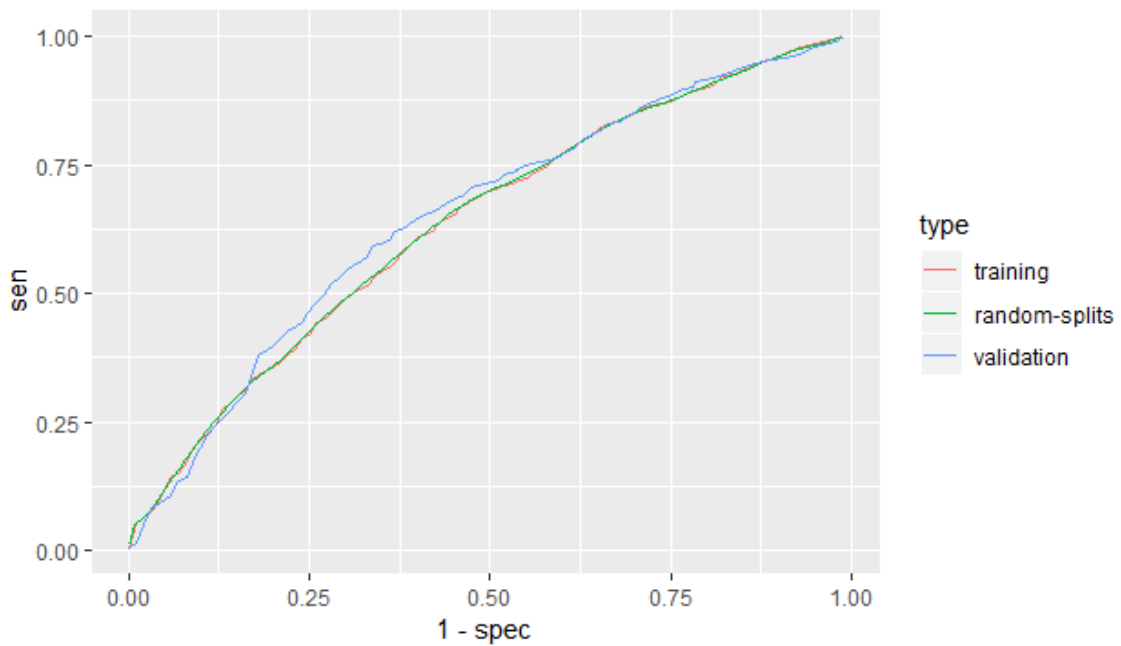
Figure 4.6: AUC Plot for Training and Validation Data Sets Featuring NLP Variables Labeled Screening.



#### 4.3.4 Diagnosing

The model for the diagnosing stage was developed using the CUIs and CPT codes used for lab tests involved in diagnosing gout. Specifically, ‘fluid analysis’ and ‘urate crystals’ were used as NLP surrogates and the CPT code for serum urate testing was used as the surrogate for coded data. In total, 238 variables were considered for diagnosing. This model performed similarly to the screening model (training AUC=.637, validation AUC=.65) (figure 4.7). However, the code for serum urate testing did demonstrate a fairly strong association with the outcome variables with a beta coefficient  $>.65$ . Furthermore, the NLP variables together had a beta coefficient  $>.18$ .

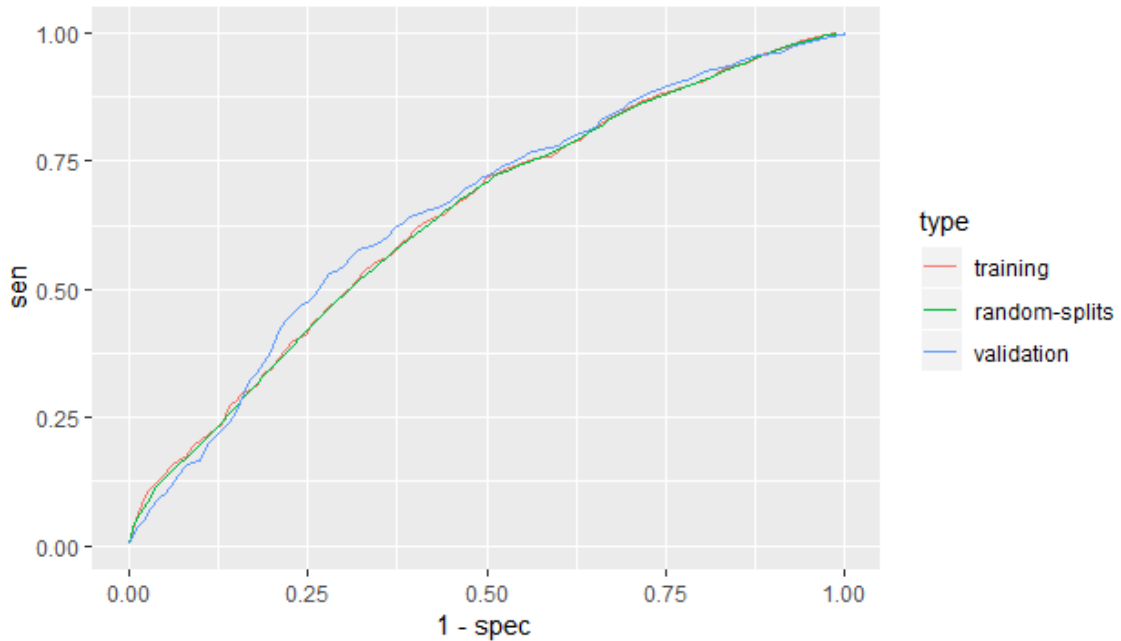
Figure 4.7: AUC Plot for Validation and Training Data Sets Using NLP Variables Labeled Diagnosing.



#### 4.3.5 Preparing

The preparing stage contained only eight NLP variables to choose from. The priority information for this stage of the value chain include all terms related to education concerning treatment options. Though this category can include information about side effects, compliance, and efficacy, it is not limited to medication or drug interventions. Thus, ‘red meat’, ‘taking NSAIDs’, and ‘kidney’ were chosen as NLP surrogates. Because NSAIDs are likely to be the first line of treatment for gout flares that patients can take while deciding on long-term treatment options, the NDC codes for a common over-the-counter treatment (ibuprofen) were also designated as surrogate variables. 121 possible variables were considered for this model. The model performed similarly to the previous stages (figure 4.8). Ibuprofen demonstrated the greatest effect on the model. ‘Red meat’ was the only NLP variable to have an individual effect on the model.

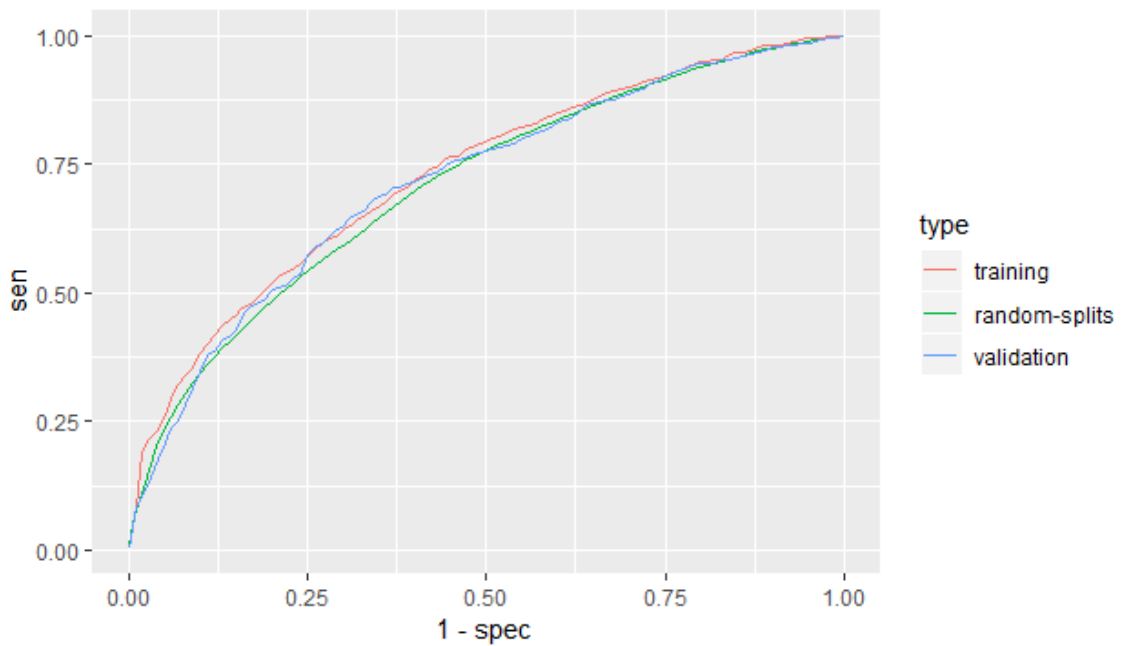
Figure 4.8: AUC for Model Created Using NLP Variables Labeled as Preparing.



#### 4.3.6 Intervening

For intervening, there were 297 total variables. Priority information for the intervening stage of the care cycle consists of ordering and administering drug therapies. The NLP concepts chosen as surrogates were all drugs commonly prescribed for gout treatment, both acute attacks and long-term ULTs. The NDC codes for these drugs were also included as surrogate outcome variables for a total of 46 surrogates for consideration by SAFE. This model performed better (training AUC=.729) (figure 4.9). Sulfinpyrazone showed a strong association in the model with a beta coefficient > 5.

Figure 4.9: AUC Plot for Training and Validation Sets Using NLP Concepts Labeled Intervening.

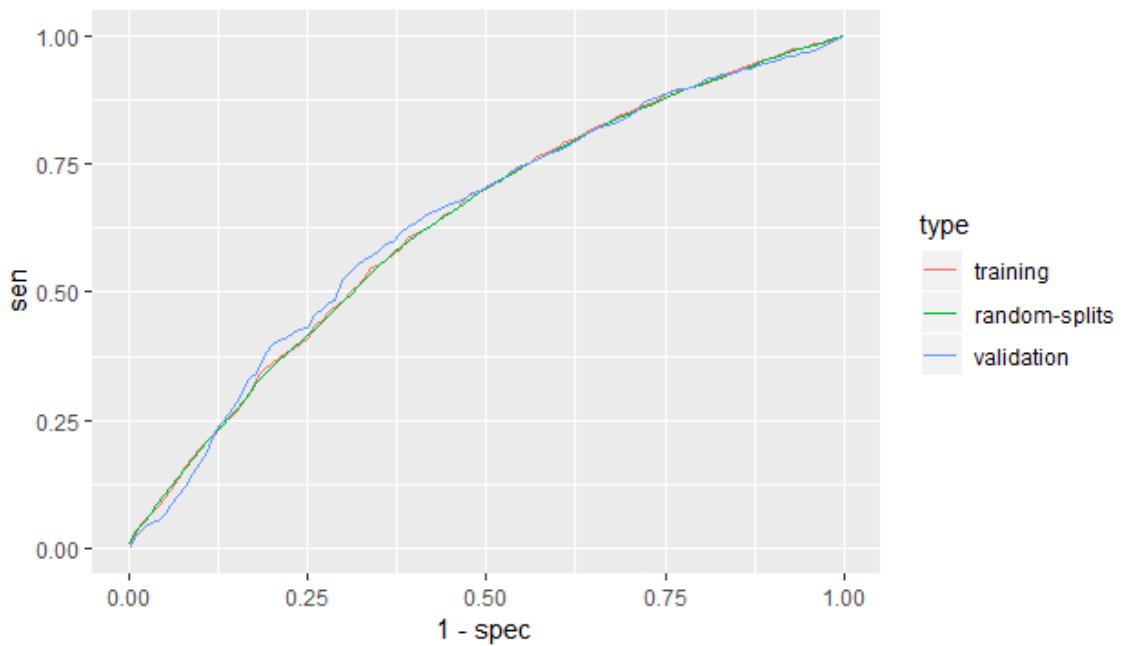


#### 4.3.7 Recovering

The recovering stage only provide three NLP concepts for consideration. Priority information relates to fine tuning therapies. Two concepts were selected as being related to this designation ('daily' and 'renal impairment'). ICD codes for renal disease were included as surrogate representation from the structured data. The model was developed using 111 variables. The performance metrics for this model were slightly lower than those presented previously (validation AUC=.639) (figure 4.10). The main variables all demonstrated small associations with gout flares, however, the NLP concept 'renal impairment' alone showed a beta coefficient of -96.27.



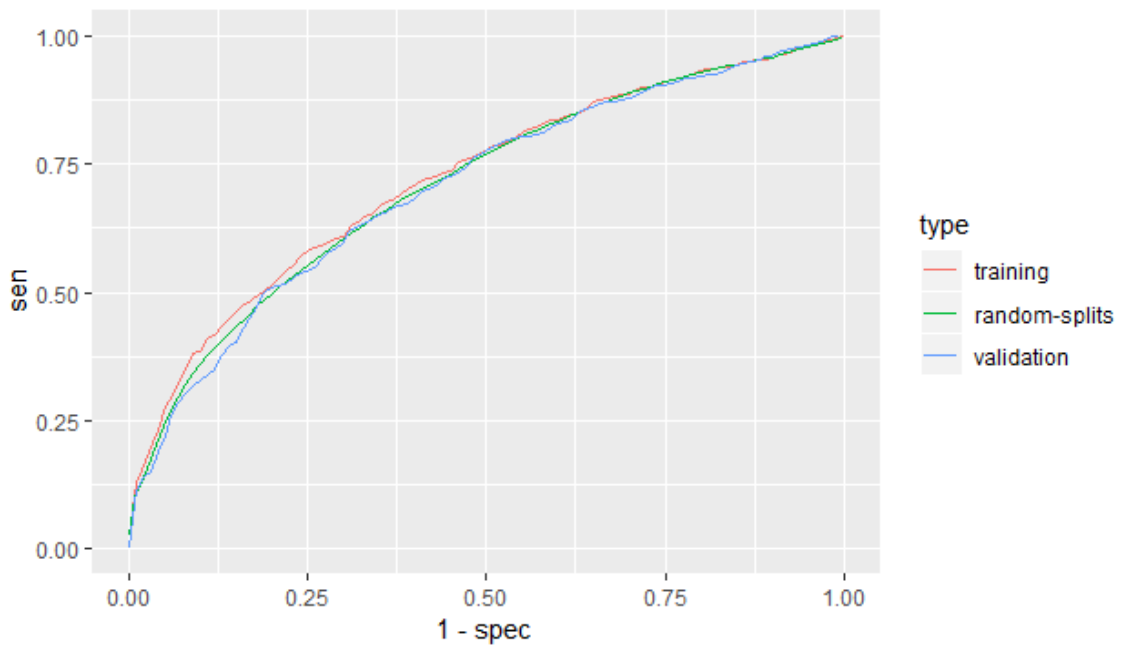
Figure 4.10: AUC Plot for Training and Validation Data Featuring NLP Variables from Recovering.



#### 4.3.8 Monitoring

The monitoring stage presented 647 variables with which to develop a model. The priority for monitoring is to manage and avoid complications, especially acute attacks. From a coded data perspective, avoidance is handled through the continued monitoring of serum urate levels. Management once an acute attack occurs frequently consists of using colchicine to alleviate symptoms. Therefore, the respective CPT and NDC codes were used as surrogate variables. 19 NLP variables related to priority information for this stage were also selected to act as surrogates. This model performed slightly lower than the intervening model (training AUC=.719) (figure 4.11). The CUIs for 'fluid intake' and 'fish oil' stand out as showing strong associations with gout flares.

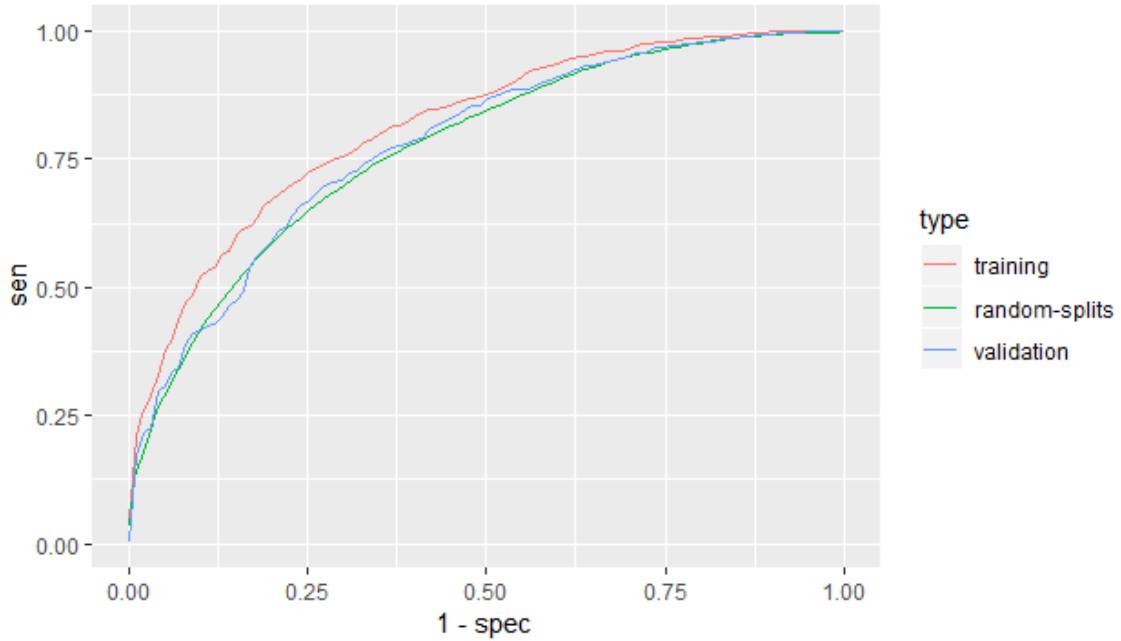
Figure 4.11: AUC Plot for Training and Validation Models Created from Variables Included in Monitoring.



#### 4.3.9 Comprehensive Model

As a final test, a model encompassing the entire value chain was developed. Whereas the first model was meant to be a general model to look for associations between broadly defined surrogates, this model was designed to look specifically at each stage of the value chain as a whole. The NLP surrogates defined for use in all previous models were also assigned as surrogate outcomes variables in this model. For medical codes, all codes used in the algorithm used to count flares were included as surrogates. In total, 1207 variables were considered for the development of this model, 112 of which were designated as surrogates. The model created had improved performance metrics when compared to the other models (figure 4.12).

Figure 4.12: AUC for Training and Validation Model for Complete Value Chain.



AUC for training data was .812. At the lowest threshold value (.672), PPV was at its lowest value of .875. All other statistics were at their highest, including an F1 score of .758.

#### 4.4 Conclusion

This chapter contains the results of the analyses, connects the analyses back to the research questions, and demonstrates consistency of the analyses with value chain theory. Data for 3964 patients was included in this value chain study. Structured and unstructured medical data was used to understand what information is readily available in patient education materials regarding the topic of gout and which concepts are associated with patient gout flares. The majority of patients were white males in the 55-69 age range.

Consistent with value chain analysis, each piece of data in each step of the study was placed in the care continuum according to the stages of the care delivery value chain where it is believed to contribute value. Comparative analysis was conducted to discover categories, themes, and relationships between and within the six value chains, leading to the following key findings. The key findings resulting from this study summarize the contributions of PEMs to the inefficacy of patient education: (a) Gout PEMs contain far more terms related to diagnosis or procedures than medications, except for information

related to the intervening stage (b) term usage varies markedly between PEMs and clinical notes, (c) Information related to preparing and recovering are noticeably absent from gout PEMs, (d) Gaps in PEM data were exacerbated in clinical note output, (e) The best performing models utilized the most input data.

Neither demographic nor healthcare utilization variables contributed to any of our models. Additional data on the similarities and differences discovered across the different stages of the care delivery value chain, between PEM and clinical note NLP output, and how variables relate to gout flares are also found in this chapter. While great strides have been made in creating good patient education materials, it is evident from the research results that there is variability in the information patients are given to learn about gout and the individual health data patients must keep track of to manage their disease. Chapter 5 includes the summary of critical analysis and discussion of these findings.

## CHAPTER 5. DISCUSSION

The purpose of the value chain study was to identify factors associated with gout flares, leading to a model for identification. This chapter includes a discussion of major findings as related to the literature on gout patient education and gout patient information requirements and what implications may be valuable for use by stakeholders. Also included is a discussion on connections to this study and value chain theory and healthcare policies. The chapter concludes with a discussion of the limitations of the study, areas for future research, and a brief summary.

The information value chain created from a scoping review allowed us to identify important information from popular gout patient education materials. The ability to use this information to identify important information in the clinical notes of gout patients and subsequently identify associations to gout flares was hindered by the following key findings: (a) Gout PEMs contained far more terms related to diagnosis or procedures than medications, except for information related to the intervening stage (b) term usage varied markedly between PEMs and clinical notes, (c) Information related to preparing and recovering was noticeably absent from gout PEMs, (d) Gaps in PEM data were exacerbated in clinical note output, (e) The best performing models utilized the most input data. Some issues relate primarily to PEMs, some to the clinical narratives, and some are a combination of the contextual relationship between the two. These issues help contribute to lack of understanding and self-management skills for gout patients.

### 5.1 Phase One Discussion and Conclusions

#### 5.1.1 Discussion

The results of this scoping review indicate that treatment and other interventions are the most popular topics for gout patient information related research. This is reflective of the confusing and complicated nature of gout treatment as both a chronic and acute condition. Moreover, several key findings highlight the interrelated nature of the various information types necessary to successfully manage gout.

A heavy focus on treatment for a health problem is to be expected, especially for a chronic painful condition like gout. However, the emphasis on treatment in research

studies for a disease that has proven treatment protocols is indicative of a larger problem. Several studies highlighted that adherence to long term therapies is lacking in gout patients. Patients often indicated that this is due to a lack of understanding of when and how to take both long- and short-term medications prescribed for gout. However, many studies found that lack of knowledge about the causes and progression of the disease was a contributing factor to misunderstandings regarding adherence to treatment strategies.

Furthermore, all of the limited research pertaining to the first two stages of care (n=3) identified lack of education regarding the causes and consequences of gout. Pre-diagnosis, this lack of understanding of gout pathophysiology leads to underdiagnosis. The research focus on this topic throughout the care cycle indicates that this issue is not remediated in later stages and continues to create barriers to effective disease management.

In addition, the variety of information types identified as being necessary for optimal gout management is reflective of the multifaceted nature of gout. Several of the articles highlighted multiple information types demonstrating that the categories work together to enhance understanding and aid the behavioral, cognitive, and emotional processes necessary for treatment compliance. Specifically, patients desire more information regarding natural remedies and lifestyle advice.

#### 5.1.2 Further Research

Despite the rich research findings provided by the relevant articles identified by the scoping review, the majority were only tangentially related to our aim of identifying the information required for improving the efficacy of treatment/management strategies. The existing literature is largely focused on identifying gaps in patient knowledge with conclusions drawn about needed information through inference from the results. More research needs to be done to explicitly identify the information that is required for more efficient education guidelines to avoid extraneous information that risks overwhelming the patient.

Six studies analyzed education interventions with two being systematic literature reviews. All studies found the interventions to be successful for increasing treatment adherence, however, each study utilized different methods for implementing and measuring the outcomes of the chosen intervention. Limited research is available for

interventions outside of the treatment stage. The included studies indicate that patients give up on medications and treatment options when side effects occur due to misunderstandings, essentially leading them to skip the recovering/rehabbing phase in favor of treating only the symptoms of acute attacks. Furthermore, studies have identified that, just as gout therapies need to be fine-tuned for the individual, education is best tailored and personalized to each patient. Future research could focus on exploration of what to do for improvement, rather than what is not being done.

### 5.1.3 Strengths and Limitations

This is the first scoping review conducted for this particular topic. The broad search strategy and inclusion criteria contributed to the breadth of evidence uncovered and provided a comprehensive overview of available research. In addition, these factors were essential to conducting a rigorous review in adherence with published scoping review protocols at each step of the screening, selection, and evaluation processes.

Despite the meticulous and robust methods utilized, the review still has limitations. First, in line with general scoping review protocol, the quality of the available research was not evaluated. As such, this review only identifies the existence of key findings and makes no judgement on the worth or potential benefits of said findings. Second, only articles published in the English language were included, meaning that articles relevant to the topic that could have further incites might have been excluded. Last, it is possible that some relevant studies were not retrieved using our search strategy. Though the search terms were chosen because they were believed to be sufficiently broad so as to encompass the majority of relevant research, it is possible that some authors expressed the concept of ‘gout patient information’ in an alternate way that would not be retrieved by our search strategy.

### 5.1.4 Conclusion

This review highlights the limited attention that has been paid to the information needs of gout patients. Though interest has grown in the last two decades, there is still an explicit need to explore the essential information requirements for optimal care and patient self-management. Specifically, there is a need to determine what information is most beneficial at each stage of the value chain.

### 5.1.5 Practice Implications

This scoping review is an initial attempt to grow the field of patient education research through the application of value chain analysis to identify areas that need further exploration by highlighting where value is currently being created and where gaps still occur. Continuation of this type of research can aid in recognizing the extensive health information needs of gout patients for the purpose of ensuring the receipt of adequate amounts of information at the time it is most beneficial. Such research can further be used to develop education interventions and other solutions to address issues in patient education.

## 5.2 Interpretation of Findings

While individuals vary in their healthcare knowledge, skills, and experiences, each of the key findings identify prominent factors in encouraging patient education throughout the continuum of care. These issues are dynamic in nature, as what is important to each patient changes over time. Each issue is examined in detail in the following sections.

### 5.2.1 Phase Two

At first glance, the lack of medication information in patient education materials about a disease might not seem like an egregious issue, or, in fact, an issue at all. There are PEMs available for specific gout and other drugs. However, when looking back over the gout value chain, we see that while medication information may be more important in certain stages, it is an important consideration in all phases of the care cycle. In the screening phase, it should be known that some medications can increase the risk of developing gout. Patients start the tests that help determine the treatment plan, including medication dosages, in the diagnosing phase. Medication information is especially important in the preparing and recovering stages where it is most absent. Patients should be receiving information about all of their treatment options in the preparing phase to help decide on the best course of treatment, taking into account interactions of medications currently being taken for preexisting conditions. For the recovering phase, patients need to know when to consult their healthcare provider about fine-tuning their medication dosages. Research has shown that patients that do not know the expected medication outcomes or



that dosage adjustments are part of the process are more likely to stop treatment (Hui et al., 2017). This stays important throughout the monitoring phase, where patients must constantly deal with new and existing comorbidities, along with their associated medications. In contrast, the sheer number of extracted medication terms identified as intervening suggests that gout PEMs contain a significant amount of information related to gout drugs. This noted imbalance likely caused our ner model to assign most medication concepts to either intervening or monitoring.

It is clear from the results that there is an overall lack of concepts extracted from the PEMs, and consequently from the clinical notes, for the preparing and recovering stages. This is indicative of a gap in the gout PEMs and gout patient education in general (Becker & Chohan, 2008). Furthermore, the information that is offered for these stages often overlaps with concepts from the intervening and/or monitoring phase. Such terms are usually used in the context of intervening or monitoring much more frequently, especially for medication related terms. This means that the ner model is more likely to identify the term as one of those two phases.

The researchers attempted to identify all important information contained with the patient education texts. Due to the writing style characteristic to our set of PEMs, this sometimes resulted in the annotation of longer phrases and sometimes, whole sentences. Clinical notes are not written with patients in mind and can be written as brief notes with a lot of medical jargon or abbreviations, depending on the style of the healthcare provider. Our ner model did fairly well at extracting medically related concepts from longer phrases and picking up certain abbreviations, even though these were not included in the original keyword list. Interestingly, in many instances, the ner model assigned a different value chain stage than originally labeled in the keyword dictionary. This is potentially correct and all of the cases I reviewed were accurately labeled based on context. Even so, this still can cause issues beyond the fact that the model will not accurately distinguish between stages 100% of the time. At times, the model did not assign a new value chain stage to a concept in addition to the keyword label, it assigned it instead of. This suggests that the concept is not used within the clinical notes in the same manner that it is used in the PEMs, which could cause confusion for patients

### 5.2.2 Phase Three

. With regard to developing models with an aim toward identifying gout flares and associated concepts, this eliminated several potential features for some stages while potentially adding potential features to others. In addition, whenever a concept is included in more than one stage, its counts are split between the stages depending on the context in which it appears in the note. This is exactly what we would want the ner to do. However, when working with algorithms that rely on frequency counts, as does the pheCAP algorithm, entities with split counts are less likely to show well in the developed model.

In terms of the pheCAP models developed for these stages of care, this meant that there were very few terms to choose from. This was especially noticeable when trying to select NLP surrogates for the recovering model. Only six terms were extracted for this phase. After removing generic terms and those that did not meet the patient threshold, there were only three terms to choose from ('dairy products', 'daily', and 'renal damage'). All concepts were included for consideration in the final model; however, per the methodology, surrogate variables were required to be chosen that reflected information designated as priority for the specific phase. In the case of recovering, priority information was related to the fine tuning of therapy. Thus, 'daily' was chosen as it could be part of a medication dosage change and 'renal damage' was selected because it could possibly be a reason for fine tuning therapy. 'Dairy products' was not chosen because it was categorized as a nonpharmacological intervention, which is within the purview of recovering, but not priority information. This was the lowest performing model.

It is always possible that the terms simply do not appear in patient notes. This would go back to the textual and contextual issues previously discussed wherein information patients need is included in PEMs but is not of concern to clinicians. This would seem most likely for nonpharmacological interventions. However, terms such as 'red meat', and 'seafood' appear under the label of alternative stages like monitoring. There are also frequent mentions of vitamins and other supplements such as 'fish oil' identified in other stages, as well.

The best performing model, in terms of both gout flare prediction and identifying associations, was the comprehensive model that not only included concepts from all stages

of the value chain, but also designated NLP concepts from every care stage as surrogate variables. In addition, all ICD, NDC, and CPT codes traditionally associated with gout and its treatment were included as surrogate outcome variables. The model for the monitoring phase performed second best, and it had the most concepts of all the care phases.

Though the study was somewhat hindered by the fact that the initial model was based on only seven PEMs, the disparity in concepts collected for certain stages suggests that some types of information are missing or neglected in gout materials. While there are certainly more PEMs that could be used to add to the model, the ones used for this study are among the most popular and trusted on the web. Furthermore, the concepts are fairly uniform among the various PEMs. Though there are some definite differences, such as Wikipedia, adding more PEMs in the same vein could just lead to exponentiation of the current concepts.

This issue is not limited to NLP concepts. Many of the CPT codes selected due to previous usage in gout studies were not useful for this project because none of our patients had that code anywhere in their data. This was true for some ICD codes and a few medication codes, as well.

### 5.3 Implications for Theory and Research

Chapter 2 included descriptions of several value chain models. These models included Porter's care delivery value chain utilized for this study. How the models developed in this study fit with this model is discussed in the following sections.

#### 5.3.1 Phase One

The strategic framework for healthcare delivery put forth by Kim, Farmer, and Porter (2013) includes the suggestion that in order to optimize healthcare for equitable community and economic development, we must first understand the full set of activities involved across the entire care cycle for all medical conditions. In this study, a value chain for gout is presented from an information perspective. The results of this study align with the primary activities of the care delivery value chain as those that generate information. However, the secondary activities primarily deal with tasks related to managing information, which in the case of an information value chain seems redundant. In this sense,

the focus is not so much on the value of task, but the value of the information created by or required for the task.

### 5.3.2 Phase Two

Gout is a unique disease with a unique patient population. The rate at which NLP terms were extracted across multiple care stages in both PEMs and clinical notes confirm that the current practice of viewing medical care as a series of isolated interventions for symptoms is less than ideal. The number of concepts related to complications and comorbidities found in our patient notes gives credence to the assertion that a medical condition is not one disease (Kim, Farmer, & Porter, 2013). Our cohort, specifically, has a high number of patients that also have diagnostic codes for lupus. This is reflected in the NLP output where we see several lupus related terms, such as ‘lupus flares’ and ‘SLE’.

### 5.3.3 Phase Three

## 5.4 Implications for Practice

The care delivery value chain touts the importance of a systemic view in order for patients to best evaluate information to guide care decisions. The results of this study show that the stages of the value chain are fluid, with patients potentially moving back and forth through the chain multiple times. For gout especially, it is difficult to tell which care stage a patient is in or which stage information is most applicable to. This is reflected throughout the value chain, the PEM and clinical note output, and the models created to identify gout flares and associated concepts.

### 5.4.1 Phase One

The gout information value chain was developed using a collection of research concerning the information requirements of gout patients and best practices for treatment and self-management. For a variety of reasons, best practices are not always implemented by healthcare providers. The repetition of topics throughout the value chain indicates that information might be best given multiple times in the care cycle. It is likely that patients might need slightly different information about the same topics depending on the care

stage. Yet, patients are usually given only one worksheet of basic gout information when first diagnosed with the condition.

#### 5.4.2 Phase Two

Much of the information identified in the gout value chain are not included in PEMs or clinical notes, nor are they told the information by any of their healthcare team. The British Society for Rheumatology Guideline for the Management of Gout specifically advocates for the provision of written and verbal instructions for most of the information included in our value chain (Hui et al., 2017). Research routinely shows that patients do not recall receiving educational information (Vaccher, et al., 2016) and our study demonstrates that many concepts related to the necessary information are not readily available in PEMs or patient notes.

#### 5.4.3 Phase Three

When using the concepts collected from patient notes to develop models for each stage of the value chain, there was a noticeable lack of available data for several care phases. This was discussed in our key findings, but the attempts to create models for each stage of care cycle revealed possible implications for clinical practice

There were plenty of available NLP concepts for screening; however, when searching for priority information to use as surrogate variables it was discovered that none of the symptoms that are considered among the first signs gout (painful joints, redness, swelling) were included in the screening data. These concepts did appear in the diagnosing and monitoring data. The concepts were annotated as screening when creating the keyword dictionary, however, the concepts were used far more often in the context of diagnosing or monitoring within the PEMs. The NER model subsequently learned to label those signs and symptoms as one of those stages. As a consequence, the screening NLP was proliferated with and overabundance of terms related to family history and risk factors. Similarly, the priority information for diagnosis is related to the ordering and administering of lab tests used to diagnose gout. Synovial fluid analysis is considered the gold standard for gout diagnosis (Hui et al., 2017). There was a concept close to this (fluid analysis) which was used as a surrogate variable for this model, however, the diagnosing data had

far more data related to possible signs and symptoms. This is in line with the research, which states that clinicians generally use signs and symptoms for gout diagnosis and screening mostly takes place outside of the healthcare cycle (Kim, Farmer, & Porter, 2013).

The lack of concepts found in the preparing stage and the abundance of terms labeled intervening support research that highlights the focus on treatment in healthcare with the preparing stage largely being skipped (Hui et al., 2017). Recovering similarly had a low number of concepts and research strongly indicates that this stage is mostly ignored in gout due to patients not realizing that ULTs can often set off flares as a side effect. This can be remedied by adjusting the medication; however, many patients just stop treatment (Hui et al., 2017). The preponderance of terms found for monitoring are likely similar to intervening.

## 5.5 Limitations

While this study produced numerous interesting results, the utility of the data is reduced due to several limitations. First, despite the relatively high number of patients and documents included in the study, the data was relatively sparse for the methodology. Even though codes and concepts might occur in the data sets, total counts could be low overall or spread among very few patients. As a result, the pheCAP algorithm identified very few associated terms for each model.

Second, our models can only be developed using information that exists. Missing or rare information in PEMs and patient notes prevents a complete understanding of the associations between terms and care stages and may result in inaccurate information. While one of the goals of this study was to identify missing and misclassified information in gout PEMs and to a lesser extent, patient clinical narratives, using PEMs to develop an NER model to extract information based on a care delivery value chain is likely not the best method.

Third, the researchers tasked with selecting information deemed important to patients are not clinicians, nor do they have the perspective of gout patients. The participation of either would have greatly benefited the study. Though each step in the study process was guided by prior research, the perspective of a rheumatologist would have been invaluable in variable selection, such as designating priority information for the stages of the value

stage or choosing surrogate variables for the phenotyping models. Having information about why healthcare providers sometimes do not follow best practice guideline could have a profound impact on the output of this study. Similarly, having patient annotations for PEMs would be immensely helpful in identifying valuable information. Though the literature review included multiple studies featuring summaries and conclusions about what information gout patients want and need, without personally experiencing gout, researchers can only annotate with an eye toward what they think gout patients need or what they would want to know as a patient.

## 5.6 Future Research

There are several opportunities for future research that could add to the findings of this study. The NER model created to extract concepts from patient data performed well according to standard metrics. It did identify concepts from PEMs and learned to identify similar, new concepts according to the value chain in clinical notes. However, in some cases it overlearned. For example, researchers identified multiple instances of family history related concepts in the PEMs as screening. Possibly to the frequency of occurrence, the model learned that ‘family history’ was important and extracted every term associated with ‘family history’ from patient notes. Future research could be done to refine the NER model. Similar methods could also be applied to other diseases. Gout is a complicated disease as outlined throughout this study. Other medical conditions are certain to have their own inherent complexities, however, the application of value chain analysis could offer additional insights into new diseases, as well as cNLP methods. As stated in the limitations section, input from clinicians and patients should be sought throughout the process as much as possible. Additionally, there is the opportunity to go farther with the concept of value and attempt to quantify the importance of patient information. A more quantitative study could be developed to understand the contribution of information to improving patient health outcomes.

## 5.7 Conclusion

Having necessary information is critical to gout patient self-management. Many factors are involved in ensuring gout patients have the right information to make well-

informed decisions about their healthcare. This is the first study the researcher is aware of that creates a value chain for gout. It is almost certainly the first study to use value chain analysis to develop an NER model. Though the models created in this study demonstrated only marginal success, the results highlighted several interesting findings: (a) Gout PEMs contained far more terms related to diagnosis or procedures than medications, except for information related to the intervening stage, (b) term usage varied markedly between PEMs and clinical notes, (c) Information related to preparing and recovering was noticeably absent from gout PEMs, (d) Gaps in PEM data were exacerbated in clinical note output, (e) The best performing models utilized the most input data.

The implications of these findings may not be immediately clear. The value chain developed for this study would need to be validated. The NER model performs well at extracting concepts, but those concepts are not necessarily gout related. The phenotyping algorithms identified mostly weak associations between concepts in the value chain and flares. The results of this study validate the gaps in information perceived by patients and gives us particular areas to start filling in. Deciding how to fill those gaps is another matter. The results of this study indicate that patient data does not necessarily have the information, either. The weak associations identified could be used to identify stronger connections to gout flares and thus, more useful information. Hopefully, someday patients will be able to access important information tailored to their needs to optimize their healthcare. Until then, future studies could focus on identifying patient information needs throughout the care continuum.



## APPENDICES

## APPENDIX 1. KEYWORD DICTIONARY

Dictionary Keywords divided into medication related and other terms for each stage of the value chain. Terms in italics were considered too generic and removed from the final dictionary. Bold items also appear in clinical note output in the same phase.

Medication			Diagnosis/Procedures		
benzbromarone	C0005035	Intervening	stomach or intestines	C0017178	Intervening
colchicine (Colcrys	C2718494	Intervening	<i>chance</i>	C0237506	Intervening
colchicine (tablets or injection	C4048699	Intervening	<b>joint</b>	C0022417	Intervening
colchicine-induced	C3656515	Intervening	inflammation and pain in joints	C0003864	Intervening
Colchicine/probenecid	C0717652	Intervening	nausea, vomiting, diarrhea and	C0151791	Intervening
disease, or who take drugs that interact	C3805130	Intervening	relieve pain	C0002766	Intervening
Febuxostat (Uloric	C2608992	Intervening	<i>also</i>	C0238664	Intervening
Given orally (by mouth) or by injection	C0555966	Intervening	<b>heart and kidney</b>	C0155602	Intervening
nonsteroidal anti-inflammatory drugs	C0003211	Intervening	diarrhea, nausea, vomiting, and	C0151791	Intervening
NSAIDs can also cause kidney problems in people taking diuretics or certain other medicines to	C2029949	Intervening	<b>stomach upset</b>	C0235309	Intervening
or low-dose	C1542589	Intervening	<b>Vitamin C</b>	C0003968	Intervening
Pegloticase (Krystexxa) is given by injection	C2938134	Intervening	Renal	C0022646	Intervening
<b>Probenecid</b>	C0033209	Intervening	<b>blood uric acid levels</b>	C0373739	Intervening
Colchicine	C0009262	Intervening	Low-dose	C0445550	Intervening
doctor may need to change the doses of your medications or monitor you	C3476743	Intervening	deposition of urate crystals in the renal medulla or uric acid crystals	C0522574	Intervening
<b>Fenofibrate</b>	C0033228	Intervening	ulcers or bleeding in the stomach	C0586374	Intervening
Nonsteroidal anti-inflammatory drug	C0003211	Intervening	ulcers, and bleeding – NSAIDs can cause stomach	C0586374	Intervening
ranolazine (Ranexa	C1703958	Intervening	prevent disease	C0679698	Intervening

allopurinol (Aloprim	C4058836	Intervening	blood levels of uric acid to normal	C0855643	Intervening
Allopurinol is also sometimes used to treat seizures, pain caused by	C0274778	Intervening	<b>stores</b>	C1698986	Intervening
<i>brand name drugs</i>	C0590778	Intervening	<i>such as</i>	C1881351	Intervening
<i>cause other side effects</i>	C0013679	Intervening	rash; skin redness	C2126375	Intervening
Colchicine is not	C1851351	Intervening	attacks of gout	C2712871	Intervening
Colchicine may cause side effects	C0868415	Intervening	relieve pain and reduce	C2940249	Intervening
<b>corticosteroids</b>	C0001617	Intervening	vitamins, minerals, or other dietary supplements	C4036036	Intervening
<b>Febuxostat</b>	C0249529	Intervening	<i>effects may be</i>	C4229333	Intervening
<b>ibuprofen</b>	C0020740	Intervening			
<b>indomethacin</b>	C0021246	Intervening			
Lesinurad (Zurampic	C4074452	Intervening			
Nonsteroidal anti-inflammatory drugs (NSAIDs	C0003211	Intervening			
<i>of your medications or monitor you carefully for side effects</i>	C0513367	Intervening			
oral corticosteroids plus colchicine	C0775883	Intervening			
prednisone, methylprednisolone	C0338362	Intervening			
Steroids – Steroids can reduce	C2315131	Intervening			
sulfinpyrazone (Anturane	C1578263	Intervening			
<i>What side effects can this medication</i>	C3639329	Intervening			
xanthine oxidase inhibitors	C0302609	Intervening			
naproxen (Naprosyn	C1578052	Intervening			
allopurinol or probenecid	C2194181	Intervening			
<b>Allopurinol</b>	C0002144	Intervening			
Allopurinol may cause	C0274778	Intervening			
azathioprine	C0004482	Intervening			
can be taken as pills or as	C3641844	Intervening			
febuxostat (brand name: Uloric	C2608992	Intervening			
indomethacin (Indocin	C0306458	Intervening			
ingredients in colchicine	C0009262	Intervening			
inject a corticosteroid directly into your joint	C2137753	Intervening			

lesinurad	C3886073	Intervening			
<i>no side effects</i>	C3650791	Intervening			
nonsteroidal anti-inflammatory drug (NSAID)	C0003211	Intervening			
NSAIDs	C0003211	Intervening			
NSAIDs (Nonsteroidal anti-inflammatory drugs)	C0003211	Intervening			
Medication			Diagnosis/Procedures		
200 mg: Initiate 1 tablet of lesinurad 200 mg/allopurinol 200 mg	C4073461	Monitoring	meats and fish	C0335766	Monitoring
adverse effects of NSAIDs	C0413722	Monitoring	Nausea/vomiting	C0027498	Monitoring
doses of short-acting NSAIDs give the fastest relief of	C1880956	Monitoring	inflammation of the mouth	C0038362	Monitoring
79initial79lam (Lescol), lovastatin (Mevacor), pravastatin (Pravachol), and simvastatin (Zocor	C3173335	Monitoring	<b>allergic reactions</b>	C0020517	Monitoring
ibuprofen (Advil, Motrin	C0306865	Monitoring	Alcohol in excess	C0159070	Monitoring
increase your dose	C1707810	Monitoring	fever, chills, and	C0085594	Monitoring
like aspirin and ibuprofen), ice the inflamed area and drink plenty of	C1424457	Monitoring	Drink alcohol	C0001948	Monitoring
Stevens-Johnson Syndrome, drug	C1274933	Monitoring	leukopenia	C0023530	Monitoring
<i>tell your doctor if you are taking</i>	C3476385	Monitoring	<b>hypersensitivity reactions</b>	C0020517	Monitoring
anti-inflammatory	C0003209	Monitoring	<b>inflammation</b>	C0021368	Monitoring
<i>before taking your</i>	C3476385	Monitoring	stomach cramping	C0344375	Monitoring
<b>Colchicine is</b>	C1851351	Monitoring	<b>stones</b>	C0006736	Monitoring
cyclophosphamide (Cytosan	C1605278	Monitoring	wrinkled skin	C0037301	Monitoring
<i>Do not take</i>	C3476381	Monitoring	rapid or irregular heartbeat	C0080203	Monitoring
<b>nonsteroidal anti-inflammatory drugs (NSAID</b>	C0003211	Monitoring	familial Mediterranean fever	C0031069	Monitoring
<b>steroids</b>	C0038317	Monitoring	<b>seafood</b>	C0206208	Monitoring
<i>adverse drug reactions</i>	C0041755	Monitoring	decrease fertility in	C0151639	Monitoring
aspirin) and increase the	C0357297	Monitoring	swelling of the salivary glands	C0240925	Monitoring
atorvastatin (Lipitor	C0286650	Monitoring	osteoarthritis or rheumatoid arthritis	C0029408	Monitoring

brand names: Advil, Motrin) and indomethacin (brand name	C0699203	Monitoring	<b>Renal stones</b>	C0022650	Monitoring
brand names: Advil, Motrin), and naproxen (brand name	C0699203	Monitoring	Mediterranean fever (FMF; an inborn condition that causes episodes of fever	C0031069	Monitoring
Celecoxib (Celebrex	C1593710	Monitoring	degenerative arthritis	C0029408	Monitoring
<b>Colchicine</b>	C0009262	Monitoring	<b>swelling</b>	C0038999	Monitoring
Colchicine (Colcrys	C2718494	Monitoring	<b>ulceration</b>	C0041582	Monitoring
Colchicine comes as a tablet and solution	C1251364	Monitoring	<b>hypomagnesemia</b>	C0151723	Monitoring
<i>Common adverse drug reactions</i>	C0414040	Monitoring	breath odor	C0018520	Monitoring
CrCl	C1846718	Monitoring	tophi	C0221248	Monitoring
<i>Do not stop taking</i>	C3476381	Monitoring	sensitivity to light	C0085636	Monitoring
Febuxostat	C0249529	Monitoring	failure, kidney disease	C0035078	Monitoring
fluconazole (Diflucan), itraconazole	C1541189	Monitoring	Renal colic	C0152169	Monitoring
fosamprenavir (Lexiva	C1321662	Monitoring	irritation of the eyes	C0235266	Monitoring
gastrointestinal adverse drug reactions	C0413956	Monitoring	<b>heart attack</b>	C0027051	Monitoring
<i>higher doses of</i>	C3639809	Monitoring	<b>within 48 hours</b>	C0150946	Monitoring
<i>It is taken</i>	C1881371	Monitoring	acute flares of gouty arthritis	C0149896	Monitoring
lesinurad 200 mg	C4074641	Monitoring	<b>pseudogout</b>	C0033802	Monitoring
medicines are working and you are taking	C3176475	Monitoring	skin lesions, severe acne or a skin rash, sores or	C0241096	Monitoring
mg: Initiate 1 tablet of lesinurad 200 mg/allopurinol 300 mg	C4073461	Monitoring	pain in one or more joints	C0162296	Monitoring
minders and those for eye drops, creams, patches, and inhalers) are not child	C0402660	Monitoring	stomach cramps	C0344375	Monitoring
<b>nonsteroidal anti-inflammatory drugs (NSAIDs)</b>	C0003211	Monitoring	blood flow and thereby decrease	C0232342	Monitoring
<b>NSAID</b>	C0003211	Monitoring	blurred vision	C0344232	Monitoring
<b>NSAIDs</b>	C0003211	Monitoring	dry mouth	C0043352	Monitoring
over-the-counter NSAID with a prescribed NSAID or take more than the recommended dose of the	C2054168	Monitoring	<i>certain types of</i>	C0007832	Monitoring
ritonavir (in Kaletra, Norvir), and saquinavir	C1977397	Monitoring	decreased interest in sexual	C0011124	Monitoring

take by mouth	C3472561	Monitoring	painful or difficult urination	C0013428	Monitoring
to aspirin, other NSAIDs, sulfa drugs, or have nasal polyps (linked to a greater chance of NSAID allergy)	C0038757	Monitoring	<b>chronic</b>	C0205191	Monitoring
warfarin (brand name: Coumadin) or	C3827680	Monitoring	antiphospholipid antibodies	C0162595	Monitoring
<i>you are taking</i>	C3176195	Monitoring	symptoms occur	C0232959	Monitoring
<i>your doctor before taking</i>	C3476385	Monitoring	<b>kidney stones</b>	C0022650	Monitoring
diltiazem (Cardizem	C1243267	Monitoring	Chronic gouty arthritis	C0268108	Monitoring
Neoral, Sandimmune	C0699603	Monitoring	fibrillation after cardiac	C0232197	Monitoring
prostaglandins	C0033554	Monitoring	Increased susceptibility to infection	C0236171	Monitoring
lesinurad	C3886073	Monitoring	numbness of the feet, hands, and around the mouth	C0221730	Monitoring
Long-term use of NSAIDs	C2911180	Monitoring	ecchymosis	C0013491	Monitoring
<b>Nonsteroidal anti-inflammatory drugs</b>	C0003211	Monitoring	<i>remedies</i>	C0205202	Monitoring
Some NSAIDs need to be taken more often during the day than	C3843221	Monitoring	tophi occur in advanced gout	C0221248	Monitoring
acylglucuronide	C0299192	Monitoring	<b>peripheral vascular disease</b>	C0085096	Monitoring
Anakinra	C0245109	Monitoring	decreased appetite	C0232462	Monitoring
dose is too high	C3163907	Monitoring	skim milk	C0349375	Monitoring
<i>mg/kg/day</i>	C3642190	Monitoring	scaly skin	C0423773	Monitoring
reactions to allopurinol	C0414017	Monitoring	skin reactions such as maculopapular rash	C0423791	Monitoring
<i>when starting these</i>	C3166682	Monitoring	and chronic abuse of ethanol (especially beer and hard liquor)	C0425331	Monitoring
			<b>infections</b>	C0439663	Monitoring
			<b>deposits of crystals</b>	C0442844	Monitoring
			Secondary infections	C0442886	Monitoring
			<i>reactions</i>	C0443286	Monitoring
			<b>low doses</b>	C0445550	Monitoring
			soft tissues of joints	C0447831	Monitoring
			Sugary drinks and foods	C0453425	Monitoring

			affected joint and apply ice packs or cold compresses (cloths soaked in ice	C0508503	Monitoring
			is working properly	C0509404	Monitoring
			measuring device) to accurately measure the correct amount of	C0512904	Monitoring
			uric acid levels in the blood may lead to deposits of urate crystals	C0522574	Monitoring
			deposit in the joints	C0541866	Monitoring
			<b>kidney or liver</b>	C0545792	Monitoring
			feeling of warmth	C0549386	Monitoring
			<b>limiting alcohol intake</b>	C0560219	Monitoring
			<b>not be safe</b>	C0581563	Monitoring
			rashes, or other allergic reactions	C0585186	Monitoring
			increased/decreased	C0679128	Monitoring
			Long-term exposure	C0683018	Monitoring
			high levels of a substance called uric acid in the blood	C0740394	Monitoring
			high levels of blood uric acid	C0740394	Monitoring
			High levels of uric acid in the blood	C0740394	Monitoring
			high fever	C0743973	Monitoring
			reactions are idiosyncratic reactions	C0745213	Monitoring
			gradual weight loss	C0750418	Monitoring
			Nerve or spinal cord impingement	C0751463	Monitoring
			<b>role in preventing</b>	C0814407	Monitoring
			of the lips or mouth	C0841473	Monitoring
			redness of the skin	C0848314	Monitoring
			drinking too much	C0848500	Monitoring
			crystals can attract white blood cells, leading to severe, painful gout attacks and chronic arthritis	C0850874	Monitoring
			Urate or uric acid	C0851010	Monitoring
			<b>raise uric acid</b>	C0857189	Monitoring

			paleness or grayness of the lips	C0877384	Monitoring
			inflammation are under	C0877470	Monitoring
			<b>controlling weight</b>	C0920298	Monitoring
			in the stomach	C0940163	Monitoring
			bloating from increased gas	C0946092	Monitoring
			decreased, lymphocyte count decreased	C0948021	Monitoring
			High levels of uric acid	C0948643	Monitoring
			Cherry products such as whole cherries or unsweetened cherry juice	C0982074	Monitoring
			runny nose	C1260880	Monitoring
			<b>losing weight</b>	C1262477	Monitoring
			<b>weight decreased</b>	C1262477	Monitoring
			<b>weight loss</b>	C1262477	Monitoring
			<b>risks for any coronary heart disease</b>	C1277690	Monitoring
			acid in the blood	C1287384	Monitoring
			increased levels of anti	C1295614	Monitoring
			Moderate-to-severe	C1299393	Monitoring
			attacks are typically followed by periods of no symptoms	C1304680	Monitoring
			cardiovascular events	C1320716	Monitoring
			undiagnosed vascular disease	C1385120	Monitoring
			cardiovascular events like heart attacks	C1385306	Monitoring
			kidney disease and adverse cardiovascular events	C1397469	Monitoring
			high levels in the blood	C1399735	Monitoring
			Renal impairment	C1565489	Monitoring
			<b>gout flare</b>	C1619733	Monitoring
			<b>Gout flares</b>	C1619733	Monitoring
			crystals can form tophi, or swollen growths	C1720757	Monitoring
			safe to use	C1820984	Monitoring
			temperature and away from excess heat and moisture (not in the bathroom)	C1822194	Monitoring



		temperature, away from light, and away from excess heat and moisture (not in the bathroom)	C1822194	Monitoring
		and urinary: Tubulointerstitial nephritis	C1843273	Monitoring
		<i>After several months of</i>	C1858431	Monitoring
		<i>such as</i>	C1881351	Monitoring
		increased overall likelihood of	C2015876	Monitoring
		crystals can be found in uric acid	C2022384	Monitoring
		swollen or painful glands	C2032740	Monitoring
		swollen glands in the neck	C2039120	Monitoring
		kidney stones or urate	C2109382	Monitoring
		<b>goes away</b>	C2128638	Monitoring
		lower back or side pain	C2129277	Monitoring
		Cut back on	C2186619	Monitoring
		<b>under the skin</b>	C2200110	Monitoring
		<b>Risk for vascular disease</b>	C2584745	Monitoring
		Increase risk of renal events	C2673803	Monitoring
		increased risk for any vascular event	C2673803	Monitoring
		irritation of the gastrointestinal (GI) tract	C2697368	Monitoring
		<b>gout attacks</b>	C2712871	Monitoring
		osteoarthritis, and others) and	C2893964	Monitoring
		irritation, upper respiratory tract	C2939098	Monitoring
		<b>Urate nephropathy</b>	C2955673	Monitoring
		fructose (especially high fructose corn syrup	C2981326	Monitoring
		high-fructose corn syrup	C2981326	Monitoring
		risk of heart attack, heart failure	C3176375	Monitoring
		<i>can become</i>	C3259831	Monitoring
		after acute attacks	C3279118	Monitoring
		call your doctor	C3476384	Monitoring

			may be increased in patients with decreased	C3552940	Monitoring
			flushing or redness	C3641769	Monitoring
			organ meats such as	C3687641	Monitoring
			<b>risk of kidney disease</b>	C3697935	Monitoring
			but because it can help	C3827771	Monitoring
			<i>Do not</i>	C3840725	Monitoring
			Drink at least eight glasses of water or other fluids each day	C3841851	Monitoring
			attack or stroke	C3844825	Monitoring
			containing drinks and foods	C3880948	Monitoring
			numbness or tingling in the fingers or toes	C3898946	Monitoring
			Eat too many foods rich	C3898963	Monitoring
			eating foods that are rich	C3898963	Monitoring
			If you are overweight, losing weight can help	C4034888	Monitoring
			<i>few hours</i>	C4036223	Monitoring
			unexpected	C4055646	Monitoring
			to treat gout in adults who were not treated successfully with or who are not able to take	C4068173	Monitoring
			last 3 months	C4086725	Monitoring
			<i>effects can be</i>	C4229014	Monitoring
			<i>effects may be</i>	C4229333	Monitoring
<b>Medication</b>			<b>Other</b>		
<i>tell your doctor and pharmacist what</i>	C4086247	Preparing	crystals accumulate in the urinary	C0151579	Preparing
<i>you are taking or plan to take</i>	C4068173	Preparing	liver disease or heart failure	C0085605	Preparing
<i>ask your doctor or pharmacist if you have any questions</i>	C3165542	Preparing	uric acid to break down a chemical	C0041980	Preparing
<b>blood thinners</b>	C0003280	Preparing	<b>kidney</b>	C0022646	Preparing
<b>take NSAIDs</b>	C2054168	Preparing	<b>breaks down</b>	C0443161	Preparing
or non-prescription medicines, or you take any herbal medicines, ask your doctor or pharmacist	C1978499	Preparing	drinks like cola	C0452444	Preparing

			<b>red meat</b>	C0452848	Preparing
			inflammation in the joints	C0574941	Preparing
			crystals form and collect in your joints and cause gout	C0809978	Preparing
			<b>dissolving</b>	C1549535	Preparing
			uric acid (hyperuricemia	C1559990	Preparing
			Treatment choices depend on	C2069130	Preparing
			kidneys remove uric acid	C2109383	Preparing
			do not overproduce uric acid should take	C3476381	Preparing
			production of uric acid	C3653539	Preparing
			Uric acid buildup also can lead to disfiguring lumps called tophi	C3806613	Preparing
			<i>too much</i>	C3843660	Preparing
<b>Medication</b>			<b>Other</b>		
take blood thinners	C2054133	Recovering	table salt	C0206136	Recovering
on this medicine long term to prevent	C2922112	Recovering	<b>daily</b>	C0332173	Recovering
uric acid-lowering drug, your doctor should slowly raise	C0857189	Recovering	tophi	C0221248	Recovering
effects, especially diarrhea or allergic reactions	C1546347	Recovering	<b>dairy products</b>	C0010947	Recovering
Pembrolizumab	C3658706	Recovering	damage to joints	C0269891	Recovering
			uric acid levels drop below 6 mg/dL (normal	C0151411	Recovering
			<i>levels</i>	C0441889	Recovering
			grapefruit or drink grapefruit juice	C0452456	Recovering
			on a regular basis	C0513554	Recovering
			of tophi (deposits of uric acid crystals	C0522574	Recovering
			joint destruction	C0541875	Recovering
			Lose weight	C1262477	Recovering
			<b>renal damage</b>	C1408258	Recovering
			<b>renal impairment</b>	C1565489	Recovering
			drinks, such as	C3641919	Recovering
			eating foods that are rich	C3898963	Recovering

Medication			Other		
diuretics (water pills) that help with high blood pressure	C3843190	Screening	<b>drink alcohol</b>	C0001948	Screening
Esidrix	C0700694	Screening	<b>Obesity</b>	C0028754	Screening
hydrochlorothiazide and other water pills	C3217109	Screening	skin rash	C0015230	Screening
			blood pressure), hyperlipidemia (high cholesterol and triglycerides	C0242339	Screening
			gout first attacks your big toe	C0221168	Screening
			Sickle cell anemia and other anemias	C0029738	Screening
			<b>hemochromatosis</b>	C0018995	Screening
			<b>serious</b>	C0205404	Screening
			painful swelling in single joints	C0311222	Screening
			<b>for rheumatoid arthritis</b>	C0260963	Screening
			Gout rarely affects	C0003868	Screening
			<b>Diabetes</b>	C0011847	Screening
			painful urination	C0013428	Screening
			<b>osteoarthritis</b>	C0029408	Screening
			<b>Kidney disease</b>	C0022658	Screening
			<b>family history of gout</b>	C0221613	Screening
			high blood pressure), hyperlipidemia (high cholesterol and triglycerides	C0242339	Screening
			pseudogout	C0033802	Screening
			base of the big toe	C0224039	Screening
			<b>gastric bypass surgery</b>	C0192398	Screening
			the big toe or other part of the foot) and/or bouts of arthritis	C0264134	Screening
			blood uric acid levels	C0373739	Screening
			of severe pain, most often the big toe	C0410779	Screening
			<i>What should I do if I forget</i>	C0423915	Screening
			<b>drink beer</b>	C0425331	Screening
			lips, mouth, tongue	C0497193	Screening
			of redness, swelling, pain, and heat in one or	C0513106	Screening
			pain, redness, swelling, and heat	C0513106	Screening

			uric acid (a normal waste product) collects in the body, and needle-like urate crystals deposit	C0522574	Screening
			swollen, red, hot	C0541781	Screening
			Hypertriglyceridemia Hypercholesterolemia	C0543517	Screening
			<b>Kidney disease or</b>	C0543793	Screening
			<b>after menopause</b>	C0587113	Screening
			alcohol, especially beer	C0678384	Screening
			<b>high levels of uric acid in the blood</b>	C0740394	Screening
			<b>hyperuricemia</b>	C0740394	Screening
			<b>high fever</b>	C0743973	Screening
			<b>genetic factors</b>	C0814299	Screening
			uric acid (a normal waste product) collects in the body, and needle-like urate	C0851010	Screening
			site may be red and warm	C0857810	Screening
			high levels of uric acid	C0948643	Screening
			<b>Intensely painful</b>	C1320357	Screening
			Leukemia and other blood cancers	C1516238	Screening
			Diabetes or	C1534917	Screening
			problems (such as bleeding, ulcer, and stomach upset), kidney problems, high blood pressure or heart problems	C1535460	Screening
			<i>may also be affected</i>	C1836053	Screening
			last 3 to 10 days, but the first 36 hours	C1865336	Screening
			Men outnumber women	C1867966	Screening
			more common in men	C1867966	Screening
			more often in men, women	C1867966	Screening
			and its complications occur more often	C2073319	Screening
			in the feet, especially	C2127235	Screening
			fainting, slurred speech, sudden blurry vision, or sudden severe headache	C2219960	Screening
			Hypertension (high blood pressure)	C2240377	Screening

			ankles, heels, knees, wrists, fingers, and elbows	C2677764	Screening
			<b>Attacks are</b>	C2751362	Screening
			may lead to	C3151638	Screening
			people don't have another one for	C3175618	Screening
			run in	C3274438	Screening
			Pain control tends to occur	C3809908	Screening
			run in some	C3810163	Screening
			to run in some	C3810163	Screening
			people become older	C3826770	Screening
			more at risk if you're overweight and drink alcohol	C3842894	Screening
			high blood pressure, high cholesterol, diabetes, or	C3843079	Screening
			high blood pressure, kidney disease, or	C3843080	Screening
			<b>during the night</b>	C3845370	Screening
			metabolic abnormalities	C4021768	Screening
			presenting as slight	C4036274	Screening
			<i>What other information should I know</i>	C4055149	Screening
<b>Other</b>					
			<b>fever</b>	C0015967	Diagnosing
			<b>tophi</b>	C0221248	Diagnosing
			<b>redness</b>	C0332575	Diagnosing
			chronic (lasting) arthritis	C0263680	Diagnosing
			X-rays	C0043309	Diagnosing
			<b>chronic gout</b>	C0268108	Diagnosing
			<b>Podagra</b>	C0221168	Diagnosing
			monosodium urate monohydrate	C0037564	Diagnosing
			<b>gouty arthritis</b>	C0003868	Diagnosing
			<b>Synovial fluid analysis</b>	C0200648	Diagnosing
			<i>around the</i>	C0151205	Diagnosing
			<b>tophus</b>	C0221248	Diagnosing
			inflammation via multiple mechanisms	C0021370	Diagnosing
			<b>blurred vision</b>	C0344232	Diagnosing

<b>pseudogout</b>	C0033802	Diagnosing
in one or more of your joints	C0162296	Diagnosing
<b>instep</b>	C0230472	Diagnosing
<b>pain</b>	C0030193	Diagnosing
crystal-induced arthropathies	C0152087	Diagnosing
<b>Synovial biopsy</b>	C0150887	Diagnosing
<b>dual energy</b>	C0085736	Diagnosing
<b>Migratory polyarthritis</b>	C0240344	Diagnosing
<b>urate crystals</b>	C0344392	Diagnosing
fever, sore throat	C0343487	Diagnosing
crystals in the joint fluid	C0200652	Diagnosing
<b>Gout – chronic</b>	C0268108	Diagnosing
<b>uric acid production increases</b>	C0041981	Diagnosing
<b>uric acid can build up and form needle-like crystals</b>	C0344392	Diagnosing
<b>Uric acid can form sharp needle-like crystals</b>	C0344392	Diagnosing
Uric acid – blood	C0373739	Diagnosing
Uric acid levels in the blood	C0373739	Diagnosing
under a microscope	C0395796	Diagnosing
<i>health care providers to</i>	C0420340	Diagnosing
Monoarticular involvement	C0427254	Diagnosing
Uric acid – urine	C0428286	Diagnosing
<b>radiographic findings</b>	C0436485	Diagnosing
<b>redness and swelling</b>	C0513348	Diagnosing
<b>calcium pyrophosphate disease</b>	C0553730	Diagnosing
<b>joint damage</b>	C0565874	Diagnosing
joint appears warm	C0575034	Diagnosing
<b>calcium pyrophosphate crystals</b>	C0729282	Diagnosing
Hyperuricemia	C0740394	Diagnosing
<b>Tophaceous gout</b>	C0744466	Diagnosing
of lips, eyes or mouth	C0841473	Diagnosing
Ultrasonographic	C1301497	Diagnosing
<b>plain radiography</b>	C1306645	Diagnosing
<b>radiographs</b>	C1306645	Diagnosing

crystals within the joint space and deposition of crystals	C1401835	Diagnosing
gout crystals time to dissolve, and that will put a stop to the flares	C1619733	Diagnosing
Posterior interosseous nerve syndrome	C1696572	Diagnosing
attacks often	C1867940	Diagnosing
joints, and knee	C1969180	Diagnosing
Location outside	C2016008	Diagnosing
too much uric acid in the blood	C2029412	Diagnosing
too much uric acid in your blood	C2029412	Diagnosing
Swelling, warmth, erythema (sometimes resembling cellulitis), and	C2039039	Diagnosing
<b>acute gout</b>	C2062908	Diagnosing
<b>Gout – acute</b>	C2062908	Diagnosing
pain starts suddenly, often during	C2130139	Diagnosing
Tophi (multiple	C2144520	Diagnosing
knee, wrist, elbow, or ankle	C2677764	Diagnosing
<i>This usually happens</i>	C3263474	Diagnosing
chalky	C3267206	Diagnosing
pain or discomfort in right upper stomach	C3641896	Diagnosing
<b>gouty joint</b>	C3697115	Diagnosing
<i>are most often affected</i>	C3808454	Diagnosing
can be found in deposits (called tophi) that	C3841020	Diagnosing
toe, but you also can have gout in your knee, ankle, foot, hand, wrist, or	C3898946	Diagnosing
dual energy computed tomography	C4055114	Diagnosing



APPENDIX 2. COMPLETE NLP OUTPUT

NLP output from patient clinical notes divided into medication related and diagnosis/procedure terms for each stage of the value chain.

Medication			Other		
C0332173	daily	Recovering	dairy products	C0010947	Recovering
			renal impairment	C1565489	Recovering
			dairy	C0010948	Recovering
			renal damage	C1408258	Recovering

Medication			Other		
C3225726	pain pill	Diagnosing	pain	C0030193	Diagnosing
			Ingrown hair	C0263492	Diagnosing
			fever	C0015967	Diagnosing
			red	C0332575	Diagnosing
			chest discomfort	C0235710	Diagnosing
			redness and	C0017574	Diagnosing
			Hypogonadism	C0020619	Diagnosing
			chronic gout	C0268108	Diagnosing
			toenail	C0222007	Diagnosing
			Acute bronchitis	C0149514	Diagnosing
			otitis	C0029877	Diagnosing
			blurred vision	C0344232	Diagnosing
			podagra	C0221168	Diagnosing
			calcium pyrophosphate crystals	C0729282	Diagnosing
			pain syndromes	C0391976	Diagnosing
			red blood	C0086252	Diagnosing
			Panniculitis	C0030326	Diagnosing
			redness and swelling	C0513348	Diagnosing
			aching	C0001044	Diagnosing
			pain chest	C0008031	Diagnosing
			Acute gout	C2062908	Diagnosing
			gouty arthritis	C0003868	Diagnosing
			actinic keratosis	C0022602	Diagnosing
			livedo reticularis	C0085642	Diagnosing

			bone biopsy	C0005933	Diagnosing
			around	C0750503	Diagnosing
			Ingrown	C0027343	Diagnosing
			painful arc	C0343214	Diagnosing
			pain increases	C0456441	Diagnosing
			Otitis externa	C0029878	Diagnosing
			osteoarthritis	C0029408	Diagnosing
			Txp	C1134470	Diagnosing
			radiographic abnormality	C0436485	Diagnosing
			painful skin	C0241136	Diagnosing
			painful lump	C2126145	Diagnosing
			Steatosis	C0152254	Diagnosing
			Dysphonia	C1527344	Diagnosing
			tophus	C0221248	Diagnosing
			tophaceous gout	C0744466	Diagnosing
			hernia repair	C0019328	Diagnosing
			pain tightness	C3647127	Diagnosing
			thymic	C0040113	Diagnosing
			popping	C0439820	Diagnosing
			myofascial	C0262941	Diagnosing
			pain management	C0002766	Diagnosing
			Urticaria	C0042109	Diagnosing
			Externa	C0152345	Diagnosing
			keloid	C0022548	Diagnosing
			microhematuria	C0239937	Diagnosing
			hernia site	C4087315	Diagnosing
			Chronic gastritis	C0085695	Diagnosing
			lichen	C0023643	Diagnosing
			planus	C0023646	Diagnosing
			pain mgmt	C0994210	Diagnosing
			Epidermoid cyst	C0014511	Diagnosing
			pain radiating	C0234254	Diagnosing
			Microalbuminuria	C0730345	Diagnosing
			painful urination	C0013428	Diagnosing
			putty	C0263893	Diagnosing
			Toenail onychomycosis	C1274470	Diagnosing
			Neuropathic	C0003892	Diagnosing
			parasitic	C0030498	Diagnosing
			osteodystrophy	C0264009	Diagnosing
			fever chills	C0085594	Diagnosing
			pain muscle	C0231528	Diagnosing

			crusty	C0555957	Diagnosing
			odynophagia	C0221150	Diagnosing
			Dysthymia	C0013415	Diagnosing
			hemarthrosis	C0018924	Diagnosing
			urate crystals	C0344392	Diagnosing
			axillary nerve palsy	C2062709	Diagnosing
			Vascular calcifications	C0342649	Diagnosing
			Disuse osteoporosis	C0152256	Diagnosing
			Phantom	C0282611	Diagnosing
			warmth	C0392197	Diagnosing
			Orchitis	C0029191	Diagnosing
			fell	C1425660	Diagnosing
			arc	C0001857	Diagnosing
			painful joints	C0003862	Diagnosing
			radiographic	C1306645	Diagnosing
			pain much	C4085212	Diagnosing
			Red streaks	C2169832	Diagnosing
			subtalar	C0038593	Diagnosing
			onychomycosis	C0040261	Diagnosing
			Testicular	C0205070	Diagnosing
			Staphylococcal	C0038170	Diagnosing
			flag	C1708067	Diagnosing
			red cell anisopoikilocytosis	C3806041	Diagnosing
			hallux valgus	C0018536	Diagnosing
			pain swelling	C0745574	Diagnosing
			cardiac amyloid	C4273093	Diagnosing
			Toenail avulsion	C0851257	Diagnosing
			Pulmonary Blastomycosis	C0339964	Diagnosing
			red cabbage	C0453115	Diagnosing
			Uric acid level	C0041981	Diagnosing
			Acute	C0205178	Diagnosing
			Spermatic cords	C0037855	Diagnosing
			Tinea corporis	C0040252	Diagnosing
			Labial abscess	C0745601	Diagnosing
			sciatic nerve palsy	C0751925	Diagnosing
			reflux esophagitis	C0014869	Diagnosing
			Hypophonia	C0521007	Diagnosing
			pyrophosphate crystal arthritis	C1388597	Diagnosing
			collagenous colitis	C0238067	Diagnosing
			Axillary lymphadenitis	C0919797	Diagnosing

			prurigo nodularis	C0263353	Diagnosing
			TMJ	C0039493	Diagnosing
			pain do	C1976730	Diagnosing
			insect bite	C0021564	Diagnosing
			joint arthritis	C0158026	Diagnosing
			red flag sx	C3646161	Diagnosing
			pain the	C0004604	Diagnosing
			Chronic conjunctivitis	C0155145	Diagnosing
			Truncal	C0042275	Diagnosing
			Homans sign	C0231781	Diagnosing
			red macular	C2216370	Diagnosing
			fever call	C2051610	Diagnosing
			Tenosynovitis	C0039520	Diagnosing
			Pilonidal cyst	C0031925	Diagnosing
			Polyarticular gout	C0744464	Diagnosing
			Acute gastritis	C0149518	Diagnosing
			Migratory arthritis	C0694577	Diagnosing
			Enthesopathy	C0242490	Diagnosing
			Sciatic nerve	C0036394	Diagnosing
			Leukocytoclastic vasculitis	C2973529	Diagnosing
			breast biopsy	C0405352	Diagnosing
			Urolithiasis	C0451641	Diagnosing
			tan	C0302595	Diagnosing
			Acute conjunctivitis	C0155141	Diagnosing
			Tonsillitis	C0040421	Diagnosing
			Chronic iritis	C0008690	Diagnosing
			uveitis	C0042164	Diagnosing
			Hemorrhoid thrombosis	C0235326	Diagnosing
			Chronic polyarthritis	C1735378	Diagnosing
			Mucinous adenocarcinoma	C0007130	Diagnosing
			turbinates	C1266928	Diagnosing
			red meats	C0452848	Diagnosing
			Chronic bronchitis	C0008677	Diagnosing
			Genital warts	C0009663	Diagnosing
			hernia	C0019270	Diagnosing
			lymphadenopathy	C0497156	Diagnosing
			Phantom limb	C0031315	Diagnosing
			Amaurosis fugax	C0149793	Diagnosing
			Seborrheic keratosis	C0022603	Diagnosing
			Proliferative	C0334094	Diagnosing
			red rubber	C1874753	Diagnosing

			majora	C0227760	Diagnosing
			painful bruise	C0301928	Diagnosing
			along	C0205154	Diagnosing
			retina damage	C0235272	Diagnosing
			red and warm	C0857810	Diagnosing
			Actinic skin damage	C1879546	Diagnosing
			meniscal tears	C0238218	Diagnosing
			his	C0019602	Diagnosing
			loose	C0205407	Diagnosing
			red lesions	C0241115	Diagnosing
			red flag signs	C4076444	Diagnosing
			clipping	C0175722	Diagnosing
			Vascular cognitive	C3805043	Diagnosing
			gout	C0018099	Diagnosing
			Pigmented	C0031911	Diagnosing
			Kidney biopsy	C0194073	Diagnosing
			testicular masses	C0241353	Diagnosing
			catheterizable	C0261558	Diagnosing
			multicystic	C0032460	Diagnosing
			joint damage	C0565874	Diagnosing
			Painful bladder spasm	C0423735	Diagnosing
			Sicca syndrome	C0086981	Diagnosing
			pain rectal	C0034886	Diagnosing
			Subungual hematoma	C0474975	Diagnosing
			tinea cruris	C1384589	Diagnosing
			team providers	C2224485	Diagnosing
			MCL	C0026691	Diagnosing
			red warm	C0200512	Diagnosing
			rasied	C1417207	Diagnosing
			Aphthous ulcers	C0038363	Diagnosing
			Fever blister	C0019345	Diagnosing
			rosacea rosacea	C0035854	Diagnosing
			meniscus	C0224498	Diagnosing
			discomfort	C2364135	Diagnosing
			red ring appeared	C2322198	Diagnosing
			bull	C0007452	Diagnosing
			concha	C0229316	Diagnosing
			bullosa	C0014527	Diagnosing
			mouth ulcers	C0149745	Diagnosing
			ragged	C1414304	Diagnosing
			Staphylococcal bacteremia	C0152965	Diagnosing

			fluid analysis	C0200648	Diagnosing
			much	C0205393	Diagnosing
			painful mucosal	C0858804	Diagnosing
			red plaques	C2126304	Diagnosing
			incision site	C0449681	Diagnosing
			Lateral femorotibial	C0447797	Diagnosing
			scabs	C0205204	Diagnosing
			Moyamoya disease	C0026654	Diagnosing
			around both	C2016899	Diagnosing
			resolution	C0300132	Diagnosing
			Tubulovillous adenoma	C0334307	Diagnosing
			sacroiliitis	C0574960	Diagnosing
			Acute hepatitis	C0267797	Diagnosing
			Locates	C0450429	Diagnosing
			painful neuropathy	C1850383	Diagnosing
			Bronchopulmonary Aspergillosis	C2350530	Diagnosing
			Schatzki ring	C0267081	Diagnosing
			Alport syndrome	C1567741	Diagnosing
			axillary swelling	C0741354	Diagnosing
			Pneum	C0032285	Diagnosing
			Road	C0442650	Diagnosing
			red blotches	C0857199	Diagnosing
			Subclinical	C0205211	Diagnosing
			tuberculous meningitis	C0041318	Diagnosing
			cryptorchidism	C0010417	Diagnosing
			exit	C0337094	Diagnosing
			team	C0871489	Diagnosing
			Endomyocardial biopsy	C0189785	Diagnosing
			Testicular hypofunction	C0271622	Diagnosing
			Graves disease	C0018213	Diagnosing
			concha bullosa	C0339821	Diagnosing
			suspicious	C0233519	Diagnosing
			cubital tunnel	C0230376	Diagnosing
			bilat	C0155516	Diagnosing
			paraesthesias	C0030554	Diagnosing
			Nephrogenic	C0391869	Diagnosing
			around joints	C0394854	Diagnosing
			per your blood	C0267596	Diagnosing
			Calcium pyrophosphate arthropathy	C0856830	Diagnosing

		eyebrow	C0015420	Diagnosing
		Seronegative rheumatoid arthritis	C0409652	Diagnosing
		excisional biopsy	C0184921	Diagnosing
		toenail infection	C0749565	Diagnosing
		synovial hypertrophy	C0410574	Diagnosing
		posterior tibiotalar joint	C2182275	Diagnosing
		midfoot osteoarthritis	C3840160	Diagnosing
		vascular abnormalities	C0241657	Diagnosing
		Myoglobinuria	C0027080	Diagnosing
		red vaginal	C0241635	Diagnosing
		Exogenous	C0205228	Diagnosing
		Sclerodactyly	C0150988	Diagnosing
		osteitis	C0029400	Diagnosing
		around site	C0509447	Diagnosing
		hairy leukoplakia	C0206186	Diagnosing
		Red River	C0328125	Diagnosing
		redness or	C0327344	Diagnosing
		pansystolic murmur	C0232258	Diagnosing
		red papules	C0859044	Diagnosing
		Chronic anxiety	C0581386	Diagnosing
		tophi elbow	C3862729	Diagnosing
		burden	C2828008	Diagnosing
		detrusor instability	C1261562	Diagnosing
		insuf	C0029626	Diagnosing
		red stool	C0278012	Diagnosing
		Atrophic	C0333641	Diagnosing
		redness swelling	C2109113	Diagnosing
		Pain scale	C1504479	Diagnosing
		toenail injury	C0347575	Diagnosing
		Systemic lupus erythematosus	C0024141	Diagnosing
		peat	C0030739	Diagnosing
		numbness	C0028643	Diagnosing
		Mole	C0027960	Diagnosing
		around the facet	C0394850	Diagnosing
		ileitis	C0020877	Diagnosing
		lines along	C2138577	Diagnosing
		satellite lesions	C0445304	Diagnosing
		calcinosis	C0006663	Diagnosing
		Hemorrhoid	C0019112	Diagnosing

			painful dysphagia	C2183443	Diagnosing
			the epiglottis	C1396772	Diagnosing
			Sjogren	C1527336	Diagnosing
			redness later	C2127376	Diagnosing
			Munchausen syndrome	C0026785	Diagnosing
			double vision	C0012569	Diagnosing
			99nitial arthritis	C3829814	Diagnosing
			pain syn	C0016053	Diagnosing
			callus	C0376154	Diagnosing
			painful muscle spasms	C4023104	Diagnosing
			red tinge	C3266636	Diagnosing
			energy	C0424589	Diagnosing
			aortitis	C0003509	Diagnosing
			fever osteomyelitis	C1443896	Diagnosing
			Red macules	C2089446	Diagnosing
			staples	C0185012	Diagnosing
			vision	C0042789	Diagnosing
			Osteitis pubis	C0221010	Diagnosing
			Migratory polyarthritis	C0240344	Diagnosing
			Seizure gout alcoholism	C0586323	Diagnosing
			acromioclavicular joint		
			arthritis	C1998181	Diagnosing
			Acute asthma	C0582415	Diagnosing
			bowel biopsy	C0192611	Diagnosing
			hernia recurrence	C0281961	Diagnosing
			Red raised patch	C2674296	Diagnosing
			pain chronically	C0150055	Diagnosing
			healed	C0043240	Diagnosing
			Epigastric	C3130255	Diagnosing
			around the vagus	C0842552	Diagnosing
			radiocarpal joint	C0043265	Diagnosing
			pain cramping	C0458254	Diagnosing
			Axillary nerve	C0228885	Diagnosing
			red brown	C0381431	Diagnosing
			red blood inhis stool	C0018932	Diagnosing
			or warm	C0509768	Diagnosing
			Ehrlichiosis	C0085399	Diagnosing
			Fever Antibody	C0373883	Diagnosing
			Asplenia	C0600031	Diagnosing
			fever hepatitis	C0424776	Diagnosing
			orthopnea	C0085619	Diagnosing



			Meniscal	C1504554	Diagnosing
			vestibular nerve damage	C0235928	Diagnosing
			labial biopsy	C0399303	Diagnosing
			around the vulva	C3670692	Diagnosing
			lichen sclerosis	C0023652	Diagnosing
			painful vulvar	C0241718	Diagnosing
			Around the ears	C2053145	Diagnosing
			pseudotumor cerebri	C0033845	Diagnosing
			painful mass	C1709448	Diagnosing
			cadaveric	C0304209	Diagnosing
			Dieulafoy lesion	C0341217	Diagnosing
			Infective otitis externa	C0021355	Diagnosing
			clonal	C1704387	Diagnosing
			painful hemorrhoids	C0744805	Diagnosing
			hyperresonant	C0231882	Diagnosing
			red cell anisocytosis	C0221278	Diagnosing
			red mass	C0086899	Diagnosing
			pain hip	C0019559	Diagnosing
			acute cystitis	C0149523	Diagnosing
			redness increases	C1512696	Diagnosing
			pain neck	C0007859	Diagnosing
			her	C0446375	Diagnosing
			punch biopsy	C0184924	Diagnosing
			fever or any	C0041466	Diagnosing
			chronic	C0205191	Diagnosing
			otitis media	C0029882	Diagnosing
			painful burning	C0234230	Diagnosing
			these	C0039828	Diagnosing
			spondyloarthropathy	C0949691	Diagnosing
			Polymyalgia rheumatica	C0032533	Diagnosing
			acute appendicitis	C0085693	Diagnosing
			radiculopathy	C0700594	Diagnosing
			Acromegaly	C0001206	Diagnosing
			bacilli	C0004587	Diagnosing
			Hepatopulmonary syndrome	C0600452	Diagnosing
			osteogenesis imperfecta	C0029434	Diagnosing
			red site	C1504570	Diagnosing
			cheat	C0683305	Diagnosing
			around lesion	C2168390	Diagnosing
			flat	C0205324	Diagnosing
			red hot	C0541781	Diagnosing

			synovial biopsy	C0150887	Diagnosing
			shave biopsy	C0184923	Diagnosing
			under	C0542339	Diagnosing
			interphalangeal joint synovitis	C0730096	Diagnosing
			pain intensity	C1320357	Diagnosing
			pain tenderness	C0234233	Diagnosing
			pain laterality	C0740543	Diagnosing
			ophthalmoplegia	C0029089	Diagnosing
			Prolapsed internal hemorrhoids	C0265037	Diagnosing
			chronic thrombocytopenia	C0749393	Diagnosing
			Latent tuberculosis	C1609538	Diagnosing
			around outside	C3642088	Diagnosing
			Toxoplasmosis	C0040558	Diagnosing
			around base	C1314395	Diagnosing
			colloid	C0009361	Diagnosing
			Red skin	C0041834	Diagnosing
			Red Dye	C1509471	Diagnosing
			osteomyelitic	C0158381	Diagnosing
			Molluscum contagiosum	C0026393	Diagnosing
			navel	C0041638	Diagnosing
			Xerosis cutis	C0263465	Diagnosing
			polyarthritis	C0162323	Diagnosing
			Inclusion cyst	C0259770	Diagnosing
			Acute otitis	C0149510	Diagnosing
			sob	C0010399	Diagnosing
			Bartholin cyst	C0004767	Diagnosing
			Painful supination	C1998080	Diagnosing
			fever break	C0011311	Diagnosing
			fibrofatty	C0225350	Diagnosing
			symphyseal	C0034015	Diagnosing
			damage	C0010957	Diagnosing
			pulsatile	C0439606	Diagnosing
			desmoid tumor	C0079218	Diagnosing
			pain diary	C0451366	Diagnosing
			polish	C0220896	Diagnosing
			strauss	C0008728	Diagnosing
			redness accompanying	C2029700	Diagnosing
			Footdrop	C0085684	Diagnosing
			Migratory	C0232901	Diagnosing

			hypoadrenal	C0001623	Diagnosing
			cardiac cachexia	C0562491	Diagnosing
			Pigmented gallstones	C3278865	Diagnosing
			red blanching	C2126289	Diagnosing
			Acute gout wrist	C0750439	Diagnosing
			any blood	C0373612	Diagnosing
			Cardiac	C0018787	Diagnosing
			debris	C0440266	Diagnosing
			polyarteritis nodosa	C0031036	Diagnosing
			tegmen tympani	C0927520	Diagnosing
			Painful orthopedic	C1393396	Diagnosing
			snoring	C0037384	Diagnosing
			around incision	C2055676	Diagnosing
			hallux malleus	C2355596	Diagnosing
			Submucosal	C1515025	Diagnosing
			Prostate biopsy	C0194804	Diagnosing
			vascular	C0042382	Diagnosing
			sarcoid	C0036202	Diagnosing
			painful bone	C0151825	Diagnosing
			detrusor weakness	C0235091	Diagnosing
			Vascular anomaly	C0158570	Diagnosing
			Enterovirus	C0014383	Diagnosing
			fever sweats	C0038992	Diagnosing
			red blood cell morphology	C0200655	Diagnosing
			spread	C0332261	Diagnosing
			Quadripareisis	C0270790	Diagnosing
			fever cough	C1277295	Diagnosing
			warts	C0347390	Diagnosing
			Acute bronchiolitis	C0001311	Diagnosing
			Nonalcoholic steatohepatitis	C3241937	Diagnosing
			quadrantanopsia	C0544680	Diagnosing
			ILD	C0206062	Diagnosing
			thymic hyperplasia	C0040115	Diagnosing
			inflammation	C0021368	Diagnosing
			arsenic	C0104238	Diagnosing
			pain jaw	C0236000	Diagnosing
			DMI	C0011685	Diagnosing
			red mucosa	C3277147	Diagnosing
			within the	C0425538	Diagnosing
			pain AC joint arthritis	C4256999	Diagnosing
			red discoloration	C2054394	Diagnosing

		more	C0205172	Diagnosing
		chemosis	C0271298	Diagnosing
		carpal arthritis	C0741990	Diagnosing
		Mt	C0036525	Diagnosing
		joint discomfort	C3544124	Diagnosing
		gouty joint	C3697115	Diagnosing
		Myelofibrosis	C0026987	Diagnosing
		around the ulcers	C0857313	Diagnosing
		bloating	C1291077	Diagnosing
		hardware	C1523994	Diagnosing
		pain leg	C0023222	Diagnosing
		porphyria cutanea tarda	C0162566	Diagnosing
		Mosquito bites	C0417744	Diagnosing
		NM	C0203634	Diagnosing
		instep	C0230472	Diagnosing
		degenerative spondylolisthesis	C0264184	Diagnosing
		Sacrococcygeal	C1550300	Diagnosing
		Red nasal	C2071372	Diagnosing
		painful site	C1718183	Diagnosing
		hyoid bone	C0020417	Diagnosing
		infrapatellar	C0224829	Diagnosing
		midline	C0549183	Diagnosing
		margins	C0205284	Diagnosing
		Broca dysphasia	C0003550	Diagnosing
		painful red	C0853395	Diagnosing
		kinetic	C0022702	Diagnosing
		Chronic hypokalemia	C0268016	Diagnosing
		hallux	C0018534	Diagnosing
		tingling	C2242996	Diagnosing
		Polydypsia	C0085602	Diagnosing
		Antiphospholipid antibody syndrome	C0085278	Diagnosing
		Cryptococcal Meningitis	C0085436	Diagnosing
		redness erythema	C0497364	Diagnosing
		Streptococcal	C0038402	Diagnosing
		Pulmonary cryptococcus	C0748116	Diagnosing
		IBD	C0021390	Diagnosing
		chondrosarcoma	C0008479	Diagnosing
		mutation analysis	C0796357	Diagnosing
		arachnoiditis chronic	C0238005	Diagnosing

			toenail bruise	C0274239	Diagnosing
			chronic hematoma	C0749095	Diagnosing
			Coccygeal	C1550233	Diagnosing
			toenail abnormalities	C1968817	Diagnosing
			radiographic compression	C0180058	Diagnosing
			interphalangeal joint arthroplasty	C0187577	Diagnosing
			Spigelian hernia repair	C0198555	Diagnosing
			Spigelian	C0392508	Diagnosing
			pulmonary biopsy	C3806336	Diagnosing
			Axillary abscess	C0263115	Diagnosing
			Acute psychosis	C0281774	Diagnosing
			painful lesion	C0241091	Diagnosing
			adb	C0236504	Diagnosing
			utd	C3845665	Diagnosing
			orthopedic screws	C3826642	Diagnosing
			orthopedic hardware	C1961571	Diagnosing
			painful within the bone	C2219991	Diagnosing
			issues	C0033213	Diagnosing
			urticaria pigmentosa	C0042111	Diagnosing
			cores	C0444669	Diagnosing
			Pyoderma gangrenosum	C0085652	Diagnosing
			solitary	C0205171	Diagnosing
			Dual energy	C0085736	Diagnosing
			Staghorn calculus	C0333014	Diagnosing
			BPPV	C0155502	Diagnosing
			red cell aplasia	C0034902	Diagnosing
			Waldenstrom macroglobulinemia	C0024419	Diagnosing
			MDD	C0262218	Diagnosing
			Gastric antral biopsy	C0586699	Diagnosing
			arrythmias	C0003811	Diagnosing
			Wegeners granulomatosis	C3495801	Diagnosing
			Rectocele repair	C0677487	Diagnosing
			Acute Esophagitis	C0149882	Diagnosing
			Takayasu	C0039263	Diagnosing
			around transplanted	C2220728	Diagnosing
			Phthisis bulbi	C0271007	Diagnosing
			Gliomatosis cerebri	C0334576	Diagnosing
			panus	C1093286	Diagnosing
			Phrenic nerve palsy	C1442879	Diagnosing

			pain postoperatively	C0030201	Diagnosing
			glans	C1550261	Diagnosing
			Pilonidal disease	C2317114	Diagnosing
			red erythematous	C3845932	Diagnosing
			pancreatitis	C0227579	Diagnosing
			pain hematuria	C0473234	Diagnosing
			Pulmonary embolus	C0034065	Diagnosing
			Solar damage	C0850866	Diagnosing
			Chronic joint discomfort	C0232491	Diagnosing
			just	C0442728	Diagnosing
			pain discomfort	C0237277	Diagnosing
			sinusitis	C0037199	Diagnosing
			CF	C0010674	Diagnosing
			red spot	C0376341	Diagnosing
			pain knee	C0231749	Diagnosing
			pain stimulator	C1709449	Diagnosing
			CMC	C0065772	Diagnosing
			red blood scan	C0948706	Diagnosing
			around suprascapular	C0842558	Diagnosing
			tophi finger	C2088173	Diagnosing
			Menometrorrhagia	C0232943	Diagnosing
			hue	C0678581	Diagnosing
			acute arthritis	C0263678	Diagnosing
			Tinnitus	C0040264	Diagnosing
			chord	C0344749	Diagnosing
			PTLD	C0432487	Diagnosing
			painful pop	C4038661	Diagnosing
			hallux interphalangeal	C0447828	Diagnosing
			diagnostic biopsy	C0401747	Diagnosing
			Eisenmenger syndrome	C0013743	Diagnosing
			Streptococcal bacteremia	C0152964	Diagnosing
			psych	C0229992	Diagnosing
			radiocapitellar	C1403299	Diagnosing
			Kaposi sarcoma	C0036220	Diagnosing
			patellofemoral compartment osteoarthritis	C1542808	Diagnosing
			chondrocalcinosis	C0553730	Diagnosing
			painful arthritis	C0718667	Diagnosing
			pessary	C0031246	Diagnosing
			Aseptic meningitis	C0025290	Diagnosing
			painful bleed	C1533092	Diagnosing

			Pagets disease	C1368019	Diagnosing
			blood flow	C0232338	Diagnosing

Medication			Other		
C0028156	NITROFURANTOIN	Screening	obese	C0028754	Screening
C0591139	Bactrim	Screening	diabetes	C0011847	Screening
C0699142	Tylenol	Screening	Kidney Disease	C0022658	Screening
C0876060	keppra	Screening	drink	C0684271	Screening
C0749139	sulfa	Screening	Family history of Cancer	C0260515	Screening
C0700899	Benadryl	Screening	Family history of Cardiomyopathy	C1272241	Screening
C0243237	Docusate sodium	Screening	hyperuricemia	C0740394	Screening
C3516158	Kidney Medicine	Screening	Lupus	C0024131	Screening
C0209368	Mycophenolate mofetil	Screening	hypoparathyroidism	C0020626	Screening
C1995848	Flunisolide nostril inhaler	Screening	diabetic neuropathy	C0011882	Screening
C1692318	Docusate	Screening	Hypoxemia	C0700292	Screening
C0728963	lovenox	Screening	osteoarthritis	C0029408	Screening
C0286677	Flonase	Screening	Family history of Tuberculosis	C0455351	Screening
C2945755	Flonase spray	Screening	Family history of	C0015584	Screening
C0678143	Zithromax	Screening	Breast cancer	C0006142	Screening
C0585361	bid	Screening	Family history of Hypercholesterolemia	C2732832	Screening
C0038317	steroid	Screening	Family history of Hypertension	C0455405	Screening
C0161672	Yellow fever vaccine	Screening	Family history of Emphysema	C2315858	Screening
C0022957	Lactulose	Screening	Family history of Heart Disease	C2186266	Screening
C0060926	Gabapentin	Screening	Sinusitis	C0037199	Screening
C1636686	Byetta	Screening	tuberculosis	C0041296	Screening
C3224278	Benadryl pill	Screening	Family history of Lung Cancer	C0728711	Screening
C0085240	Lupus anticoagulant	Screening	rhinorrhea	C1260880	Screening
C0875967	Avandia	Screening	Groin discomfort	C1096590	Screening
C0003232	Antibiotics	Screening	Sad	C0085159	Screening
C0085758	Tca	Screening	family history of breast cancer	C0559119	Screening
C0002598	amiodarone	Screening	Family history of asthma	C1261327	Screening
C2683919	Byetta pen	Screening	Family history of rheumatoid arthritis	C0221614	Screening

C0016365	fluoxetine	Screening	Prostate cancer	C0376358	Screening
C1319409	diabetic medicines	Screening	Family history of Alcohol Abuse	C0476560	Screening
C3214596	flecainide pill	Screening	Family history of Depression	C0455383	Screening
C3230437	diabetes pill	Screening	Family history of thyroid disease	C0850707	Screening
			Family history of Osteoarthritis	C0455444	Screening
			PRN	C0558288	Screening
			hemochromatosis	C0018995	Screening
			hemochromatosis gene	C1384665	Screening
			during the night	C3845370	Screening
			Family history of polycystic	C0455422	Screening
			warm	C0687712	Screening
			drinking alcohol	C0001948	Screening
			Kidney	C0022646	Screening
			family history of kidney cancer	C0700102	Screening
			Fibromyalgia	C0016053	Screening
			Family history of hyperlipidemia	C4040131	Screening
			Dyspepsia	C0013395	Screening
			Family history of Gout	C0221613	Screening
			family history of prostate cancer	C1532320	Screening
			gout	C0018099	Screening
			Family history of Arthritis	C0221565	Screening
			Family history of prostate cancer nephrolithiasis	C1563033	Screening
			Hypertensive	C0020538	Screening
			cecal	C0007531	Screening
			history of Hemodialysis	C4047993	Screening
			Family history of Alcohol addiction	C3541869	Screening
			Osteoarthritis of glenohumeral	C0409939	Screening
			Quant	C0695050	Screening
			family history of renal disease	C2316874	Screening



			Family history of Multiple Sclerosis	C0455388	Screening
			Family history of Colon Cancer	C0730200	Screening
			Family history	C0241889	Screening
			Kidney Surgery	C0194053	Screening
			diabetes management	C0150544	Screening
			denies	C0332319	Screening
			diabetes complications	C0342257	Screening
			drink some juice	C2136335	Screening
			after transplant	C3896643	Screening
			diabetes disease	C0085207	Screening
			Diabetes History	C0455678	Screening
			intertrochanteric femur fracture	C0162385	Screening
			hypogammaglobulinemia	C0086438	Screening
			family history of dementia	C2315857	Screening
			history of cerebrovascular accident	C0559159	Screening
			Family history of cataracts	C0455398	Screening
			Family history of Brain Cancer	C1997137	Screening
			family history of urologic	C0455360	Screening
			diabetic exam	C3162295	Screening
			diabetic gastroparesis	C0267176	Screening
			history of CABG	C1842251	Screening
			Family history of Liver Cancer	C1998287	Screening
			Unspecified	C0205370	Screening
			hyperthyroidism	C0020550	Screening
			Family history of Alcoholism	C0559555	Screening
			family history of aneurysm	C1271046	Screening
			CAMPYLOBACTER	C0006813	Screening
			diabetes insipidus	C0011848	Screening
			numbness big toe	C0587056	Screening
			genetic factors	C0814299	Screening
			Family history of Anxiety	C4061647	Screening
			Anxiety disorder	C0003469	Screening
			kidney cancer	C0740457	Screening

			YERSINIA	C0043405	Screening
			Family history of HIV	C2584882	Screening
			Sickle cell disease	C0002895	Screening
			Sickle cell trait	C0037054	Screening
			Debility	C3714552	Screening
			Hypoalbuminemia	C0239981	Screening
			etoh	C0001962	Screening
			Family history of Cerebral Palsy	C0455391	Screening
			after surgery	C0241311	Screening
			Diabetic ulcer of toe	C2183144	Screening
			diabetic socks	C3876752	Screening
			diabetic enteropathy	C0400875	Screening
			Diabetes check	C1655734	Screening
			dysuria	C0013428	Screening
			Skin warm	C0235218	Screening
			Family history of Leukemia	C0260512	Screening
			diabetic retinopathy	C0011884	Screening
			family history of liver disease	C0455417	Screening
			too	C0067954	Screening
			Family history of anemia	C0260528	Screening
			history of Brain tumor	C1997047	Screening
			Family history of cardiac	C3669347	Screening
			Gluteal	C1550262	Screening
			serious	C0205404	Screening
			neoplasm uncertain behavior	C0154129	Screening
			lightheadedness	C0220870	Screening
			Mold	C0369241	Screening
			Osteoarthritis of knee	C0409959	Screening
			diabetic nephropathy	C0011881	Screening
			Axillary	C0004454	Screening
			Hypophosphatemia	C0085682	Screening
			Cytomegalovirus viremia	C0877635	Screening
			cytomegalovirus disease	C0010823	Screening
			Diabetic polyneuropathy	C0271680	Screening
			polyneuropathy	C0152025	Screening
			diabetic autonomic	C0271686	Screening
			Diabetic Hypoglycemia	C0865166	Screening

			Family history of Hepatitis	C0559141	Screening
			Family history of Pulmonary Disease	C3887084	Screening
			Diabetic peripheral neuropathy	C0740447	Screening
			history of Pneumonia	C0455542	Screening
			diabetic eye	C0342245	Screening
			Kidney injury	C0160420	Screening
			Acetone	C0001002	Screening
			Family history of Glaucoma	C0455397	Screening
			history of Diphtheria	C1446286	Screening
			Gastric bypass surgery	C0192398	Screening
			obesity history	C0455493	Screening
			Family history of kidney disease	C0260532	Screening
			Hiccups	C0019521	Screening
			tingling	C2242996	Screening
			sarcoid	C0036202	Screening
			Stump	C0002690	Screening
			Family history of Bladder Cancer	C2316064	Screening
			campylobacter ab	C0945898	Screening
			Campylobacter Jejuni	C0006819	Screening
			odynophagia	C0221150	Screening
			Neoplasm	C0027651	Screening
			Family history of Cervical Cancer	C1997259	Screening
			Diabetic foot	C0206172	Screening
			Family history of Coronary Arteriosclerosis	C2317524	Screening
			Kidney lesion	C1402288	Screening
			history of Heart problem	C0559157	Screening
			Family history of Hernia	C3887151	Screening
			kidney disease requiring	C1719537	Screening
			Hydrocele repair	C0558336	Screening
			diabetes post	C1504532	Screening
			Family history of Alzheimer Disease	C1271045	Screening
			Kidney calculi	C0022650	Screening
			Orthopedic surgery	C0162439	Screening

			drink water	C0599638	Screening
			Family history of Cirrhosis	C3887082	Screening
			Murder	C0086660	Screening
			Constipation	C0009806	Screening
			Family history of Gallbladder Disease	C0559142	Screening
			Family history of Skin Cancer	C1997275	Screening
			Family history of macular degeneration	C0520726	Screening
			Hypocalcemia	C0020598	Screening
			family history of blood	C0455376	Screening
			after menopause	C0587113	Screening
			Family history of Hypercalcemia	C0342637	Screening
			Family history of Hyperparathyroidism	C3887070	Screening
			diabetic shoes	C0499344	Screening
			Discitis	C0012624	Screening
			Family history of malignant neoplasm	C1261378	Screening
			Menieres disease	C0025281	Screening
			Appendicitis	C0003615	Screening
			hyperventilation	C0020578	Screening
			kidney disease or	C0543793	Screening
			scarlet fever	C0036285	Screening
			Neurogenic bladder	C0005697	Screening
			radiculopathy	C0700594	Screening
			Labial abscess	C0745601	Screening
			Family history of Throat cancer	C3887008	Screening
			Family history of migraine	C0455393	Screening
			Family history of celiac	C2316251	Screening
			Diabetic ulcer	C0743150	Screening
			history of Deceased	C2229976	Screening
			drink water to	C0522749	Screening
			axillary lymphadenopathy	C0578735	Screening
			drink liquor	C0425331	Screening
			Family history of Hypothyroidism	C0577643	Screening
			base of the	C0225810	Screening

			Diabetic foot ulcer	C0406526	Screening
			again	C0723612	Screening
			at night	C0240526	Screening
			Dry cough	C0850149	Screening
			osteoarthritis of the hip	C0029410	Screening
			Family history of Hyperthyroidism	C2317124	Screening
			Accidental Drowning	C0867949	Screening
			soda	C0683086	Screening
			diabetic ketoacidosis	C0011880	Screening
			Family history of Ischemic stroke	C0260518	Screening
			Family history of Pulmonary Embolism	C2317597	Screening
			Dry mouth	C0043352	Screening
			granulomatosis disease	C0024307	Screening
			Osteoarthritis bilateral	C4081953	Screening
			Umbilical	C0041638	Screening
			history of Gunshot Wound	C2169624	Screening
			history of Hysterectomy	C0438065	Screening
			Apathetic	C0085632	Screening
			Osteopetrosis	C0029454	Screening
			Family history of Parkinson Disease	C0574092	Screening
			Family history of Thyroid Cancer	C2316063	Screening
			after working	C0425088	Screening
			Vitiligo	C0042900	Screening
			Family history of Essential Hypertriglyceridemia	C0559122	Screening
			Family history of Osteoporosis	C2911643	Screening
			Diabetes type	C1320657	Screening
			hypoglycemia	C0020615	Screening
			Family history of obesity	C0455373	Screening
			habitus	C0013170	Screening
			Family history of Pulmonary Fibrosis	C1800706	Screening
			Colorectal cancer staging	C0677947	Screening
			after urination	C1821649	Screening
			Incontinence	C0021167	Screening

			Lymphedema of leg	C1275454	Screening
			family history of early	C0455427	Screening
			drink sugar	C0452443	Screening
			Family history of Multiple Myeloma	C2317109	Screening
			Family history of Simple Goiter	C2186265	Screening
			persistent fever	C0476474	Screening
			family history of autoimmune disease	C0577642	Screening
			history of Metastatic Cancer	C2170476	Screening
			history of Bradycardia	C4038788	Screening
			nights sweats	C0028081	Screening
			hemoptysis	C0019079	Screening
			Family history of Hydrocephalus	C4038808	Screening
			Fungus	C0016832	Screening
			after fall	C2135413	Screening
			diabetic on	C0421248	Screening
			diabetic peripheral	C0011871	Screening
			SLE	C0024141	Screening
			bursitis	C0006444	Screening
			diabetes hypertension	C0543574	Screening
			neuropathic pains	C3714625	Screening
			Metabolic bone disease	C0005944	Screening
			Family history of Polycythemia Vera	C1264016	Screening
			Family history of Migraine Headache	C2367596	Screening
			nephrosclerosis	C0027719	Screening
			made	C0425087	Screening
			fibroids	C0023267	Screening
			Nonalcoholic Steatohepatitis	C3241937	Screening
			Family history of bleeding	C2186261	Screening
			atherosclerosis	C0004153	Screening
			bipolar disease	C0005587	Screening
			ataxia	C0004134	Screening
			history of Adopted child	C2367303	Screening
			Diabetic macular	C0730285	Screening

			AAA	C0162871	Screening
			Recurrent UTI	C0262655	Screening
			history of Dialysis	C0455667	Screening
			family history of colorectal cancers	C3266797	Screening
			diabetic injury	C3875503	Screening
			Family history of Supranuclear palsy	C2931887	Screening
			family history of sleep	C2315516	Screening
			drink much	C0848500	Screening
			history of Arteritis	C3532493	Screening
			Dyslipidemia	C0242339	Screening
			microalbuminuria	C0730345	Screening
			Family history of Pancreatic	C1997382	Screening
			Family history of Allergy	C0455453	Screening
			Family history of Paranoid Schizophrenia	C0455382	Screening
			Diabetic diet	C0011878	Screening
			infraclavicular lymphadenopathy	C1264066	Screening
			Migraine headache	C0149931	Screening
			nutritionist	C0237083	Screening
			high fever	C0743973	Screening
			gastroesophageal reflux disease	C0017168	Screening
			history of Adenocarcinoma	C1997170	Screening
			blood clots in	C0423010	Screening
			Family history of Congenital abnormality	C0496711	Screening
			diabetes other	C0011870	Screening
			Family history of bipolar	C0455384	Screening
			amyloidosis	C0002726	Screening
			Family history of kidney	C1397162	Screening
			approximately	C0332232	Screening
			Family history of Melanoma	C1996990	Screening
			Acne vulgaris	C0001144	Screening
			Family history of Gastric Ulcer	C0559140	Screening
			Attacks are	C2751362	Screening
			coryza	C0086066	Screening

			sarcoid disease	C0340432	Screening
			Lupus nephritis	C0024143	Screening
			nephritis	C0027697	Screening
			Lymphedema of arm	C0730207	Screening
			Family history of Peptic Ulcer	C0455415	Screening
			Family history of Hearing	C0260538	Screening
			history of macular	C3839192	Screening
			Kidney transplant	C0022671	Screening
			Family history of Smoker	C1542099	Screening
			waist	C0230097	Screening
			kidney atrophy	C0341698	Screening
			Neuropathic	C0003892	Screening
			diabetic amyotrophy	C0271685	Screening
			Strabismus Surgery	C0197981	Screening
			drink alcohol occasionally	C0556298	Screening
			Aneuric	C0049161	Screening
			Family history of Mental	C1397167	Screening
			Family history of Thyroid	C0455366	Screening
			Family history of Epilepsy	C0455392	Screening
			arthropathy	C0022408	Screening
			trended	C1521798	Screening
			any fevers	C0041466	Screening
			Ureteral	C0041959	Screening
			intense	C0522510	Screening
			nonobstructing	C0264787	Screening
			Headaches	C0018681	Screening
			hemoperitoneum	C0019065	Screening
			family history of headache	C2316204	Screening
			history of Tachycardia	C3887026	Screening
			Family history of Esophageal Reflux	C3494804	Screening
			Acne	C0702166	Screening
			diabetic dietary	C0562216	Screening
			family history of endocrine disease	C0455365	Screening
			Kidney mass	C0262613	Screening
			Family history of Breast Cyst	C2315879	Screening



			bruising or other abnormalities	C0679314	Screening
			Osteoarthritis hands	C0263746	Screening
			Celiac Crisis	C1300681	Screening
			history of Aplastic Anemia	C1997103	Screening
			diabetic clinic	C3839636	Screening
			hypertensive nephrosclerosis	C0264657	Screening
			Osteoarthritis of ankle	C0409931	Screening
			Family history of Atherosclerosis	C0455407	Screening
			perforated diverticulitis	C0544794	Screening
			wound healing	C0043240	Screening
			salmonella enteritis	C0036114	Screening
			Meningioma	C0025286	Screening
			Family history of Psoriasis	C0455439	Screening
			Txp	C1134470	Screening
			umbilical hernia repair	C0019333	Screening
			diabetic neuropathic	C0343178	Screening
			kidney disease III	C1868148	Screening
			Prediabetes	C0362046	Screening
			Cellulitis	C0007642	Screening
			hepatocellular disease	C0023895	Screening
			Bronchitis	C0006277	Screening
			Family history of Rheumatic Fever	C2315907	Screening
			CRC	C0170127	Screening
			diabetes in	C0032969	Screening
			obesity complicates	C3647716	Screening
			Pituitary adenoma	C0032000	Screening
			Family history of Essential Hypercholesterolemia	C0020445	Screening
			Family history of Oxygen deficit	C2316880	Screening
			Chromhidrosis	C0263473	Screening
			Family history of Psoriatic	C2315905	Screening
			keratoconus	C0022578	Screening
			after	C0231290	Screening
			Dysplastic nevus	C0205748	Screening

			Family history of Accidental death	C0425043	Screening
			Family history of Ulcer	C0574097	Screening
			Kidney tumor	C0022665	Screening
			obesity nutrition	C1408387	Screening
			Alzheimer disease	C0002395	Screening
			kidney disease stage	C0022661	Screening
			Family history of Malignant Lymphoma	C2315022	Screening
			sickle cell	C0221283	Screening
			diabetic agents	C0935929	Screening
			chest discomfort	C0235710	Screening
			lupus arthritis	C0541786	Screening
			perirectal abscess	C0267566	Screening
			Family history of Cerebral	C2584725	Screening
			nephrocalcinosis	C0027709	Screening
			barrier laser	C0302718	Screening
			Gastroenteritis	C0017160	Screening
			diabetic control	C0421257	Screening
			Dyspnea	C0013404	Screening
			bm	C0011135	Screening
			Family history of Blood infection	C0554872	Screening
			MELAS	C0162671	Screening
			family history of parathyroid	C1840403	Screening
			hyponatremia	C0020625	Screening
			kidney hydronephrosis	C1385560	Screening
			Gallstone pancreatitis	C0521614	Screening
			airway disease	C0699949	Screening
			occasional	C0521114	Screening
			Hypocalcemia and hypophosphatemia	C0475815	Screening
			radiofrequency	C2347883	Screening
			adhesions	C0001511	Screening
			fever	C0015967	Screening
				278 C0075763	Screening
			Family history of systemic lupus	C3887087	Screening
			much	C0205393	Screening
			MRSA	C1265292	Screening

			Family history of Hyperlipoproteinemia	C0700623	Screening
			Family history of colonic polyps	C2911243	Screening
			Old age	C1999167	Screening
			obese weight	C0740216	Screening
			Saturday night	C0270796	Screening
			better	C0332272	Screening
			Family history of deafness	C1442747	Screening
			Family history of Parkinsonism	C2939151	Screening
			Toxic	C0600688	Screening
			Breast discomfort	C0877338	Screening
			osteoarthritis in multiple	C0559096	Screening
			become	C0429569	Screening
			history of testicular	C1960622	Screening
			NASH	C1092184	Screening
			Cirrhosis	C0023890	Screening
			posttraumatic	C0152086	Screening
			hernia repair	C0019328	Screening
			diabetes poorly	C0554876	Screening
			Family history of Hodgkin Disease	C2316879	Screening
			tophaceous	C0744466	Screening
			ketoacidosis	C0220982	Screening
			history of Opioid abuse	C3266352	Screening
			speech	C0037817	Screening
			Family history of Backache	C2316195	Screening
			genetic abnormalities	C0262496	Screening
			Kidney transplant complication	C1261281	Screening
			Chlamydia DNA PCR	C1315245	Screening
			during night	C0231912	Screening
			Meningitis	C0025285	Screening
			regimen	C0040808	Screening
			history of Current Smoker	C3241966	Screening
			history of Abdominal hernia	C0455548	Screening
			family history of other	C0260535	Screening
			smoldering	C0002894	Screening

			Overweight	C0497406	Screening
			Calcitonin	C0006668	Screening
			callouses	C3841385	Screening
			Family history of Osteopenia	C2315253	Screening
			Acute myopericarditis	C0265132	Screening
			Yersinia antibodies	C0523287	Screening
			ehrlichiosis	C0085399	Screening
			after lunch	C1879668	Screening
			Cryptogenic cirrhosis	C0267809	Screening
			twisting	C0231467	Screening
			diabetic cheiroarthropathy	C0406685	Screening
			Drinks alcohol on rare	C0425316	Screening
			Family history of Seizure	C3267207	Screening
			Kidney damage	C1408258	Screening
			hematuria	C0018965	Screening
			history of Seasonal allergies	C2106658	Screening
			Lupus cerebritis	C0393968	Screening
			lupus erythematosus	C0155180	Screening
			Family history of Airway	C3887086	Screening
			Gall	C2700230	Screening
			hepatocellular cancer	C0345904	Screening
			rheumatoid arthritis	C0003873	Screening
			Kidney hematoma	C0475022	Screening
			Mucositis	C0333355	Screening
			myeloma	C0026764	Screening
			lupus erythematosus	C0409974	Screening
			morbid	C0026538	Screening
			HLD	C0020473	Screening
			Family history of CAD	C0329472	Screening
			parotitis	C0030583	Screening
			Family history of Bone	C1997149	Screening
			dental abnormalities	C0262444	Screening
			hyperplasia of breast	C0542028	Screening
			IBD	C0021390	Screening
			Hernia surgery	C3826215	Screening
			Family history of autism	C1445919	Screening
			family history of disorders	C0559550	Screening
			COPD	C0024117	Screening

			Family history of Diverticulitis	C2315926	Screening
			Meniscus repair	C0407887	Screening
			Family history of Alcohol dependence	C2911218	Screening
			Kidney cyst	C3887499	Screening
			Rheumatoid arteritis	C0264993	Screening
			Campylobacter enteritis	C0275982	Screening
			subj	C3889670	Screening
			Family history of myocardial infarction	C0455406	Screening
			history of hypoglycemia	C4039056	Screening
			abnormalities are	C3277173	Screening
			sinusitis disease	C0015029	Screening
			uveitis	C0042164	Screening
			Cornea clear	C1849214	Screening
			vomit	C0042963	Screening
			Family history of Tongue Neoplasm	C0573984	Screening
			beam radiation	C3846444	Screening
			overuse	C0035127	Screening
			dizzyness	C0012833	Screening
			history of Mesothelioma	C1997977	Screening
			Family history of Colitis	C0455416	Screening
			Family history of Megaloblastic Anemia	C1306856	Screening
			Diabetic toe	C0476266	Screening
			kidney disease in	C3824723	Screening
			neurophy	C0155302	Screening
			Neoplasm of fibula	C0347341	Screening
			angioedema	C0002994	Screening
			over	C0020505	Screening
			history of Primary hyperparathyroidism	C4040208	Screening
			390	C0054370	Screening
			drink more	C3842894	Screening
			staph	C0038160	Screening
			Family history of suicide	C0455386	Screening
			Campylobacter in stool	C2020393	Screening
			hernia repair mesh repair	C0519122	Screening
			for rheumatoid arthritis	C0260963	Screening

			Family history of Ichthyosis	C4012361	Screening
			history of gastroesophageal reflux	C4039982	Screening
			vasculitis	C0042384	Screening
			Kidney initial	C2839534	Screening
			family history gastric cancer	C1708349	Screening
			Osteoarthritis of foot	C0586735	Screening
			Diverticulosis	C1510475	Screening
			drink second bottle	C2193544	Screening
			bursa	C0006441	Screening
			Diarrhea much	C4084784	Screening
			Thrombocytopenia	C0040034	Screening
			worse	C0332271	Screening
			BOOP	C0242770	Screening
			organizing pneumonia	C0264383	Screening
			history of retinal detachment	C0455516	Screening
			neurogenic claudication	C0580173	Screening
			granulomatous lymphadenitis	C1960596	Screening
			Gluteal cellulitis	C0263158	Screening
			Ampullary adenoma	C1332244	Screening
			COPD bronchitis	C0742809	Screening
			diabetic glomerulosclerosis	C0017667	Screening
			gastroparesis	C0152020	Screening
			hypochloremia	C0085680	Screening
			history of Adrenal	C4039586	Screening
			Family history of Hypolipidemia	C1857970	Screening
			history of Morbid	C3510286	Screening
			Strabismus	C0038379	Screening
			snoring	C0037384	Screening
			Family history of Bowel cancer	C0559117	Screening
			Family history of Peripheral neuropathy	C2316926	Screening
			Schizoaffective disorder	C0036337	Screening
			history of Hypernephroma	C4047637	Screening
			diaphragmatic	C0011980	Screening

			Family history of alpha	C4038806	Screening
			family history as	C0514034	Screening
			Shigella	C0036953	Screening
			his	C0019602	Screening
			Drinking warm	C1737350	Screening
			lymphomatous	C0024299	Screening
			Healthy adult	C0686750	Screening
			Flaring	C1517205	Screening
			Family history of		
			Bronchiectasis	C4231142	Screening
			Gastric cancer	C0024623	Screening
			workup	C0741889	Screening
			history of Polymyalgia		
			rheumatica	C3532608	Screening
			history of Amblyopia	C1272091	Screening
			umbilical hernias	C0019322	Screening
			diabetic lotion	C1169242	Screening
			Fibrocystic breast	C0016034	Screening
			cherry juice	C0982074	Screening
			Diabetes type II	C0011860	Screening
			MT second toe	C0085686	Screening
			diabetes are	C3829804	Screening
			diabetes as	C0375127	Screening
			neoplasm of bone	C0005967	Screening
			lupus membranous	C0268758	Screening
			Paget disease of bone	C0029401	Screening
			diabetes monitoring	C0422587	Screening
			family history of tremor	C2317094	Screening
			base of the thumb	C2016583	Screening
			Falls frequently	C0850703	Screening
			avid	C1510996	Screening
			Necrotizing	C0027540	Screening
			history of Hemorrhage	C0475171	Screening
			Calcaneus fracture	C0281926	Screening
			transplant recipient	C0376387	Screening
			osteoporosis	C0029456	Screening
			may also	C2678291	Screening
			Osteoarthritis of lumbar		
			spine	C1442869	Screening
			lipo	C1333906	Screening
			base of the second toe	C0224049	Screening

			Sad affect	C2219477	Screening
			orthotic shoes	C3688926	Screening
			Mouth droop	C2237286	Screening
			diabetes under	C2062378	Screening
			Family history of cardiac disorder	C0559128	Screening
			cornea cornea	C0010031	Screening
			wheezing worse at night	C2203206	Screening
			discoid lupus	C0024138	Screening
			half	C2825407	Screening
			Pseudoxanthoma elasticum	C0033847	Screening
			Scleredema	C0036413	Screening
			Alport	C1567741	Screening
			Bilateral breast cancer	C0281267	Screening
			Seronegative rheumatoid arthritis	C0409652	Screening
			Quadriplegia	C0034372	Screening
			Obesity hypoventilation syndrome	C0031880	Screening
			psychosis	C0033975	Screening
			Hypoglycemia rarely	C4227725	Screening
			Family history of Polycythemia	C3887075	Screening
			family history of cardiovascular disease	C0455404	Screening
			history of Vulva cancer	C1997152	Screening
			Axillary abscess	C0263115	Screening
			incisions well healed	C2116737	Screening
			Headaches are occipital	C0231613	Screening
			Yersinia enterocolitica	C0043406	Screening
			Amyloid	C0002716	Screening
			Bronchiolitis	C0006271	Screening
			obliterans	C0040021	Screening
			Narcotic addiction	C1527402	Screening
			base of the ulcer	C2171457	Screening
			Dermatolysis	C0010495	Screening
			nasal drainage	C0746759	Screening
			Pericarditis	C0031046	Screening
			diabetic strips	C0462900	Screening
			Functional Murmur	C0232255	Screening
			Diabetes per	C3171765	Screening



			Solitary	C0205171	Screening
			Hodgkin disease	C0019829	Screening
			Family history of congestive	C2315232	Screening
			Family history of hypertrophic	C0949658	Screening
			GvHD	C0018133	Screening
			working	C0043227	Screening
			diabetic dilated retinal	C1314526	Screening
			after removal	C0372646	Screening
			neoplasm of prostate	C0154009	Screening
			Necrotizing pancreatitis	C0267941	Screening
			drink fluids	C0426597	Screening
			history of appendicitis	C0455547	Screening
			gastric bypass	C0017125	Screening
			Family history of Urinary problem	C0424960	Screening
			Family history of Black lung	C0574101	Screening
			osteoarthritis history	C0455572	Screening
			Kidney problems	C0812426	Screening
			family history of atopy	C0455457	Screening
			inguinal hernia repair	C0021446	Screening
			smoker	C0337664	Screening
			diabetes test	C0438272	Screening
			diabetes uncontrolled	C2349362	Screening
			Family history of Breast Neoplasm	C0455356	Screening
			diabetes to	C0730232	Screening
			after sex	C2126184	Screening
			endorses	C0680918	Screening
			Phrenic nerve palsy	C1442879	Screening
			lymphedema	C0024236	Screening
			lemonade	C0452446	Screening
			Intracerebral bleed	C2937358	Screening
			possible	C0332149	Screening
			guides	C0181090	Screening
			history of Heat stroke	C3887136	Screening
			hepatocellular carcinoma	C2239176	Screening
			intense pain	C1320357	Screening

			Family history of Congenital Malformations	C1261329	Screening
			Meningitis booster	C3839177	Screening
			Carcinoid tumor	C0007095	Screening
			drink coke	C0452444	Screening
			Blastomycosis	C0005716	Screening
			Diabetic Arthropathy	C0494909	Screening
			Family history of Sarcoidosis	C2317266	Screening
			hyperhomocysteinemia	C0598608	Screening
			Paronychia of toe	C0311211	Screening
			disease deceased	C0747268	Screening
			Sinusitis acute	C0149512	Screening
			Family history of Duodenal	C0559139	Screening
			history of Accidental fall	C2242910	Screening
			Hypervolemia	C0546817	Screening
			diabetic dermopathy	C0406682	Screening
			history of some	C3645919	Screening
			pulmonary sarcoid	C0340199	Screening
			quiet	C0439654	Screening
			will also be	C0425262	Screening
			reports	C0700287	Screening
			Uremia	C0041948	Screening
			Midline incision	C0456276	Screening
			Kaposi sarcoma	C0036220	Screening
			malaise	C0231218	Screening
			night shift	C1660631	Screening
			hypodensities	C0742093	Screening
			Moyamoya disease	C0026654	Screening
			Family history of Nephropathy	C0403443	Screening
			Miracle	C0996776	Screening
			cites	C1264695	Screening

Medication			Other		
C2054168	take NSAIDS	Preparing	Kidney	C0022646	Preparing
			DISSOLVE	C1549535	Preparing
			red meat	C0452848	Preparing

			red blisters	C2126355	Preparing
			blood thinners	C0003280	Preparing
			txp	C1134470	Preparing
			red	C0332575	Preparing
			break down	C0443161	Preparing
			came	C0960273	Preparing
			down	C0205104	Preparing
			disfunction	C0005887	Preparing
			red streaks	C2169832	Preparing
			incidentaloma		
			a	C2609247	Preparing
			trx	C1336690	Preparing
			blood	C0005767	Preparing
			take down	C0189301	Preparing
			do	C1512020	Preparing
			dissection	C0012737	Preparing
			sauce	C0453357	Preparing
			damge	C0525773	Preparing
			red violet	C0763107	Preparing
			shut down	C1547200	Preparing
			went	C0796199	Preparing
			kidney dis	C0022658	Preparing
			kidney down	C0194182	Preparing
			insufficiency	C0349073	Preparing
			kidney diseas	C0431705	Preparing

Medication			Other		
C0038317	steroids	Monitoring	infection	C0439663	Monitoring
C0009262	Colchicine	Monitoring	swelling	C0038999	Monitoring
C0030049	Oxycodone	Monitoring	serous effusion	C0302149	Monitoring
C0728755	Dilaudid	Monitoring	inflammation	C0021368	Monitoring
C0445550	low doses	Monitoring	Chronic	C0205191	Monitoring
C0002645	Amoxicillin	Monitoring	kidney injury	C0160420	Monitoring
C0003211	NSAID	Monitoring	weight gain	C0043094	Monitoring
C0012373	Diltiazem	Monitoring	Urinary tract infection	C0042029	Monitoring
C0027415	narcotics	Monitoring	weight loss	C1262477	Monitoring
C3889572	10mg dose	Monitoring	Bowel sounds	C0232693	Monitoring
C0728963	Lovenox	Monitoring	ulceration	C0041582	Monitoring
C1261311	steroid injection	Monitoring	Pulmonary fibrosis	C0034069	Monitoring

C0700926	Ancef	Monitoring	chronic obstructive pulmonary	C0024117	Monitoring
C0851881	ENTEROCOCCAL INFECTIONS	Monitoring	hypersensitivity pneumonitis	C0002390	Monitoring
C0007561	Ceftriaxone	Monitoring	Peripheral vascular disease	C0085096	Monitoring
C0699129	coumadin	Monitoring	Staphylococcus Aureus Infection	C1318973	Monitoring
C0542867	60mg	Monitoring	Increased risk for pancreatitis	C1842408	Monitoring
C0360714	statin	Monitoring	Chronic alcohol	C0001973	Monitoring
C0876068	lidoderm	Monitoring	CHRONIC CHEST	C1740831	Monitoring
C1962522	Amlodipine as	Monitoring	heart disease	C0018799	Monitoring
C0585077	steroid dose	Monitoring	delayed recall	C0561757	Monitoring
C0699177	Plaquenil	Monitoring	Escherichia coli urinary tract infection	C0577708	Monitoring
C0700899	Benadryl	Monitoring	immunosuppressive	C0021079	Monitoring
C0332173	qd	Monitoring	Ibs	C0022104	Monitoring
C3656735	Amlodipine induced	Monitoring	chronic infection	C0151317	Monitoring
C0004259	Atropine	Monitoring	Wound infection	C0043241	Monitoring
C0719198	Celebrex	Monitoring	stone	C0006736	Monitoring
C0014563	Epinephrine	Monitoring	encouraging weight	C2958424	Monitoring
C0242402	opioid	Monitoring	Chronic back	C0457949	Monitoring
C0376196	opiate	Monitoring	Renal stones	C0022650	Monitoring
C1851351	Colchicine not	Monitoring	unintentional weight loss	C2363736	Monitoring
C0305814	debrox drops	Monitoring	chronic renal	C0022661	Monitoring
C0002598	amiodarone	Monitoring	gout flares	C1619733	Monitoring
C0022860	labetalol	Monitoring	chronic pulmonary embolism	C0856722	Monitoring
C0366521	labetalol dose	Monitoring	gout attack	C2712871	Monitoring
C0701009	bumex	Monitoring	Abnormal weight loss	C0936227	Monitoring
C0149783	steroid therapy	Monitoring	Nonpitting edema	C1265804	Monitoring
C0875968	Avelox	Monitoring	Allergic rhinitis	C2607914	Monitoring
C2064827	steroid topical	Monitoring	respiratory infections	C0035243	Monitoring
C1547581	as needed	Monitoring	Chronic migraine	C1960870	Monitoring
C1098080	Crestor	Monitoring	hemisensory loss	C0234216	Monitoring
C0006625	cachexia	Monitoring	chronic cough	C0010201	Monitoring
C3667576	steroid spray	Monitoring	weight	C0043100	Monitoring
C3663261	steroid ointment	Monitoring	cold intolerance	C0009269	Monitoring
C0040610	tramadol	Monitoring	chronic were kidney disease	C1561643	Monitoring

C2723026	steroid topical creams	Monitoring	Chronic anemia	C0581384	Monitoring
C0051696	Amlodipine	Monitoring	Chronic rhinitis	C0008711	Monitoring
C0085826	antiplatelet agents	Monitoring	gout	C0018099	Monitoring
C4257295	fluticasone nasal spray	Monitoring	count	C0750480	Monitoring
C0014025	Enalapril	Monitoring	risk for infection	C0582147	Monitoring
C0394853	steroid inj	Monitoring	heart attack	C0027051	Monitoring
C0147814	Unasyn	Monitoring	chronic anticoagulation	C0694554	Monitoring
C0020933	imipenem	Monitoring	seafood	C0206208	Monitoring
C0981221	atropine drops	Monitoring	thrush	C0006849	Monitoring
C1619735	decreasing dose	Monitoring	Candida under the breast	C0741706	Monitoring
C0036557	sedatives	Monitoring	unexplained weight loss	C1828173	Monitoring
C1652084	Flunisolide nasal spray	Monitoring	Incision well healed	C2116737	Monitoring
C0585361	bid	Monitoring	panic attacks	C0086769	Monitoring
C0020740	Ibuprofen	Monitoring	systemic lupus	C0024141	Monitoring
C0591139	bactrim	Monitoring	labia	C0227759	Monitoring
C0807726	refills	Monitoring	Low weight	C0041667	Monitoring
C0876060	Keppra	Monitoring	Not doing weight bearing	C0563556	Monitoring
C0586794	steroids not	Monitoring	recent weight loss	C2126067	Monitoring
C0699992	lasix	Monitoring	pneumothorax or pulmonary	C0810019	Monitoring
C0366596	oxycodone dosing	Monitoring	immune liver disease	C0021053	Monitoring
C1702177	Januvia	Monitoring	infection of skin	C0162627	Monitoring
C2985380	steroid creams	Monitoring	pulmonary infections	C0876973	Monitoring
C0593507	advil	Monitoring	bearing weight	C0085086	Monitoring
C1880956	such high doses	Monitoring	chronic knee	C0451820	Monitoring
C2065041	steroid inhalers	Monitoring	chronic disease	C0008679	Monitoring
C2925914	began after taking	Monitoring	renal cysts	C0268800	Monitoring
C0700798	Indocin	Monitoring	pseudogout	C0033802	Monitoring
C0366345	amiodarone doses	Monitoring	allergic reaction	C0020517	Monitoring
C0633854	Fioricet	Monitoring	Umbilical hernia repair	C0019333	Monitoring
C0376414	Paxil	Monitoring	Kidney or Liver	C0545792	Monitoring
C0015399	eyedrops	Monitoring	chronic pancreatitis	C0149521	Monitoring
C0584668	stopped taking	Monitoring	caffeine intake	C4062719	Monitoring
C0250482	Zosyn	Monitoring	Breast	C0006141	Monitoring
C0939412	novolog	Monitoring	BCC	C0152320	Monitoring
C2054168	NSAIDs while taking	Monitoring	Vaccine reaction	C0565653	Monitoring
C0040341	Tobramycin	Monitoring	obstructing stones	C0940751	Monitoring
C0663448	viagra	Monitoring	prostate cancer	C0376358	Monitoring

C0716467	2mg versed	Monitoring	chronic histoplasmosis	C0854428	Monitoring
C0054836	carvedilol	Monitoring	low levels	C0151723	Monitoring
C0032825	KCL	Monitoring	fungal infection	C0026946	Monitoring
C0570232	steroid inj skin reaction	Monitoring	significant weight	C3897172	Monitoring
C1707810	increased dose	Monitoring	Mycoplasma	C0026934	Monitoring
C0366557	metoprolol dosing	Monitoring	Renal neoplasm	C0022665	Monitoring
C0569293	Amiodarone pulmonary toxicity	Monitoring	simple cysts	C0037157	Monitoring
C0719509	Coreg	Monitoring	Applauded	C0662157	Monitoring
C0977190	3mg	Monitoring	Chronic atrial	C0694539	Monitoring
C3663260	steroid drops	Monitoring	lucencies	C0743894	Monitoring
C0366686	warfarin dose	Monitoring	weight gain or weight loss	C2964349	Monitoring
C0521900	Amoxicillin as	Monitoring	incision	C0184898	Monitoring
C0032143	tPa	Monitoring	opportunistic infections	C0029118	Monitoring
C2054130	chronic antibiotics	Monitoring	scleral icterus	C0240962	Monitoring
C3653411	opioids	Monitoring	or edema	C0474434	Monitoring
C0058829	Dyazide	Monitoring	purified	C1998793	Monitoring
C1879367	flexor	Monitoring	peripheral artery disease	C1306889	Monitoring
C0308399	Bacitracin ointment	Monitoring	Chronic hepatitis	C0019189	Monitoring
C2054177	steroid to take	Monitoring	kidney disease	C0022658	Monitoring
C1427310	steroids for	Monitoring	advanced liver disease	C0860197	Monitoring
C1570232	Lyrica	Monitoring	PRN	C0558288	Monitoring
C1439877	after 129nitial dose	Monitoring	serosanguineous drainage	C1112519	Monitoring
C3206494	amiodarone pills	Monitoring	supraclavicular lymphadenopathy	C0749155	Monitoring
C2029949	NSAID related	Monitoring	do as	C3899344	Monitoring
C0342269	steroid induced	Monitoring	chronic cholecystitis	C0085694	Monitoring
C0701042	cipro	Monitoring	incarcerated incisional hernia	C0311271	Monitoring
C0452115	infection or vaccine	Monitoring	goes away	C2128638	Monitoring
C0663241	Linezolid	Monitoring	dry weight	C1439839	Monitoring
C0536495	moxifloxacin	Monitoring	chronic upper respiratory infections	C2074970	Monitoring
C1822607	takes inhalers as	Monitoring	urination	C0042036	Monitoring
C1709043	missing any doses	Monitoring	RLE full weight bearing	C2149803	Monitoring
C0074332	senna	Monitoring	Vascular calcifications	C0342649	Monitoring
C0718612	apatate	Monitoring	adverse reaction	C0559546	Monitoring
C2702169	Stelara	Monitoring	healing wounds	C0043240	Monitoring
C0733815	Levophed	Monitoring	blood in stool	C0018932	Monitoring
C4081659	Not taking if	Monitoring	paraesophageal hernia	C0267725	Monitoring
C0216784	Valsartan	Monitoring	chronic skin	C0157738	Monitoring

C2054160	taking otc	Monitoring	Honking systolic murmur	C2046973	Monitoring
C4075962	low dose chest	Monitoring	under the skin	C2200110	Monitoring
C0556984	tid	Monitoring	cognitive deficit	C0009241	Monitoring
C2936530	opioid therapy	Monitoring	Chronic obstructive	C0333166	Monitoring
C0568678	Atropine without further event	Monitoring	Chronic serous otitis	C0155421	Monitoring
C3464355	Dymista nasal spray	Monitoring	Clostridium difficile colitis	C0238106	Monitoring
C1174739	Velcade	Monitoring	Clostridium difficile infection	C0343386	Monitoring
C0245561	duloxetine	Monitoring	coffee ground emesis	C1510416	Monitoring
C0038757	sulfa allergy	Monitoring	Gastroesophageal reflux disease	C0017168	Monitoring
C0746949	NSAID allergy	Monitoring	blood loss	C0019080	Monitoring
C3209937	colchicine pills	Monitoring	blood clots	C0302148	Monitoring
C0750389	chronic warfarin	Monitoring	Carcinoid tumor	C0007095	Monitoring
C0085542	pravastatin	Monitoring	single gastric polyp	C0940274	Monitoring
C0393080	VORICONAZOLE	Monitoring	Gastric polyp	C0236048	Monitoring
C0001617	corticosteroid	Monitoring	anaphylactic reaction	C0002792	Monitoring
C0304586	Antibiotics for skin	Monitoring	Postmenopausal bleeding	C0032776	Monitoring
C0557004	when taking	Monitoring	blood loss anemia	C0154286	Monitoring
C0416166	events while taking	Monitoring	low blood	C1658984	Monitoring
C1707813	dose pak	Monitoring	recent weight gain	C2367670	Monitoring
C0124498	kayexalate	Monitoring	ventral hernia	C0019326	Monitoring
C0740157	Carafate	Monitoring	lumbar hernia	C0401119	Monitoring
C3642173	Renal dose	Monitoring	thromboembolic events	C0040038	Monitoring
C1542525	NSAID drug reaction	Monitoring	chronic infarcts	C0548844	Monitoring
C0939400	Nexium	Monitoring	limiting sodium intake	C1821817	Monitoring
C0358845	NSAIDs and opioid analgesics	Monitoring	swelling of these joints	C0152031	Monitoring
C0022209	inh	Monitoring	cigarette smoker	C0337667	Monitoring
C2363722	steroid psychosis	Monitoring	Staphylococcus aureus skin infection	C1739131	Monitoring
C0690666	150mg	Monitoring	pilonidal cyst	C0031925	Monitoring
C0721444	low dose asa	Monitoring	inguinal hernia repair	C0021446	Monitoring
C0025084	taking meds	Monitoring	rectal masses	C0240873	Monitoring
C0026078	midodrine	Monitoring	Noninsulin dependent	C0011860	Monitoring
C0570424	adverse reaction to amiodarone	Monitoring	adenopathy	C0497156	Monitoring
C1518010	low radiation dose	Monitoring	arises	C4019053	Monitoring
C0973749	160mg dose	Monitoring	dental caries	C0011334	Monitoring

C3251097	ACE inhibitor beta blocker	Monitoring	hernia	C0019270	Monitoring
C0878554	chronic opioid intake	Monitoring	Advised continued weight loss	C0555962	Monitoring
C0589598	second dose	Monitoring	loose	C0205407	Monitoring
C0790952	Azelastine spray	Monitoring	Perianal	C0442158	Monitoring
C0810782	inhaler as	Monitoring	chronic sinusitis	C0149516	Monitoring
C0858726	Steroid induced osteoporosis	Monitoring	Chronic diarrhea	C0401151	Monitoring
C1736183	NSAID prophylaxis	Monitoring	stomach ulcers	C0038358	Monitoring
C0282638	antibiotic prophylaxis	Monitoring	under local anesthesia	C1720162	Monitoring
C1319853	NSAID induced	Monitoring	Periapical abscess	C0031024	Monitoring
C0936433	oxycodone tablets	Monitoring	yeast infections	C0750466	Monitoring
C2054156	taking weight loss pills	Monitoring	bloating	C1291077	Monitoring
C0366482	Flecainide dose	Monitoring	Chronic otitis	C0747083	Monitoring
C0950902	Integrilin	Monitoring	sensorineural hearing loss	C0018784	Monitoring
C0444956	high doses	Monitoring	serositis	C0036749	Monitoring
C0001645	beta blocker	Monitoring	drainage or infection	C3513343	Monitoring
C0003015	ace inhibitor	Monitoring	microscopic colitis	C0400821	Monitoring
C0059865	etodolac	Monitoring	inframammary skin	C0459398	Monitoring
C1515187	takes night dose	Monitoring	latent infections	C0872054	Monitoring
C0980743	tobramycin drops	Monitoring	helminth infections	C0018889	Monitoring
C0978129	500mg	Monitoring	hepatic cysts	C0267834	Monitoring
C0715695	300mg	Monitoring	low back	C0024031	Monitoring
C0078839	zolpidem	Monitoring	Degenerative lumbar spinal stenosis	C0410636	Monitoring
C0406479	steroid acne	Monitoring	HIV infection	C0019693	Monitoring
C4053796	NSAID nephropathy	Monitoring	chronic HIV infection	C0853112	Monitoring
C4036053	or missed doses	Monitoring	Internal Hernia	C0178282	Monitoring
C0043031	warfarin anticoagulation	Monitoring	breast abscess	C0151463	Monitoring
C0359826	Betadine skin	Monitoring	bone loss	C0029453	Monitoring
C0853383	Low dose epinephrine	Monitoring	infection is	C2010716	Monitoring
C1555542	Dosing weight	Monitoring	TOOTH ABSCESS	C0518988	Monitoring
C0178602	dose	Monitoring	or chest discomfort	C0008031	Monitoring
C1706103	dose as	Monitoring	Homans signs	C0231781	Monitoring
C0746307	hydralazine induced skin lupus	Monitoring	Chronic systolic heart	C1135194	Monitoring



C4075005	does not take	Monitoring	incision infection	C0038941	Monitoring
C1273095	single dose	Monitoring	Kidney working	C3176738	Monitoring
C0749009	steroid allergy	Monitoring	keloid	C0022548	Monitoring
C3207189	caffeine pills	Monitoring	BK virus infection	C1096691	Monitoring
C0003360	antihistamines	Monitoring	degenerative disk	C2717759	Monitoring
C0684237	Narcan	Monitoring	Rectal	C1527425	Monitoring
C0876226	zyvox	Monitoring	histoplasmosis skin	C0199757	Monitoring
C0499146	Administer subcu as single dose	Monitoring	Cat scratch	C0238909	Monitoring
C0002771	analgesics	Monitoring	chronic damage	C0006109	Monitoring
C3249878	Steroid infections	Monitoring	Hiatus hernia	C3489393	Monitoring
C1134651	beta glucan	Monitoring	drink milk	C0452242	Monitoring
C2370736	dose zolpidem	Monitoring	DOE	C0231807	Monitoring
C2136360	Verbalizes taking dose as	Monitoring	pneumothorax or pleural effusion	C0947889	Monitoring
C0857243	NSAIDs cause mouth ulcers	Monitoring	friends	C0079382	Monitoring
C3528809	80mg dose	Monitoring	serous otitis media	C0155415	Monitoring
C3837102	steroid nasal	Monitoring	bowel adhesions	C0267778	Monitoring
C0749012	steroid dependent	Monitoring	umbilical hernia	C0019322	Monitoring
C0196394	steroid spinal epidural injection	Monitoring	Incarcerated hernia	C0740406	Monitoring
C0270994	steroid myopathy	Monitoring	Chronic venous stasis	C0750169	Monitoring
			degenerative arthritis	C0029408	Monitoring
			Hyperplastic polyps	C0333983	Monitoring
			Rectal polyp	C0034887	Monitoring
			bilateral knee	C0230434	Monitoring
			superficial skin infection	C0342985	Monitoring
			high levels	C0151714	Monitoring
			Scrotal abscess	C0238418	Monitoring
			Escherichia coli	C0014834	Monitoring
			Polymyalgia rheumatica	C0032533	Monitoring
			biliary colic	C0151824	Monitoring
			Heat intolerance	C0231274	Monitoring
			Escherichia coli bacteremia	C1096262	Monitoring
			Chronic neck	C0746815	Monitoring
			ulcerations no skin	C0437804	Monitoring
			ulcerations or lesions	C0275990	Monitoring
			stopped working	C0425082	Monitoring
			anxiety attacks	C0700031	Monitoring
			LBP	C0020649	Monitoring

			breast lump	C0024103	Monitoring
			inflammation process	C1155266	Monitoring
			inflammation or infectious	C1400391	Monitoring
			Chronic ischemic heart disease	C0264694	Monitoring
			Abnormal weight	C0578026	Monitoring
			much weight loss	C4084777	Monitoring
			hemorrhagic cysts	C0333145	Monitoring
			Perianal Abscess	C0031019	Monitoring
			chronic insomnia	C0751249	Monitoring
			intentional weight loss	C1563041	Monitoring
			Nonobstructive coronary artery disease	C2007633	Monitoring
			Nonocclusive coronary	C4020724	Monitoring
			GI blood loss	C0041909	Monitoring
			Renal osteodystrophy	C0035086	Monitoring
			scleroderma renal crisis	C1262147	Monitoring
			infection not	C0580334	Monitoring
			renovascular disease	C1442904	Monitoring
			sodium intake	C0489645	Monitoring
			toenail fungal infection	C0749566	Monitoring
			aortic vascular	C0182556	Monitoring
			systemic infection	C0243026	Monitoring
			skipping	C0560435	Monitoring
			black stools	C0025222	Monitoring
			invasive ductal	C1134719	Monitoring
			Breast cancer	C0006142	Monitoring
			chronic hip	C0744939	Monitoring
			clostridium difficile enterocolitis	C1400528	Monitoring
			breath or chest	C0423729	Monitoring
			kidney cyst	C3887499	Monitoring
			ulcer disease	C0030920	Monitoring
			underlying	C0749769	Monitoring
			weight change	C0005911	Monitoring
			Infective otitis externa	C0021355	Monitoring
			tendinitis	C0039503	Monitoring
			HCV infection	C3871345	Monitoring
			Externa	C0152345	Monitoring
			Chronic viral hepatitis	C0276623	Monitoring
			wound	C0043250	Monitoring

			chronic allograft	C0403592	Monitoring
			MRSA wound infection	C1504508	Monitoring
			skin rashes	C0015230	Monitoring
			Reflux Esophagitis	C0014869	Monitoring
			high levels of	C0564512	Monitoring
			chronic foot	C0410418	Monitoring
			Chronic memory loss	C0746484	Monitoring
			increasing sweats	C0700590	Monitoring
			scaling skin	C0237849	Monitoring
			nail abscess	C1404693	Monitoring
			chronic cardiovascular disease	C1290380	Monitoring
			wound skin	C0564444	Monitoring
			coronary atherosclerosis	C0010054	Monitoring
			nonobstructing	C0264787	Monitoring
			inflammation or infection	C0679333	Monitoring
			Colovesical fistula	C0268842	Monitoring
			bronchogenic cysts	C0006281	Monitoring
			Rectal bleeding	C0267596	Monitoring
			biliary ductal dilatation	C0842860	Monitoring
			Gastric residuals	C3665864	Monitoring
			chronic chest wall	C0742356	Monitoring
			constipation	C0009806	Monitoring
			chest infections	C0149725	Monitoring
			Thyroid neoplasm	C0040136	Monitoring
			submental nodes	C0229723	Monitoring
			chronic dysphagia	C0743317	Monitoring
			Best	C1522427	Monitoring
			bowel gas	C3670913	Monitoring
			weight gain weight loss	C3175831	Monitoring
			hemarthrosis	C0018924	Monitoring
			bone contusion	C1390461	Monitoring
			Prostate	C0033572	Monitoring
			neuroendocrine tumor	C0206754	Monitoring
			may be	C1278418	Monitoring
			neoplasm of skin	C0007114	Monitoring
			supraumbilical hernia	C0749174	Monitoring
			abdominal distension	C0000731	Monitoring
			inguinal hernia	C0019294	Monitoring
			10lb	C3364555	Monitoring
			kidney	C0022646	Monitoring

			Infusion Reaction	C2368034	Monitoring
			Postherpetic neuralgia	C0032768	Monitoring
			Ulceration healed	C0333293	Monitoring
			Stump	C0002690	Monitoring
			Dental Infection	C0877046	Monitoring
			Recurrent urinary tract infection	C0262655	Monitoring
			Chronic Abdominal	C0232491	Monitoring
			parenchymal liver	C0745745	Monitoring
			Mycoplasma pneumoniae	C0032302	Monitoring
			stream	C0442540	Monitoring
			infection blood	C0474659	Monitoring
			ureteral calculi	C1456865	Monitoring
			Melanosis in the colon	C0221391	Monitoring
			GI losses	C0473916	Monitoring
			who	C0043237	Monitoring
			Abscess Drainage	C0344096	Monitoring
			gluteal abscess	C0263118	Monitoring
			pelvic abscess	C0030785	Monitoring
			chronic thickening	C2074894	Monitoring
			reflux nephropathy	C3495566	Monitoring
			Dependent edema	C0235437	Monitoring
			Giardia cysts	C3662519	Monitoring
			source of infection	C0449426	Monitoring
			compression or cord	C0037926	Monitoring
			chronic neuropathic	C1864996	Monitoring
			Refused rectal exam	C0741701	Monitoring
			chronic glomerulonephritis	C0152451	Monitoring
			Pfannenstiel skin incision	C0457819	Monitoring
			bowel disease	C0021831	Monitoring
			intrarenal	C0226712	Monitoring
			fish oil	C0016157	Monitoring
			stone likely urate stone	C0798105	Monitoring
			Kidney infection	C0021313	Monitoring
			Noncardiac chest	C0476281	Monitoring
			Dry cough	C0850149	Monitoring
			infectious hepatitis	C0019159	Monitoring
			ganglion cysts	C1258666	Monitoring
			chronic constipation	C0401149	Monitoring
			attack stroke	C3844825	Monitoring
			intestinal infections	C0178238	Monitoring

			effusions	C0013687	Monitoring
			Chronic thrombocytopenia	C0749393	Monitoring
			chronic edema	C0333241	Monitoring
			as a sinus infection	C0940933	Monitoring
			Cerebral vascular disease	C1410784	Monitoring
			chronic wound	C3494660	Monitoring
			chronic lumbar	C0410414	Monitoring
			hardware	C1523994	Monitoring
			colonic polyps	C0009376	Monitoring
			flares	C1517205	Monitoring
			will become	C0548520	Monitoring
			do	C1512020	Monitoring
			tapers	C0441640	Monitoring
			chronic vascular	C0559030	Monitoring
			inconclusive	C0205258	Monitoring
			hydronephrosis	C0020295	Monitoring
			adenomatous polyps	C0206677	Monitoring
			dysuria	C0013428	Monitoring
			Night sweats	C0028081	Monitoring
			bowel obstruction	C0021843	Monitoring
			radiculopathy	C0700594	Monitoring
			low blood sugars	C0020615	Monitoring
			peritonsillar abscess	C0031157	Monitoring
			Cyst of skin	C0191335	Monitoring
			beer intake	C0559430	Monitoring
			or unusual	C3166232	Monitoring
			hypophonia	C0521007	Monitoring
			Hair loss	C0002170	Monitoring
			chronic thrombosis	C2728999	Monitoring
			Chronic elbow	C0564826	Monitoring
			chronic degenerative	C0393583	Monitoring
			chronic dvt	C2728996	Monitoring
			incisional hernia repair	C0342971	Monitoring
			chronic allergic rhinitis	C0748410	Monitoring
			senile macular retinal	C0242383	Monitoring
			sob	C0010399	Monitoring
			chronic vertigo	C0750248	Monitoring
			chronic arthritis	C0263680	Monitoring
			Abnormal weight gain	C0332544	Monitoring
			Rectal skin tag	C0345890	Monitoring
			chronic synovitis	C0877521	Monitoring

			MDS	C0265219	Monitoring
			cardiac dilatation	C0264732	Monitoring
			hilar adenopathy	C0149711	Monitoring
			Chronic gastrointestinal bleed	C0266808	Monitoring
			chronic liver	C0156189	Monitoring
			zoonotic infections	C0043528	Monitoring
			Vanc	C1430966	Monitoring
			asthma attack	C0347950	Monitoring
			Monckeberg vascular calcifications	C0887866	Monitoring
			deposition of amyloid	C0011560	Monitoring
			chronic pleural effusion	C0747636	Monitoring
			ascites	C0003962	Monitoring
			fluid intake	C0429791	Monitoring
			Adenomatous polyp of colon	C0850572	Monitoring
			rectal abscesses	C0149770	Monitoring
			histoplasmosis infection	C0019655	Monitoring
			chest discomfort	C0235710	Monitoring
			cardiac events	C0741923	Monitoring
			weight loss goals	C0515789	Monitoring
			or cardiovascular disease	C0007222	Monitoring
			Pruritic rash	C0033771	Monitoring
			Lumbar radiculopathy	C1263855	Monitoring
			gall stones	C0242216	Monitoring
			do think	C3259568	Monitoring
			fluctuating weight	C0241729	Monitoring
			Upper respiratory infection	C0041912	Monitoring
			fevers chills	C0085594	Monitoring
			gained some weight	C4014806	Monitoring
			wound dehiscence	C0259768	Monitoring
			chronic deformities	C0744536	Monitoring
			inside wound	C0160524	Monitoring
			hematemesis	C0018926	Monitoring
			scarlet fever	C0036285	Monitoring
			Stage IV kidney disease	C1561641	Monitoring
			Reactive airway disease	C3714497	Monitoring
			chronic prostatitis	C0085696	Monitoring
			infections requiring	C3483787	Monitoring
			renal abscess	C0151465	Monitoring

			Neuropathic	C0003892	Monitoring
			Cauda equina spinal cord injury	C0854395	Monitoring
			obstructive uropathy	C0178879	Monitoring
			stone event	C0418022	Monitoring
			Buttock wound	C0741846	Monitoring
			infection like	C0745245	Monitoring
			esophageal varices	C0014867	Monitoring
			or reflux	C1535588	Monitoring
			Chronic membranous glomerulonephritis	C0854414	Monitoring
			non weight bearing	C0445100	Monitoring
			bone erosions	C0587240	Monitoring
			Perianal skin	C1704244	Monitoring
			under anesthesia	C1720436	Monitoring
			hemophilia	C0684275	Monitoring
			DVT	C0149871	Monitoring
			kidney stones or	C0744261	Monitoring
			renal masses	C0262613	Monitoring
			chronic bone	C1385418	Monitoring
			ulcer on the skin	C0437803	Monitoring
			encouraged water intake	C0204697	Monitoring
			Cardiac ascites	C0341525	Monitoring
			catheter site infections	C1112210	Monitoring
			skin infections	C0037278	Monitoring
			Endorses	C0680918	Monitoring
			bowel perforation	C0021845	Monitoring
			reaction as	C0865403	Monitoring
			infected implants	C0588128	Monitoring
			after taking	C2129215	Monitoring
			sinusitis	C0037199	Monitoring
			Postnasal drip	C0032781	Monitoring
			friends who drink	C0556322	Monitoring
			Not taking	C0426599	Monitoring
			Gastric varices	C0017145	Monitoring
			not taking any	C3844558	Monitoring
			Extensive vascular	C0155094	Monitoring
			dark stool	C0474585	Monitoring
			for weight loss	C0547548	Monitoring
			much better	C3841449	Monitoring
			swelling as	C0424810	Monitoring

			DOS	C0719635	Monitoring
			chronic otitis externa	C0151217	Monitoring
			radiation pneumonitis	C0206063	Monitoring
			hemoptysis	C0019079	Monitoring
			she	C1822717	Monitoring
			chronic cystitis	C0221763	Monitoring
			memory loss	C0751295	Monitoring
			soa	C1898571	Monitoring
			infected knee	C1400580	Monitoring
			loose stools	C2129214	Monitoring
			chronic heel	C0744717	Monitoring
			prostate infection	C0240811	Monitoring
			saddle embolus	C0023370	Monitoring
			ureteral cysts	C1696112	Monitoring
			itching	C0033774	Monitoring
			pulmonary emboli	C0034065	Monitoring
			chronic shoulder	C0264042	Monitoring
			hepatojugular reflux	C0239949	Monitoring
			Central chest	C0423634	Monitoring
			unintended	C1283932	Monitoring
			Chronic hoarseness	C0745015	Monitoring
			chronic diastolic heart	C2711480	Monitoring
			coughing up sputum	C0239134	Monitoring
			beefy red open wound	C3645725	Monitoring
			sweats or weight	C4048703	Monitoring
			Chronic utis	C0262421	Monitoring
			chronic dyspepsia	C0743312	Monitoring
			loose bowel movements	C0011991	Monitoring
			Gastric lymphoma	C0349532	Monitoring
			Nabothian cysts	C0027269	Monitoring
			Fibroid uterus	C0042133	Monitoring
			symptoms or weight loss	C1542746	Monitoring
			neoplasm of colon	C0007102	Monitoring
			mucinous neoplasm	C1334811	Monitoring
			or rest	C0682643	Monitoring
			gallbladder stones	C0947622	Monitoring
			cat scratch disease	C0007361	Monitoring
			stones passing	C0848621	Monitoring
			thrill in the	C2115906	Monitoring
			smoking cigarettes	C0700219	Monitoring
			infection or fevers	C1400815	Monitoring



		Salivary glands	C0036098	Monitoring
		indwelling stent	C4270259	Monitoring
		renal parenchymal disease	C1841992	Monitoring
		sharp pains	C0455270	Monitoring
		fructose corn syrup	C2981326	Monitoring
		purulent drainage	C0517630	Monitoring
		Staph infection	C0038160	Monitoring
		Incisional hernia	C0267716	Monitoring
		chronic colitis	C0267375	Monitoring
		hacking cough	C0239133	Monitoring
		further weight loss	C0150869	Monitoring
		long term	C0443252	Monitoring
		Increased pulmonary vascular	C1867423	Monitoring
		Bee sting reaction	C0438638	Monitoring
		Hyperpigmentation of skin	C0162834	Monitoring
		epididymal cysts	C0037859	Monitoring
		Omega fish oil	C1572282	Monitoring
		swelling thumb	C0575899	Monitoring
		risk of cardiovascular disease	C3176371	Monitoring
		frothy	C4069284	Monitoring
		lacunar infarctions	C0333559	Monitoring
		MAC	C0009545	Monitoring
		history of kidney stone	C1998388	Monitoring
		Lyme disease	C0024198	Monitoring
		breast tenderness	C0262397	Monitoring
		renal vascular disease	C0268790	Monitoring
		Simple	C0205352	Monitoring
		sliding hiatal hernia	C0376710	Monitoring
		chronic conditions	C0399432	Monitoring
		Chronic leg edema	C1739409	Monitoring
		chronic process	C1827411	Monitoring
		discomfort	C2364135	Monitoring
		hallux valgus	C0018536	Monitoring
		edema or infectious	C1400819	Monitoring
		corneal edema	C0010037	Monitoring
		corneal	C0010031	Monitoring
		corneal decompensation	C0948284	Monitoring
		pancreatic neoplasm	C0030297	Monitoring
		Breast cyst	C0006144	Monitoring

			Diaphragmatic hernia	C0019284	Monitoring
			kid	C0680063	Monitoring
			obvious	C0557880	Monitoring
			stone disease	C0947660	Monitoring
			fungal skin infection	C0011630	Monitoring
			stone each	C1535790	Monitoring
			infected mesh	C1321093	Monitoring
			ovarian cysts	C0029927	Monitoring
			burn scar	C0036280	Monitoring
			hyperplasia	C0020507	Monitoring
			head aches	C0018681	Monitoring
			sanguinous drainage	C0333271	Monitoring
			Ulcer debridement	C0730126	Monitoring
			leg wound	C1408542	Monitoring
			after recent viral infection	C2919453	Monitoring
			chronic reflux	C0743582	Monitoring
			rectal neuroendocrine tumor	C1335678	Monitoring
			stitches in the skin	C1540362	Monitoring
			hilar lymphadenopathy	C0456973	Monitoring
			environmental allergies	C0282504	Monitoring
			ankylosing spondylitis	C0038013	Monitoring
			Monilia genital infection	C0006840	Monitoring
			CMV infection	C0010823	Monitoring
			infection of the	C0555971	Monitoring
			ureteral stones	C0041952	Monitoring
			chronic stone	C0267885	Monitoring
			FHx prostate cancer	C0260515	Monitoring
			chronic iritis	C0008690	Monitoring
			it is	C3174772	Monitoring
			chronic epigastric	C0743541	Monitoring
			chronic functional constipation	C4060572	Monitoring
			today	C0310367	Monitoring
			GI infections	C4082764	Monitoring
			rectal prolapse	C0034888	Monitoring
			reflux	C0232483	Monitoring
			osteoarthritic	C1834973	Monitoring
			Mucinous carcinoma of skin	C0346020	Monitoring
			mucinous adenocarcinoma	C0007130	Monitoring

			urination or pelvic	C3539896	Monitoring
			infection in the	C0854706	Monitoring
			Chronic polyarthritis	C1735378	Monitoring
			or colon	C0555952	Monitoring
			symptomatic aortic stenosis	C0741183	Monitoring
			breast skin rash	C0741755	Monitoring
			chronic leg	C0263560	Monitoring
			hoarseness of voice	C0019825	Monitoring
			degenerative disc disease	C0158266	Monitoring
			bright red	C1272329	Monitoring
			abdominal tract hematoma	C0473120	Monitoring
			scrotal edema	C0151609	Monitoring
			relapsing lung	C0855002	Monitoring
			Streptococcal infection	C0038395	Monitoring
			pulmonary vascular	C0456261	Monitoring
			chronic headaches	C0151293	Monitoring
			colostomy site	C0546255	Monitoring
			risk for cardiac event	C1443393	Monitoring
			Spinal epidural abscess	C0238434	Monitoring
			fungus	C0016832	Monitoring
			not put weight	C0231246	Monitoring
			chronic incontinence	C0749938	Monitoring
			chronic bronchitis	C0008677	Monitoring
			interstitial thickening	C2750120	Monitoring
			recent weight change	C2127346	Monitoring
			chronic residual	C0270408	Monitoring
			current infection	C0588457	Monitoring
			collagen vascular disease	C0262428	Monitoring
			psoas abscess	C0085222	Monitoring
			went	C0796199	Monitoring
			incision line	C0197081	Monitoring
			gastroparesis	C0152020	Monitoring
			Chronic osteomyelitis	C0008707	Monitoring
			dysarthria	C0013362	Monitoring
			endobronchial	C0444471	Monitoring
			venous stasis	C0277919	Monitoring
			Chronic venous	C0042485	Monitoring
			Bone Neoplasm	C0005967	Monitoring
			chronic microangiopathy	C3808622	Monitoring
			Bone neoplasm uncertain behavior	C0346546	Monitoring

		certain types of food	C0566312	Monitoring
		cerebellar ataxia	C0007758	Monitoring
		Treating as	C0516188	Monitoring
		infection per	C2346550	Monitoring
		chronic active hepatitis	C0241910	Monitoring
		Inflammatory bowel disease	C0021390	Monitoring
		Chronic liver disease	C0341439	Monitoring
		within the	C0425538	Monitoring
		symptomatic	C0231220	Monitoring
		xanthine stones	C1848431	Monitoring
		stone or foreign	C3879015	Monitoring
		staghorn stone	C0438018	Monitoring
		atrial pacing	C0199647	Monitoring
		peripheral neuropathy	C0031117	Monitoring
		Psoriatic arthritis	C0003872	Monitoring
		inflammation and skin	C0011603	Monitoring
		Chronic angina	C0340288	Monitoring
		versus stasis disease	C0018133	Monitoring
		ventral incisional hernia	C0750175	Monitoring
		Adenovirus infection	C0001486	Monitoring
		Chronic nasal	C0746757	Monitoring
		Nasal polyps	C0027430	Monitoring
		atherosclerotic vascular disease	C0004153	Monitoring
		high dose fish oil	C0452295	Monitoring
		abscess	C0000833	Monitoring
		dry itchy skin	C3830437	Monitoring
		renal vascular	C0227622	Monitoring
		stasis dermatitis	C0011620	Monitoring
		Calf tenderness	C0238883	Monitoring
		Anemia of kidney disease	C1561828	Monitoring
		log	C0228228	Monitoring
		in the cyst	C1394327	Monitoring
		Skin abscess	C0149777	Monitoring
		Infected sebaceous cyst	C0345989	Monitoring
		Chronic stasis skin	C0748828	Monitoring
		scaly skin	C0423773	Monitoring
		offsets	C1711330	Monitoring
		chronic proctitis	C0860176	Monitoring
		Infected graft	C0349725	Monitoring

			infected hip	C0744926	Monitoring
			Reducible umbilical hernia	C0577704	Monitoring
			chronic anal fistula	C0740978	Monitoring
			Herbal weight loss	C1572271	Monitoring
			in skin integrity	C0946387	Monitoring
			heart valve infection	C0014121	Monitoring
			cognitive impairment	C0338656	Monitoring
			pulmonary edema	C0034063	Monitoring
			inflammation related to your gallbladder	C0008325	Monitoring
			chronic interstitial	C0221236	Monitoring
			interstitial lung disease	C0206062	Monitoring
			these	C0039828	Monitoring
			rectal fistula	C0034884	Monitoring
			water intake	C0013123	Monitoring
			definite epidural abscess	C0237049	Monitoring
			chronic pelvic	C0149960	Monitoring
			remember	C0034770	Monitoring
			GI bleed	C0017181	Monitoring
			chronic hearing loss	C0744663	Monitoring
			low dose lung	C4067633	Monitoring
			sexual behavior	C0036864	Monitoring
			chronic nerve	C4229567	Monitoring
			Nevus	C0027960	Monitoring
			tonsil stones	C0272388	Monitoring
			limiting alcohol intake	C0560219	Monitoring
			Chronic laryngitis	C0155836	Monitoring
			chronic volvulus	C0267195	Monitoring
			radicular	C0034543	Monitoring
			Bochdalek hernia	C0265700	Monitoring
			carotid bruits	C0007280	Monitoring
			femoral bruits	C0558799	Monitoring
			tears	C0039409	Monitoring
			nasal drainage	C0746759	Monitoring
			chronic childhood respiratory disease	C1398939	Monitoring
			thrush infection	C3646468	Monitoring
			FHx of kidney disease	C0260532	Monitoring
			numbness	C0028643	Monitoring
			or wound infection	C3844442	Monitoring
			discomfort around	C0858893	Monitoring

			chronic asthma	C0877430	Monitoring
			emphysema or airway	C1403214	Monitoring
			chronic abscess	C0333398	Monitoring
			prostate abscess	C0156290	Monitoring
			after 48 hours	C3897190	Monitoring
			chronic prostate toe rectal pains	C0742666	Monitoring
			epidermoid cysts	C0014511	Monitoring
			Norovirus infection	C2712971	Monitoring
			spinal stenosis	C0037944	Monitoring
			do become	C0510415	Monitoring
			Chronic ischemic colitis	C0267413	Monitoring
			axillary adenopathy	C0578735	Monitoring
			Metabolic bone disease	C0005944	Monitoring
			either	C3844638	Monitoring
			Low cardiac output	C0007166	Monitoring
			as food always	C3900013	Monitoring
			infections or upper respiratory infections	C1536805	Monitoring
			voice loss	C0003564	Monitoring
			low fever	C0239574	Monitoring
			granulomatous disease	C0740451	Monitoring
			infection becomes	C1864807	Monitoring
			sleep disturbance	C0037317	Monitoring
			Ulcerative colitis	C0009324	Monitoring
			crypt abscess	C0333374	Monitoring
			Rectal ulcerative colitis	C3509262	Monitoring
			atrophy	C0333641	Monitoring
			infection up	C0158421	Monitoring
			stool	C0015733	Monitoring
			infections to	C0157749	Monitoring
			infected hematoma	C0948087	Monitoring
			Chronic allergic	C0029543	Monitoring
			caused neurotoxicity	C0546131	Monitoring
			chronic oral	C0747051	Monitoring
			pulmonary effusions	C1608981	Monitoring
			atypical pulmonary infection	C0392054	Monitoring
			pannus	C0333350	Monitoring
			microscopic hematuria	C0239937	Monitoring
			chronic subdural hematoma	C0749095	Monitoring

			do you	C3259020	Monitoring
			Perirectal small cutaneous abscess	C0267566	Monitoring
			thyroid disease	C0040128	Monitoring
			Weight trending	C0424655	Monitoring
			Wound drainage	C0694702	Monitoring
			acute diverticulitis	C0518989	Monitoring
			Watchers weight	C2067212	Monitoring
			Surgical wound	C0332803	Monitoring
			chronic epididymitis	C0238110	Monitoring
			chest wound	C0742361	Monitoring
			incision dehiscence	C0038940	Monitoring
			heart murmur	C0018808	Monitoring
			carb intake	C4255294	Monitoring
			sarcoid pulmonary	C0340199	Monitoring
			anorexia or weight loss	C1971623	Monitoring
			Metastatic breast cancer	C0278488	Monitoring
			relief	C0564405	Monitoring
			urination or bloody	C0473237	Monitoring
			uloric	C2683462	Monitoring
			hernia repairs	C0019328	Monitoring
			risk for GI bleed	C3251812	Monitoring
			chronic productive cough	C0742859	Monitoring
			Chronic osteoarthritis	C0263778	Monitoring
			GI cancers	C0685938	Monitoring
			do not drink	C4087012	Monitoring
			of acute infection	C0155392	Monitoring
			low calcium levels in the blood	C0020598	Monitoring
			food intake	C0013470	Monitoring
			gallstones or pancreatitis	C0521614	Monitoring
			infection bacterial infection	C0004623	Monitoring
			scapular	C0223628	Monitoring
			in the chest	C1253943	Monitoring
			MRSA pneumonia	C1142536	Monitoring
			Renal colic	C0152169	Monitoring
			obs	C2986870	Monitoring
			wound complications	C1096106	Monitoring
			Coughing up phlegm	C1536391	Monitoring
			check weight	C2712830	Monitoring
			chronic bronchiectasis	C0741793	Monitoring

			chronic fevers	C0743971	Monitoring
			ulceration or erosions	C4055054	Monitoring
			MRSA skin infection	C0343401	Monitoring
			or damage	C1301684	Monitoring
			Cecal polyps	C1112566	Monitoring
			disc disease	C0012619	Monitoring
			infection the skin	C1142269	Monitoring
			cecal volvulus	C0238047	Monitoring
			Calcified coronary artery	C0742825	Monitoring
			abscess cavity	C0333372	Monitoring
			hepatic abscess	C0023885	Monitoring
			Suicidal intent	C0582496	Monitoring
			effusion or pericardial effusion	C0031039	Monitoring
			Chronic gouty arthritis	C0268108	Monitoring
			inflammation prostate	C0033581	Monitoring
			infected tunneled	C3161243	Monitoring
			choledocholithiasis or acute obstruction	C3649781	Monitoring
			chronic in	C0153912	Monitoring
			chronically ill appearing	C2051413	Monitoring
			groin abscess	C0263109	Monitoring
			after weight loss	C2129177	Monitoring
			Incarcerated ventral hernia	C0311269	Monitoring
			Diverticulosis without acute diverticulitis	C0149653	Monitoring
			prostate hyperplasia	C2937421	Monitoring
			chronic medical	C0425066	Monitoring
			vascular disease	C0042373	Monitoring
			inflammation around	C0031099	Monitoring
			varicella zoster infection	C0586989	Monitoring
			chronic depressive	C0581391	Monitoring
			vascular stenosis	C0679403	Monitoring
			subdural empyema	C0038539	Monitoring
			bone flap	C1266913	Monitoring
			Retention cysts	C0035281	Monitoring
			chronic musculoskeletal	C0746683	Monitoring
			chronic recurrent	C0410422	Monitoring
			Colloid cyst	C0333157	Monitoring
			Chronic sequela	C2198003	Monitoring
			vascular malformation	C0158570	Monitoring



			colon perforation	C0347646	Monitoring
			Chronic rib	C0844663	Monitoring
			Chronic cardiopulmonary disease	C0238074	Monitoring
			Allergic	C0700624	Monitoring
			Chronic head	C0558154	Monitoring
			Chronic hepatitis C virus infection	C0524910	Monitoring
			volume blood loss	C4265180	Monitoring
			Chronic anxiety	C0581386	Monitoring
			fluid weight	C3484207	Monitoring
			around his wounds	C2129888	Monitoring
			dry mouth	C0043352	Monitoring
			inflammation/abscess	C3513855	Monitoring
			intermittent cough	C2077828	Monitoring
			blurry vision	C0344232	Monitoring
			risk of kidney disease	C3697935	Monitoring
			Chronic foot ulcer	C0744178	Monitoring
			chronic muscle cramping	C0746672	Monitoring
			acute flare	C4042866	Monitoring
			thyroid cysts	C0162299	Monitoring
			Coarse vascular calcifications	C1268677	Monitoring
			infection but	C2749557	Monitoring
			vitamin K intake	C2317598	Monitoring
			seasonal allergic rhinitis	C0018621	Monitoring
			obstructing hernia	C0156140	Monitoring
			chronic fungal	C0396046	Monitoring
			swelling of legs	C0581394	Monitoring
			chronic ankle	C0410419	Monitoring
			Chronic hand	C0264045	Monitoring
			dysphonia	C1527344	Monitoring
			Chronic wrist	C0564827	Monitoring
			Colocutaneous fistula	C0341377	Monitoring
			recent wound infection	C2169571	Monitoring
			BONE INFECTION	C2242472	Monitoring
			drink juice	C2136335	Monitoring
			Septic pulmonary emboli	C0333222	Monitoring
			stump healed	C1398427	Monitoring
			Chronic pulmonary fibrosis	C0340126	Monitoring
			ischemic vascular	C0235490	Monitoring

			head trauma	C0018674	Monitoring
			tingling in the hand	C4084744	Monitoring
			chronic iron deficiency anemia	C0740989	Monitoring
			pancreatic pseudocyst	C0030299	Monitoring
			bright	C0423899	Monitoring
			urethral stricture disease	C0041974	Monitoring
			biliary sludge	C0282074	Monitoring
			hematuria or	C0475537	Monitoring
			adenocarcinoma of the prostate	C0007112	Monitoring
			LVAD	C0181598	Monitoring
			ulcers or skin	C0455787	Monitoring
			drastic	C0743236	Monitoring
			arsenic levels	C0373548	Monitoring
			infection damage	C1411542	Monitoring
			chronic inflammatory bowel	C0267374	Monitoring
			infectious colitis	C0277524	Monitoring
			as much as	C1879743	Monitoring
			nonocclusive	C0266061	Monitoring
			Purposeful	C1285529	Monitoring
			blastic pelvic	C2021201	Monitoring
			cervical spinal cord lesion	C0730136	Monitoring
			chronic pains	C0150055	Monitoring
			chronic dyspnea	C1388883	Monitoring
			intestinal metaplasia	C0334037	Monitoring
			Acute blood loss anemia	C0154298	Monitoring
			Chronic mesenteric ischemia	C0311262	Monitoring
			hepatocellular disease	C0023895	Monitoring
			steatosis	C0152254	Monitoring
			chronic active ileitis	C0745221	Monitoring
			infection or hernia	C4049327	Monitoring
			chronic psychosis	C0221764	Monitoring
			increased weight gain	C0000765	Monitoring
			swelling and	C0455933	Monitoring
			inflammation of the liver	C0019158	Monitoring
			Chronic dermatitis	C0262975	Monitoring
			insignificant	C3898757	Monitoring
			brawny edema	C0333248	Monitoring

			Papillary thyroid cancer	C0238463	Monitoring
			Xerosis of skin	C0263465	Monitoring
			gonococcal infection	C0018081	Monitoring
			chronic hypernatremia	C0268012	Monitoring
			Metastatic prostate cancer	C0936223	Monitoring
			infected coronary	C2049798	Monitoring
			prosthetic infection	C0349726	Monitoring
			truncal ataxia	C0427190	Monitoring
			GI: liver disease	C0017183	Monitoring
			invasive pneumococcal disease	C1320214	Monitoring
			not drink	C0564343	Monitoring
			gouty	C0003868	Monitoring
			Thyroid	C0040132	Monitoring
			urinary leakage	C3897214	Monitoring
			chronic moderate	C0267386	Monitoring
			UK	C0077769	Monitoring
			weight loss after gastric	C2126001	Monitoring
			Integumentary: skin lesion	C0191447	Monitoring
			A fib	C0004238	Monitoring
			scarring to the flanks	C2037960	Monitoring
			Staphylococcus aureus bacteremia	C1142423	Monitoring
			High cardiac output	C0085128	Monitoring
			Alopecia areata	C0002171	Monitoring
			kidney transplant	C0022671	Monitoring
			salivary stones	C0036091	Monitoring
			neoplasm of the lung	C0024121	Monitoring
			or erosions	C1540849	Monitoring
			infection prophylaxis	C0877629	Monitoring
			Not eating	C0418837	Monitoring
			alcohol intake	C0001948	Monitoring
			chronic uveitis	C1510449	Monitoring
			Psoriatic plaques	C0920235	Monitoring
			chronic hemolytic anemia	C0271904	Monitoring
			murmur as child	C0746654	Monitoring
			possibly	C0332149	Monitoring
			osteoarthritis flare	C3544322	Monitoring
			toenail infection	C0749565	Monitoring
			Seronegative rheumatoid arthritis	C0409652	Monitoring

			infections or stomatitis	C1398444	Monitoring
			Worse after	C0241739	Monitoring
			attacks	C0004063	Monitoring
			risk of heart disease	C1277690	Monitoring
			cyst rupture	C0333140	Monitoring
			myeloid leukemia	C0023470	Monitoring
			ulcerations or rashes	C0744159	Monitoring
			inflammation without any intestinal	C3889047	Monitoring
			aneurysm dissection	C0002949	Monitoring
			Chronic daily headache	C0752147	Monitoring
			visual	C0234621	Monitoring
			msk	C1420279	Monitoring
			panic	C0030318	Monitoring
			abd	C0449202	Monitoring
			metaplasia	C0025568	Monitoring
			glycogen storage disease	C0017919	Monitoring
			ovarian simple cyst	C0237010	Monitoring
			Periumbilical hernia	C0747528	Monitoring
			chronic Hep	C0524909	Monitoring
			not be safe	C0581563	Monitoring
			Paresthesia of skin	C0235046	Monitoring
			heat as	C1820546	Monitoring
			chronically draining wound	C0750432	Monitoring
			yellow sputum	C0457096	Monitoring
			chest or abdominal	C0846687	Monitoring
			nails	C0027342	Monitoring
			Black lung	C0003165	Monitoring
			clavicular fracture	C0159658	Monitoring
			splenic granulomas	C1535984	Monitoring
			Chronic kidney disease		
			mineral bone disease	C4076240	Monitoring
			increased fluid intake	C0426596	Monitoring
			infected mastoid	C1096736	Monitoring
			away	C0425139	Monitoring
			viral infection	C0042769	Monitoring
			diverticular disease	C1510475	Monitoring
			added	C0002395	Monitoring
			symptomatic urinary tract infection	C0749968	Monitoring
			degenerative changes	C0011164	Monitoring

			helped	C1269765	Monitoring
			Gastric erosions	C0341177	Monitoring
			gastric	C1704242	Monitoring
			erosions	C0333307	Monitoring
			liver biopsy	C0193388	Monitoring
			pneumoperitoneum	C0032320	Monitoring
			sickle cell	C0221283	Monitoring
			sickle cell disease	C0002895	Monitoring
			Beta Thalassemia	C0005283	Monitoring
			sickle beta thalassemia	C0221019	Monitoring
			Cod Liver Oil OIL	C0009213	Monitoring
			under the nails	C0474374	Monitoring
			enterovirus types	C0376325	Monitoring
			under	C0542339	Monitoring
			Perforated appendicitis	C0854119	Monitoring
			omental adhesions	C0267781	Monitoring
			Alcoholic liver disease	C0023896	Monitoring
			squamous cell carcinoma	C0149782	Monitoring
			stage liver disease	C0745744	Monitoring
			inherited renal disease	C0403547	Monitoring
			promote weight loss	C2584720	Monitoring
			started as	C0474365	Monitoring
			weight loss surgery	C1456587	Monitoring
			chronic jaw	C0266964	Monitoring
			burgdorferi antibodies	C0368786	Monitoring
			chronic ear infections	C0743359	Monitoring
			or signs of infection	C2191772	Monitoring
			Bone marrow edema	C0948162	Monitoring
			localized infections	C0016397	Monitoring
			retrobulbar hemorrhage	C0302497	Monitoring
			gum infection	C0744403	Monitoring
			diverticulosis or diverticulitis	C0679411	Monitoring
			salt intake	C0489767	Monitoring
			skin tears	C0877377	Monitoring
			Chronic intermittent diarrhea	C0743174	Monitoring
			gastric reflux	C0558176	Monitoring
			vascular damage	C1389629	Monitoring
			chronic stage IV	C0854804	Monitoring
			Incision site	C0449681	Monitoring

			looks	C0233426	Monitoring
			bone fractures	C0016658	Monitoring
			renal as	C0403448	Monitoring
			Necrotic pancreatitis	C0267941	Monitoring
			chronic hydronephrosis	C1405879	Monitoring
			chronic hypocalcemia	C0033806	Monitoring
			foods	C0016452	Monitoring
			Squamous cell skin cancer	C0553723	Monitoring
			loss was	C2018719	Monitoring
			inflammation of duodenum	C0013298	Monitoring
			stones or masses	C1714971	Monitoring
			trigeminal neuralgia	C0040997	Monitoring
			arteriosclerotic vascular disease	C0003850	Monitoring
			ureteral stent	C0183518	Monitoring
			chronic myeloid	C0023473	Monitoring
			inflammation no skin	C3873446	Monitoring
			gastric hyperplastic polyp	C0878649	Monitoring
			suture in the skin	C0191408	Monitoring
			Atrophic vaginal	C0221392	Monitoring
			Urticaria	C0042109	Monitoring
			chronic lumbar back	C0741393	Monitoring
			tingling in the arm	C2116338	Monitoring
			Metastatic renal cell carcinoma	C0278678	Monitoring
			incision made	C2034895	Monitoring
			chronic drainage	C0748721	Monitoring
			wound open	C0332798	Monitoring
			thrombus	C0087086	Monitoring
			rectal cancer	C0007113	Monitoring
			radiation cystitis	C0156270	Monitoring
			Radiation proctitis	C0400827	Monitoring
			Mitral valve endocarditis	C0746604	Monitoring
			pacemaker	C3890506	Monitoring
			superficial wound infection	C0406104	Monitoring
			central line infection	C1096243	Monitoring
			risk of vascular disease	C2584745	Monitoring
			infection if	C2051616	Monitoring
			HBV Infection	C3854623	Monitoring
			synovial cysts	C0085648	Monitoring
			Heberden nodes	C0018862	Monitoring

			chronic sacroiliac	C0948612	Monitoring
			Short term memory loss	C0701811	Monitoring
			scrotal infections	C1299539	Monitoring
			crusting of healed skin	C2231982	Monitoring
			scrotal skin	C0222198	Monitoring
			Splenic laceration	C0347636	Monitoring
			infected inguinal	C0919796	Monitoring
			enterocutaneous fistula	C0341318	Monitoring
			hernia mesh repair	C0519122	Monitoring
			infection of the sacrum	C0410371	Monitoring
			rectal perforation	C0341402	Monitoring
			glottic gap	C2138972	Monitoring
			chronic respiratory	C0264220	Monitoring
			lupus flares	C4054590	Monitoring
			SLE flare	C1735608	Monitoring
			fluid thrill no ascites	C0437004	Monitoring
			chronic dental caries	C0266852	Monitoring
			Scrotal	C0036471	Monitoring
			heart attack or	C2926099	Monitoring
			cold sores	C0019345	Monitoring
			drink extra	C1170830	Monitoring
			necrosis	C0027540	Monitoring
			Abdominal Adhesions	C0549357	Monitoring
			Protracted upper respiratory infection	C2133965	Monitoring
			chronic rash	C3806538	Monitoring
			asthmatic bronchitis	C1319018	Monitoring
			Degenerative spondylolisthesis	C0264184	Monitoring
			falls or any	C2707943	Monitoring
			stone like	C1823135	Monitoring
			hernia as	C0267713	Monitoring
			or myalgias	C0410002	Monitoring
			RLE toe touch weight bearing	C2149821	Monitoring
			Refused weight loss	C2169617	Monitoring
			attempting weight loss	C2046395	Monitoring
			Chronic anal fissure	C0349071	Monitoring
			nicotine	C0028040	Monitoring
			rashes or	C0011974	Monitoring
			importance of weight	C1705104	Monitoring

			Malignant neoplasm	C0006826	Monitoring
			chronic infiltrates	C0021376	Monitoring
			Thyrotoxicosis without		
			thyroid storm	C2873871	Monitoring
			or fevers	C0275976	Monitoring
			backup	C1552560	Monitoring
			chronic erythema	C1265577	Monitoring
			over	C0020505	Monitoring
			Antrochoanal polyp	C0008298	Monitoring
			fluid collection	C0394552	Monitoring
			scarring or old	C0404534	Monitoring
			such an	C1548400	Monitoring
			aspiration pneumonia	C0032290	Monitoring
			meningeal cysts	C0347534	Monitoring
			Pituitary Neoplasm	C0032019	Monitoring
			Chronic nausea	C0746779	Monitoring
			Over weight	C0497406	Monitoring
			chronic severe	C0267387	Monitoring
			uncal herniation	C0393985	Monitoring
			in weight gain	C1398625	Monitoring
			pulmonary vascular disease	C0020542	Monitoring
			likelihood	C0033204	Monitoring
			recheck	C0745623	Monitoring
			Acute pulmonary edema	C0155919	Monitoring
			intra	C0347985	Monitoring
			Perianal fistula	C0267561	Monitoring
			tics	C0040188	Monitoring
			chronic Q fever	C1443892	Monitoring
			psoas muscle	C0085221	Monitoring
			spine infections	C0748912	Monitoring
			Pancreatic cysts	C0030283	Monitoring
			Central	C0205099	Monitoring
			incision drainage	C0152277	Monitoring
			kidney stones and weight	C2109384	Monitoring
			Regaining	C0730881	Monitoring
			Anaplastic astrocytoma	C0334579	Monitoring
			Nonmelanoma skin	C0699893	Monitoring
			or sexual	C1527307	Monitoring
			reaction units	C1975995	Monitoring
			heat	C0018837	Monitoring
			erythematosis	C0409974	Monitoring



			Ulcerations are drying	C0747964	Monitoring
			Chronic pulmonary edema	C0264518	Monitoring
			lifts weight	C0043095	Monitoring
			T levels	C1278066	Monitoring
			hepatitis infection	C1112211	Monitoring
			dysphagia and weight loss	C3277224	Monitoring
			rectal colon polyp	C0742670	Monitoring
			holes or tears	C1883270	Monitoring
			incision skin	C0191279	Monitoring
			fiber intake	C1821272	Monitoring
			eating fish	C3671189	Monitoring
			prostate or urothelial	C1514430	Monitoring
			incision wounds	C0000925	Monitoring
			narcotic dependence	C1527402	Monitoring
			polyp in the sigmoid	C0742699	Monitoring
			chronic sacral	C2919335	Monitoring
			Blood	C0005767	Monitoring
			coccygeal decubitus ulcer	C2728301	Monitoring
			infected sacral	C3648743	Monitoring
			sacral decubitus	C0558159	Monitoring
			chronic pancreatitis as	C0940977	Monitoring
			Infected cyst	C1142249	Monitoring
			pelvic fluid collections	C1697454	Monitoring
			erythema of the skin	C0241365	Monitoring
			hernia or reflux	C1268942	Monitoring
			nasal bleeds	C0014591	Monitoring
			chronic pyelonephritis	C0085697	Monitoring
			Postmenopausal bone loss	C0029458	Monitoring
			not always	C2749261	Monitoring
			chronic mucosal	C1290074	Monitoring
			Chronic resp	C0421217	Monitoring
			pleural thickening	C0264545	Monitoring
			within 48 hours	C0150946	Monitoring
			chronic strain	C2063696	Monitoring
			airway obstruction	C0001883	Monitoring
			Rectourethral Fistula	C0268875	Monitoring
			above	C1282910	Monitoring
			oxalate stones	C0428457	Monitoring
			fevers or skin rashes	C0847014	Monitoring
			infection signs of infection	C2225262	Monitoring
			infection after dog bite	C0850850	Monitoring

		nephrolithiasis	C0392525	Monitoring
		after starting	C1552564	Monitoring
		profile	C1721540	Monitoring
		his	C0019602	Monitoring
		chronic inf	C0155397	Monitoring
		rust colored sputum	C0748946	Monitoring
		pus drainage	C0748194	Monitoring
		red meat intake	C0556202	Monitoring
		Blanching	C0948786	Monitoring
		lose consciousness	C2057717	Monitoring
		choking	C0008301	Monitoring
		barrier laser barrier laser	C0302718	Monitoring
		stone extraction	C0883371	Monitoring
		chronic allergies	C0740905	Monitoring
		chronic blood disorder	C1275398	Monitoring
		symptomatic infections	C0864665	Monitoring
		Renal arterial thrombosis	C0340608	Monitoring
		cold or heat intolerance	C0424798	Monitoring
		much	C0205393	Monitoring
		chronic ruq	C0262419	Monitoring
		Calcitonin	C0006668	Monitoring
		electrolyte abnormalities	C0151613	Monitoring
		paraumbilical hernia	C0019311	Monitoring
		Mediastinal lymphadenopathy	C0520743	Monitoring
		septic arthritis	C0003869	Monitoring
		increased weight or edema	C0743393	Monitoring
		low	C0205251	Monitoring
		during this	C3827541	Monitoring
		swelling in the knee	C0240130	Monitoring
		chronic thromboembolic	C2363973	Monitoring
		discuss weight loss	C1535374	Monitoring
		under chin	C0448809	Monitoring
		hallux	C0018534	Monitoring
		as blood loss	C0516480	Monitoring
		stone surgeries	C0401239	Monitoring
		Cryptogenic organizing pneumonia	C0242770	Monitoring
		simple liver cyst	C2887948	Monitoring
		yellow fever	C0043395	Monitoring
		anaphylactic reaction to	C0344159	Monitoring

			Monocryl	C0381197	Monitoring
			allergic conjunctivitis	C0009766	Monitoring
			hyperplasia of tongue	C0024421	Monitoring
			biliary obstruction	C0400979	Monitoring
			NUT ALLERGY	C0577620	Monitoring
			to the flanks	C2032306	Monitoring
			chronic basilar fibrosis	C0334133	Monitoring
			chronic lung fibrosis	C0264526	Monitoring
			leukemoid reaction	C0023501	Monitoring
			Tornwaldt cyst	C0264294	Monitoring
			nasal bone fractures	C0339848	Monitoring
			Chronic nasal bone	C1290184	Monitoring
			Not checking blood sugars	C2136219	Monitoring
			night	C0240526	Monitoring
			groin nodes	C0857362	Monitoring
			vulvar cancer	C0375071	Monitoring
			chronic mental	C0683405	Monitoring
			came	C0960273	Monitoring
			Anomalous pulmonary venous drainage	C0265916	Monitoring
			Pseudomonas infection	C0033817	Monitoring
			nervous system infection	C0007684	Monitoring
			Hepatitis diagnostic	C0770872	Monitoring
			do not see any	C3639726	Monitoring
			muscle spasms	C0037763	Monitoring
			potassium in the blood	C0020461	Monitoring
			spondylitic	C0263853	Monitoring
			Midline abd hernia	C0750176	Monitoring
			GI	C0521362	Monitoring
			orthopnea	C0085619	Monitoring
			Chronic Lymphoma	C2063391	Monitoring
			infected bursa	C1290161	Monitoring
			he	C1418983	Monitoring
			Chronic Pansinusitis	C0155827	Monitoring
			infection because	C0034386	Monitoring
			infected intra	C0270179	Monitoring
			Drainage of abdominal abscess	C0405771	Monitoring
			Recurrent hernia	C0281961	Monitoring
			no signs of infection	C3693702	Monitoring
			Deg	C2348088	Monitoring

			Acne scarring	C0423783	Monitoring
			ruptured aneurysms	C0162869	Monitoring
			invasive pulmonary fungal infection	C1262313	Monitoring
			photosensitivity reaction	C0162830	Monitoring
			Invasive pulmonary aspergillus infection	C0276653	Monitoring
			or recurrent hernia	C0851807	Monitoring
			cerebellar infarcts	C1835116	Monitoring
			rectal adenocarcinoma	C0236073	Monitoring
			gastric antral vascular	C0149978	Monitoring
			good	C0267211	Monitoring
			stent	C0205170	Monitoring
			infrarenal	C0038257	Monitoring
			Prostate carcinoma	C0226025	Monitoring
			desmoplastic reaction	C0600139	Monitoring
			biliary stones	C1511789	Monitoring
			Chronic hyponatremia	C0008350	Monitoring
			Incarcerated umbilical hernia	C0268007	Monitoring
			infarction within the vascular	C0700253	Monitoring
			heart burns	C0011263	Monitoring
			bone disease	C0018834	Monitoring
			myeloma FISH	C0005940	Monitoring
			internal hemorrhoid	C2210831	Monitoring
			ulcerations or wounds	C0265034	Monitoring
			significant coronary artery disease	C0460766	Monitoring
			leiomyoma or benign	C1299434	Monitoring
			daytime somnolence	C0023267	Monitoring
			weight loss was weight	C2219848	Monitoring
			stone heart	C0750414	Monitoring
			lying	C2938932	Monitoring
			risk of kidney injury	C0600261	Monitoring
			Ruptured aortic aneurysm	C0582456	Monitoring
			chronic sinus disease	C0265010	Monitoring
			Chronic pelvic abscess	C0748720	Monitoring
			metastatic rectal cancer	C0269024	Monitoring
			infection or granulomatous	C0861772	Monitoring
			becomes	C1610637	Monitoring
				C0429569	Monitoring

		tinea infection	C0040247	Monitoring
		HBV	C0019169	Monitoring
		instead of	C0425956	Monitoring
		Chronic frontal sinusitis	C0008683	Monitoring
		Breast neoplasm	C1458155	Monitoring
		Papillary serous endometrial	C0854924	Monitoring
		papillary serous	C0334358	Monitoring
		pancreatic duct dilatation	C0400535	Monitoring
		diverticular abscess	C0581275	Monitoring
		concerning weight	C2034380	Monitoring
		emesis	C0042963	Monitoring
		recent intentional weight loss	C2169614	Monitoring
		px	C0332132	Monitoring
		meningitis	C0025285	Monitoring
		leakage	C0015376	Monitoring
		bile leak	C0400997	Monitoring
		Idiopathic pulmonary fibrosis	C0085786	Monitoring
		Fatty liver disease	C0341447	Monitoring
		chronic therapy	C0749634	Monitoring
		Malignant neoplasm of	C0153340	Monitoring
		splenic calcifications	C1404059	Monitoring
		smoking history	C1519384	Monitoring
		coughing or deep breath	C1276787	Monitoring
		tibial	C0040184	Monitoring
		PICC line	C0179740	Monitoring
		chronic cellulitis	C0544781	Monitoring
		limited weight bearing	C2080837	Monitoring
		esophageal strictures	C0014866	Monitoring
		chest wall infection	C0438341	Monitoring
		breast skin thickening	C1268720	Monitoring
		Latent syphilis	C0039133	Monitoring
		herniorraphy	C0458169	Monitoring
		Indirect inguinal hernia	C0019296	Monitoring
		hemorrhage or vascular anomaly	C0519029	Monitoring
		pelvic fractures	C0149531	Monitoring
		hip abscess	C0263120	Monitoring
		endemic	C0243130	Monitoring

			fungal pulmonary infections	C0024116	Monitoring
			fevers or sweats	C0038992	Monitoring
			scrotal hernia	C0019319	Monitoring
			meniscal tears	C0238218	Monitoring
			smoking or risky behavior	C1519383	Monitoring
			Esophageal ulcers	C0151970	Monitoring
			nasal spray	C0461725	Monitoring
			Passing flatus	C0016204	Monitoring
			chronic granulomatous disease	C0018203	Monitoring
			chronic diabetic neuropathy	C0393830	Monitoring
			breaks in the skin	C3842551	Monitoring
			Hyperplasia of the breast	C0741698	Monitoring
			breast disease	C0006145	Monitoring
			subsegmental pulmonary	C0503868	Monitoring
			fragment these stones	C0400630	Monitoring
			IgA	C0020835	Monitoring
			ULCER RECTAL	C0400839	Monitoring
			gluteal	C1550262	Monitoring
			left inguinal hernia	C0262537	Monitoring
			incision hernia	C0176963	Monitoring
			sleep apnea	C0037315	Monitoring
			kidney stones were uric acid stones	C2109383	Monitoring
			heaviest	C2711761	Monitoring
			ect	C0013806	Monitoring
			further	C1517331	Monitoring
			bowel or vascular	C0400883	Monitoring
			risk sexual behavior	C1261242	Monitoring
			chronically dry skin	C2074685	Monitoring
			Epidural abscess	C0270629	Monitoring
			Perianal skin tag	C0521605	Monitoring
			infection abd	C0438343	Monitoring
			flare up	C3830105	Monitoring
			pleural effusion	C0032227	Monitoring
			pulmonary process	C0748169	Monitoring
			chronic pancolitis	C2711681	Monitoring
			peripelvic cysts	C0866184	Monitoring
			resolution of chest	C2318026	Monitoring

			ulcer arthritis	C1388566	Monitoring
			chronic occipital	C0744647	Monitoring
			infected arthroplasty	C0410808	Monitoring
			Infection of implant	C0405488	Monitoring
			chronic atypical	C1292772	Monitoring
			lung induced lung disease	C0599154	Monitoring
			erythema around	C2071472	Monitoring
			Chronic Leukemia	C1279296	Monitoring
			requiring wound	C0744501	Monitoring
			infection related	C0085073	Monitoring
			insufficiency	C0349073	Monitoring
			olfactory groove meningioma	C1335107	Monitoring
			Gastric mucosal atrophy	C0597736	Monitoring
			radiotracer	C0597354	Monitoring
			breakthrough	C0444503	Monitoring
			or ischemia	C0745412	Monitoring
			site healed	C2197765	Monitoring
			collateral venous	C0265074	Monitoring
			or colon cancer	C0009375	Monitoring
			Forehead laceration	C0561236	Monitoring
			ureteral reflux	C0042580	Monitoring
			anxiety	C0003467	Monitoring
			CaOx stones	C1147841	Monitoring
			this	C1080058	Monitoring
			rheumatoid arthritis	C0003873	Monitoring
			lifelong	C4274169	Monitoring
			allergic fungal	C1827192	Monitoring
			Reflux kidney	C2123534	Monitoring
			poisoning as blood	C0036690	Monitoring
			CrCL	C1846718	Monitoring
			Ulcers in colon	C0267491	Monitoring
			eating food because it	C3275021	Monitoring
			Extraction of kidney stone	C0162428	Monitoring
			back discomfort	C0235706	Monitoring
			dysplasia	C0334044	Monitoring
			refusal to bear weight	C4054081	Monitoring
			lymphangitis	C0024225	Monitoring
			striae in the skin	C0152459	Monitoring
			Watches	C0043012	Monitoring
			again	C0723612	Monitoring

		ulcers or infection	C1407931	Monitoring
		chronic health	C0559278	Monitoring
		chronic fractures	C2712806	Monitoring
		it was	C4086960	Monitoring
		esophageal spasms	C0014863	Monitoring
		PDT	C0175486	Monitoring
		inflammation of the blood	C0042384	Monitoring
		oliguria	C0028961	Monitoring
		infection/abscess	C0400889	Monitoring
		steatohepatitis	C2711227	Monitoring
		started	C0439659	Monitoring
		around	C0750503	Monitoring
		Infected sexual	C0036916	Monitoring
		Expected weight gain	C2233528	Monitoring
		raise blood	C0235416	Monitoring
		reaction to	C0013182	Monitoring
		swelling of nasal	C0581927	Monitoring
		formed stools	C2128963	Monitoring
		swelling or chest	C0347940	Monitoring
		inflammation from rheumatoid	C0333423	Monitoring
		cholestatic liver disease	C0860204	Monitoring
		stone pancreatitis	C0440736	Monitoring
		planned weight loss	C1814869	Monitoring
		radiation esophagitis	C0238113	Monitoring
		myalgia	C0231528	Monitoring
		respiratory distress	C0476273	Monitoring
		chronic allergic sinusitis	C0748727	Monitoring
		Klebsiella pneumoniae line infection	C0948802	Monitoring
		pneumoniae line infection	C0729704	Monitoring
		recent upper respiratory infection	C2169609	Monitoring
		stage III lung cancer	C0862847	Monitoring
		infective endocarditis	C1541923	Monitoring
		inflammation is	C2678093	Monitoring
		pelvic hematoma	C0475319	Monitoring
		Gastric outlet obstruction	C0162651	Monitoring
		pancreatic adenocarcinoma	C0281361	Monitoring
		induration under the wound	C2116826	Monitoring
		port site infection	C4054168	Monitoring



			anorexia weight loss	C0426583	Monitoring
			thrill in vascular	C0241658	Monitoring
			interstitial pulmonary edema	C0748120	Monitoring
			inguinal lymphadenopathy	C0578736	Monitoring
			Nonalcoholic fatty liver	C0400966	Monitoring
			hereditary	C0439660	Monitoring
			promote weight weight	C2584705	Monitoring
			swelling of feet	C0574002	Monitoring
			in the transplant	C2170316	Monitoring
			stent thrombosis	C3897493	Monitoring
			stones blood in urine	C0455909	Monitoring
			myofascial	C0262941	Monitoring
			salmonella infection	C0036117	Monitoring
			intake and weight	C4263181	Monitoring
			squamous intraepithelial lesion	C0333873	Monitoring
			Nasal abscess	C0264263	Monitoring
			tenderness	C0234233	Monitoring
			infection in	C0003204	Monitoring
			mechanical neck	C3877575	Monitoring
			Migraine headaches	C0149931	Monitoring
			submucosal	C1515025	Monitoring
			ordered as	C0508364	Monitoring
			cysts	C0010709	Monitoring
			berry aneurysms	C0005136	Monitoring
			gas	C0017110	Monitoring
			calf	C0230445	Monitoring
			senile dementia	C0011268	Monitoring
			coughing up green sputum	C2126217	Monitoring
			carbohydrate intake	C0489461	Monitoring
			stabbing	C0418391	Monitoring
			Anion gap acidosis	C0860062	Monitoring
			Well healed knee wound	C2142391	Monitoring
			chronic lung infection	C3163798	Monitoring
			mycobacterium infection	C0026918	Monitoring
			desmoid tumor	C0079218	Monitoring
			distal ureteral stone	C2006154	Monitoring
			No known liver disease	C3280432	Monitoring
			PI	C0031939	Monitoring

			stopped drinking soft drinks	C0425321	Monitoring
			fatty liver	C0015695	Monitoring
			insult	C0598698	Monitoring
			ASCVD	C3665365	Monitoring
			ulceration as	C0509790	Monitoring
			home	C0442519	Monitoring
			Chronic hyperkalemia	C0268023	Monitoring
			Chronic spinal	C3697550	Monitoring
			feelings	C1527305	Monitoring
			Breast implants	C0179412	Monitoring
			ideally weight	C0421272	Monitoring
			variceal or GI hemorrhage	C0333106	Monitoring
			therapy given	C3699632	Monitoring
			venous disease	C0235522	Monitoring
			chronic intractable	C0476481	Monitoring
			saddle anesthesia	C0179052	Monitoring
			Chronic pruritus	C0748035	Monitoring
			radiation fibrosis	C2350622	Monitoring
			Not drinking much water	C2077403	Monitoring
			chest weight	C0179897	Monitoring
			significant	C0750502	Monitoring
			chronic vessel	C3275069	Monitoring
			recommend weight	C3853327	Monitoring
			Warm skin	C0235218	Monitoring
			parallel	C0233174	Monitoring
			family weight	C2203029	Monitoring
			dz	C0062886	Monitoring
			Helicobacter pylori infection	C0850666	Monitoring
			ileitis	C0020877	Monitoring
			chronic gallbladder	C1391788	Monitoring
			chronicity organizing pneumonia	C4039254	Monitoring
			chronic radiation proctitis	C0400829	Monitoring
			sarcoid	C0036202	Monitoring
			profound vision loss	C3276857	Monitoring
			hypopituitarism	C0020635	Monitoring
			chronic rotator cuff	C0186620	Monitoring
			kidney cancer	C0740457	Monitoring
			perforated sigmoid colon	C4041049	Monitoring

			decompensation of liver disease	C4075847	Monitoring
			given	C1442162	Monitoring
			Cirrhosis of the liver	C0023890	Monitoring
			Bleeding internal hemorrhoids	C0265036	Monitoring
			under live fluoroscopy	C0846072	Monitoring
			dry rales	C0859999	Monitoring
			chronic diverticulitis	C0859969	Monitoring
			bowel dilatation	C3280831	Monitoring
			swelling or skin	C0281982	Monitoring
			Mucinous cystic pancreatic neoplasm	C1518872	Monitoring
			ureteral strictures	C3887590	Monitoring
			does not	C1299585	Monitoring
			wound continues to bleed	C0241742	Monitoring
			Sessile colon polyp	C0940597	Monitoring
			Histoplasma capsulatum infection	C0153261	Monitoring
			infected chest seroma	C3805093	Monitoring
			jaundice or	C0474426	Monitoring
			lose weight to	C0231247	Monitoring
			Allergic sinusitis	C0748726	Monitoring
			septated renal cyst	C0237039	Monitoring
			ulcers or reflux	C0362009	Monitoring
			orthopedic	C0029355	Monitoring
			infection drainage	C0559642	Monitoring
			Contradictory	C4061957	Monitoring
			cardiac chest	C0190043	Monitoring
			chronic metabolic alkalosis	C0740894	Monitoring
			Diverticulosis in the sigmoid colon	C0012818	Monitoring
			radiation colitis	C0341339	Monitoring
			Staph aureus infection	C0748791	Monitoring
			skin ulcerations	C0037299	Monitoring
			fluid retention	C0268000	Monitoring
			gun shot wound	C0043252	Monitoring
			infected toes	C0555972	Monitoring
			kappa light chain myeloma	C1532715	Monitoring
			Metab	C0025519	Monitoring
			infection or ocular	C0015403	Monitoring
			remnant thyroid	C0266285	Monitoring

			chest	C0817096	Monitoring
			staples in the skin	C1139841	Monitoring
			ataxia	C0004134	Monitoring
			ulceration under	C0585371	Monitoring
			Postinflammatory pulmonary fibrosis	C0175999	Monitoring
			Exophytic right renal cyst	C4229072	Monitoring
			sustain weight loss	C4062926	Monitoring
			Klatskin tumor	C0206702	Monitoring
			Pneumobilia	C1739097	Monitoring
			accidental overdose	C0151821	Monitoring
			suicidal behavior	C1760428	Monitoring
			central retinal	C0858623	Monitoring
			flank	C0230171	Monitoring
			Biliary strictures	C0597984	Monitoring
			infection process	C0596824	Monitoring
			second vascular	C0751414	Monitoring
			sigmoid polyp	C0877441	Monitoring
			bone metastasis	C0153690	Monitoring
			Chronic interstitial cystitis	C0600040	Monitoring
			oligoarticular rheumatoid arthritis	C0157917	Monitoring
			drip	C0452837	Monitoring
			Wound as	C0270118	Monitoring
			planned vascular	C4265958	Monitoring
			trying to drink	C3641816	Monitoring
			perioral numbness	C0221730	Monitoring
			cyanosis	C0010520	Monitoring
			perineural cysts	C0520720	Monitoring
			soft tissue infection	C0149778	Monitoring
			weight as	C0513476	Monitoring
			MAI pulmonary infection	C0026916	Monitoring
			swelling no	C0577599	Monitoring
			ulcers or venous stasis	C0042344	Monitoring
			apneic	C0003578	Monitoring
			burst	C0439818	Monitoring
			Chronic non	C0342087	Monitoring
			Flash pulmonary edema	C1168329	Monitoring
			choking on foods	C0417813	Monitoring
			pelvicaliectasis	C2242514	Monitoring
			talking to friends	C3161682	Monitoring

			but not as	C4036134	Monitoring
			Oral herpes simplex infection	C0341012	Monitoring
			Allergic asthma	C0155877	Monitoring
			burden	C2828008	Monitoring
			chronic diffuse	C0343880	Monitoring
			intracerebral hematoma	C0021870	Monitoring
			tears as	C1385905	Monitoring
			interstitial pneumonia	C0206061	Monitoring
			Panic disorder	C0030319	Monitoring
			radicular lumbar	C1405960	Monitoring
			hip osteoarthritis	C0029410	Monitoring
			HDV	C0011220	Monitoring
			resolution	C0300132	Monitoring
			splenomegaly	C0038002	Monitoring
			20lb	C3364556	Monitoring
			labia majora	C0227760	Monitoring
			ductal epithelium	C1512086	Monitoring
			aortic atherosclerosis	C0155733	Monitoring
			vaginal itching	C0042256	Monitoring
			role in preventing	C0814407	Monitoring
			skin wound not healed	C2039198	Monitoring
			thyroid nodules	C0040137	Monitoring
			papilloma virus infection	C0343641	Monitoring
			lose weight after weight	C2219985	Monitoring
			praised	C0557963	Monitoring
			chronic cervical	C0269062	Monitoring
			Prostate hypertrophy	C1739363	Monitoring
			CVA tenderness	C0235634	Monitoring
			just	C0442728	Monitoring
			Cardiac anomaly	C0018798	Monitoring
			raise red	C0427458	Monitoring
			blastic	C1378512	Monitoring
			calcium levels in the blood	C0729820	Monitoring
			mucosal thickening	C3686502	Monitoring
			dry skin	C0151908	Monitoring
			Mono	C0021345	Monitoring
			radiopaque	C2930749	Monitoring
			stone passage	C2035063	Monitoring
			knee discomfort	C0745538	Monitoring
			as these	C1956388	Monitoring

			Hemangioma of liver	C0238246	Monitoring
			bladder infections	C0600041	Monitoring
			chronic healed	C2368046	Monitoring
			hepatic metastasis	C0494165	Monitoring
			other viral infection	C0343538	Monitoring
			abuse related	C1550478	Monitoring
			diff weight bearing	C0563568	Monitoring
			Urate Nephropathy	C2955673	Monitoring
			Lumbar disc disease	C0221775	Monitoring
			Thrombosis of arteriovenous fistula	C0340909	Monitoring
			gastric variceal bleed	C0267209	Monitoring
			viral upper respiratory infection	C0009443	Monitoring
			skin thickening	C0241165	Monitoring
			dark red blood	C2129029	Monitoring
			opf	C0658189	Monitoring
			abominal	C3391308	Monitoring
			healed scars	C0008767	Monitoring
			airway infection	C4228019	Monitoring
			infection of the larynx	C1400586	Monitoring
			infected site	C0578491	Monitoring
			digital rectal	C1384593	Monitoring
			Osteoarthritis of hands	C0263746	Monitoring
			hematoma in the groin	C0585249	Monitoring
			papilledema or retinal	C0339604	Monitoring
			Crohn disease	C0010346	Monitoring
			Osteomyelitis versus abscess	C0264053	Monitoring
			after vascular	C1392823	Monitoring
			lobar pneumonia or	C1535472	Monitoring
			bleeding skin	C0574741	Monitoring
			fungal lung infection	C0151874	Monitoring
			chronic control	C1171182	Monitoring
			shadowing	C0332554	Monitoring
			sludge	C0750852	Monitoring
			CBD	C0006863	Monitoring
			better	C0332272	Monitoring
			responsive pulmonary process	C0871261	Monitoring
			after weight gain	C2126003	Monitoring

		some vascular disease	C3549710	Monitoring
		Acinetobacter infection	C0001139	Monitoring
		refresh tears	C2962648	Monitoring
		hemorrhoids	C0723400	Monitoring
		chronic hemorrhoids	C0744804	Monitoring
		chronic wound healing	C3879688	Monitoring
		arachnoid cyst	C0078981	Monitoring
		testicular	C0205070	Monitoring
		serous serous drainage	C1822295	Monitoring
		BKA	C1426785	Monitoring
		chronic pericardial effusion	C1850039	Monitoring
		spread of disease	C3697425	Monitoring
		chronic throat	C0155825	Monitoring
		under the tongue	C1636188	Monitoring
		urination after	C1821649	Monitoring
		chronic arm	C0158382	Monitoring
		chronic D Diff infection	C2074980	Monitoring
		scleroderma GI disease	C0011644	Monitoring
		abscess in the stoma	C1142179	Monitoring
		sclerodactyly	C0150988	Monitoring
		symptomatic vascular disease	C2936329	Monitoring
		Pill esophagitis	C0267099	Monitoring
		laceration	C0043246	Monitoring
		tinea cruris	C1384589	Monitoring
		Parastomal hernia	C0341539	Monitoring
		tinea pedis infection	C0744135	Monitoring
		chronic feet	C1276133	Monitoring
		bloating or	C0946092	Monitoring
		RUQ	C0439734	Monitoring
		Chronic eczema	C0263222	Monitoring
		eczema versus fungal infection	C1322253	Monitoring
		hemorrhoid	C0019112	Monitoring
		dystonic movements	C0013421	Monitoring
		Sulfa caused vaginal	C1591349	Monitoring
		went away	C2169390	Monitoring
		in the skin	C0262988	Monitoring
		wants weight	C0421273	Monitoring
		bacteruria	C0262380	Monitoring
		Sigmoid volvulus	C0149863	Monitoring

			infection or stasis	C1407921	Monitoring
			tooth loss	C0080233	Monitoring
			related blood	C1266852	Monitoring
			infection status	C0517627	Monitoring
			solid	C0205208	Monitoring
			stable chest pains	C0742297	Monitoring
			risk of prostate cancer	C1954276	Monitoring
			inflammation warmth	C2087495	Monitoring
			maceration of the skin	C0558143	Monitoring
			Chronic idiopathic constipation	C0267509	Monitoring
			Retroperitoneal lymphadenopathy	C0748390	Monitoring
			refused	C1705116	Monitoring
			NASH induced liver	C3869479	Monitoring
			coughing up yellow sputum	C2126216	Monitoring
			Gastric diverticulum	C0038355	Monitoring
			containing inguinal hernia	C3809861	Monitoring
			chronic Lyme disease	C2063079	Monitoring
			was	C1421478	Monitoring
			recurrent epistaxis	C3809715	Monitoring
			renal findings	C0426703	Monitoring
			chondrocalcinosis	C0553730	Monitoring
			Abdominal aortic atherosclerosis	C0398356	Monitoring
			chronic stomach	C0341172	Monitoring
			stasis edema	C1135352	Monitoring
			stool blood	C1321898	Monitoring
			line complications	C1275741	Monitoring
			flush skin	C0016382	Monitoring
			for liver disease	C2584636	Monitoring
			arterial inflow	C0449613	Monitoring
			about these	C3898970	Monitoring
			Chronic plaque	C0406317	Monitoring
			bloating after dairy food	C2198704	Monitoring
			stone not	C0940852	Monitoring
			stone nephrolithiasis	C1578933	Monitoring
			levels in the blood	C0428249	Monitoring
			chronic scar	C3258142	Monitoring
			Wound cellulitis	C0406832	Monitoring
			Moyamoya	C0026654	Monitoring



			intracranial vascular disease	C0007820	Monitoring
			blood in the stool	C3843741	Monitoring
			a weight	C0745275	Monitoring
			blanching of skin	C0277941	Monitoring
			photosensitivity of the skin	C0349506	Monitoring
			serious	C0205404	Monitoring
			chronic liver injury	C2242584	Monitoring
			do still	C3173472	Monitoring
			liver damage	C0151763	Monitoring
			weight loss management	C0884421	Monitoring
			Unspecified hernia repair	C0198552	Monitoring
			undergone	C3829754	Monitoring
			subcutaneous abscess	C0241266	Monitoring
			Basal cell skin cancer	C0751676	Monitoring
			profound weight loss	C1848641	Monitoring
			compartment syndrome	C0009492	Monitoring
			increased vascular	C0232341	Monitoring
			remaining	C1527428	Monitoring
			or supporting	C0409089	Monitoring
			microlithiasis	C0333027	Monitoring
			hereditary pancreatitis	C0238339	Monitoring
			groin	C0018246	Monitoring
			Cryptococcal infection	C0740272	Monitoring
			Wound care as	C0811367	Monitoring
			tracheoesophageal fistula	C0040588	Monitoring
			Scrotal cellulitis	C0268927	Monitoring
			chronic neutropenia	C0746882	Monitoring
			risk for liver disease	C1281905	Monitoring
			bridging fibrosis	C0334160	Monitoring
			small vessel disease	C2733158	Monitoring
			cauda equina	C0007458	Monitoring
			meningitis or systemic infection	C0729584	Monitoring
			prandial	C0376674	Monitoring
			sternal wound infection	C2729214	Monitoring
			Anticardiolipin antibody syndrome	C1608418	Monitoring
			within the skin	C2234621	Monitoring
			Blackout spell	C0312422	Monitoring
			Antral polyps	C0264239	Monitoring

		ulceration not	C1720140	Monitoring
		spigelian hernia	C0392508	Monitoring
		Infected finger	C0555974	Monitoring
		air	C0001861	Monitoring
		mantle cell lymphoma	C0334634	Monitoring
		vascular abnormalities	C0241657	Monitoring
		chronic sinopulmonary infection	C1846546	Monitoring
		vitiligo	C0042900	Monitoring
		as it would be	C3641844	Monitoring
		chronic pedal edema	C0747319	Monitoring
		OA knee	C0409959	Monitoring
		airway disease	C0699949	Monitoring
		Drainage Of Skin Abscess	C0370367	Monitoring
		cystic liver disease	C0158683	Monitoring
		infection or purulent	C1535040	Monitoring
		indwelling	C0439848	Monitoring
		muscle damage	C0410158	Monitoring
		Submental island flap	C0440834	Monitoring
		infection after	C0393390	Monitoring
		thing	C1551338	Monitoring
		before	C0332152	Monitoring
		clammy skin	C0392162	Monitoring
		chronic epistaxis	C1739141	Monitoring
		vascular event	C0038454	Monitoring
		vomiting or weight loss	C2169616	Monitoring
		Acute respiratory infection	C0339901	Monitoring
		chronic pericarditis	C0265143	Monitoring
		pseudomonas urinary tract infections	C0577710	Monitoring
		cerebral vascular	C0007787	Monitoring
		Amyloid	C0002716	Monitoring
		remnant	C3272697	Monitoring
		adjuvant radiation therapy	C1706721	Monitoring
		fun	C2700434	Monitoring
		Subcapsular renal hematoma	C3897450	Monitoring
		fill	C1708059	Monitoring
		groin wound	C1402898	Monitoring
		choroid plexus papilloma	C0205770	Monitoring
		inflammatory arthritis	C0003864	Monitoring

			Not falls	C0575123	Monitoring
			under fluoroscopic guidance	C2321778	Monitoring
			rectal exam	C0199900	Monitoring
			Moisturize	C0868994	Monitoring
			hypervolemia	C0546817	Monitoring
			unexpected	C4055646	Monitoring
			colonic lipoma	C0940607	Monitoring
			or septic arthritis	C1692886	Monitoring
			gap	C0061928	Monitoring
			gained much weight	C3175834	Monitoring
			breath away	C3154057	Monitoring
			stone retinal	C0154854	Monitoring
			deposition of crystals	C0442844	Monitoring
			chronic angle	C0154947	Monitoring
			Not taking oxycodone as	C3898453	Monitoring
			tubular	C0332208	Monitoring
			compression	C0728907	Monitoring
			dyspnea	C0013404	Monitoring
			salivary gland infection	C0392318	Monitoring
			polyp in the cecum	C0742570	Monitoring
			relief of bladder	C0401615	Monitoring
			found	C0150312	Monitoring
			massive blood loss	C0333279	Monitoring
			chronic shoulder dislocation	C1403308	Monitoring
			Chronic right vision loss	C3275688	Monitoring
			comfort	C1331418	Monitoring
			rectal tumor	C0034885	Monitoring
			staghorn calculus	C0333014	Monitoring
			exertion or chest	C0232288	Monitoring
			vascular dementia	C0011269	Monitoring
			chronic fatigue	C0518656	Monitoring
			nylon in the skin	C0856559	Monitoring
			wound necrosis	C1096115	Monitoring
			fat or weight	C0521974	Monitoring
			lumbosacral radiculopathy	C0154738	Monitoring
			Prostate tenderness	C0240813	Monitoring
			papillary	C0205312	Monitoring
			Discolored skin	C0151907	Monitoring
			instability	C1444783	Monitoring

			urinary stones	C0042018	Monitoring
			Biliary stent	C0183512	Monitoring
			fibroids or endometrial	C1536487	Monitoring
			Thyromegaly	C0018021	Monitoring
			left axillary abscess	C4280975	Monitoring
			Stocking distribution sensory loss	C0277852	Monitoring
			polyarticular	C0240789	Monitoring
			appendicitis	C0003615	Monitoring
			bladder spasm	C0426390	Monitoring
			ventral incisional hernia	C1532116	Monitoring
			always	C1549493	Monitoring
			nocturia	C0028734	Monitoring
			Chronic dysuria	C0743334	Monitoring
			colloid nodule	C0342117	Monitoring
			purpuric skin rash	C0151882	Monitoring
			swelling in stump	C0740962	Monitoring
			bowel within the hernia	C1394743	Monitoring
			ulcerations dry skin	C3494913	Monitoring
			without parastomal hernia	C3264414	Monitoring
			retinal detachment	C0035305	Monitoring
			management of kidney disease	C1515005	Monitoring
			ulcer bleed	C0333291	Monitoring
			Pharyngocutaneous fistula	C0396009	Monitoring
			urination difficulty	C0241705	Monitoring
			as	C0162635	Monitoring
			osler nodes	C0240608	Monitoring
			inflammation in the	C0004690	Monitoring
			raise uric acid	C0857189	Monitoring
			retroperitoneal abscess	C0237962	Monitoring
			graft thrombosis	C0919939	Monitoring
			pelvic infections	C0030790	Monitoring
			vulvar infection	C1400809	Monitoring
			reducible central hernia	C1265757	Monitoring
			coughing or chest	C0876765	Monitoring
			chronic urate nephropathy	C0268769	Monitoring
			swelling tenderness	C2055675	Monitoring
			obstructive coronary artery	C0546319	Monitoring
			blood or blood	C0371802	Monitoring
			infected vascular graft	C0340896	Monitoring

			pacing	C0562458	Monitoring
			chronic infundibular	C0395990	Monitoring
			nocardia infection	C0028242	Monitoring
			chronic effusions	C0031144	Monitoring
			gastric perforation	C0235884	Monitoring
			drainage of retroperitoneal abscess	C0342976	Monitoring
			Peritoneal abscess	C0267756	Monitoring
			Wound related	C2597978	Monitoring
			infected dialysis	C1400574	Monitoring
			stump infection	C0392042	Monitoring
			bowel ischemia	C2004435	Monitoring
			Sickle Cell Trait	C0037054	Monitoring
			focal atelectasis	C0264496	Monitoring
			Splenic abscess	C0272412	Monitoring
			yellow nasal	C2203645	Monitoring
			debris	C0440266	Monitoring
			infection being	C1855452	Monitoring
			inflammation or erosions	C0333357	Monitoring
			any	C1552551	Monitoring
			dermoid cyst	C0011649	Monitoring
			bladdered	C0156265	Monitoring
			swelling rectal	C0848365	Monitoring
			stool as	C0423599	Monitoring
			inflammation without	C0155354	Monitoring
			infection given ascites	C0919899	Monitoring
			Esophageal erosions	C0341117	Monitoring
			Abscess drain	C0333371	Monitoring
			intra abdominal abscess	C0243001	Monitoring
			anastomotic leak	C0919691	Monitoring
			RLQ abd abscess	C0750795	Monitoring
			Neck strain	C0262573	Monitoring
			gal	C1704676	Monitoring
			pseudoaneurysm	C1510412	Monitoring
			infected AV fistula	C0741319	Monitoring
			cervical or inguinal lymphadenopathy	C1850027	Monitoring
			phrenic nerve palsy	C1442879	Monitoring
			Behcet disease	C0004943	Monitoring
			slurred speech	C0234518	Monitoring
			stones calcium	C0797811	Monitoring

		stones within the bladder	C0005683	Monitoring
		wound abscess	C0406105	Monitoring
		infected renal cyst	C0403383	Monitoring
		suspect infection	C0744970	Monitoring
		Mycoplasma infection	C0026936	Monitoring
		palpitation or chest	C0030252	Monitoring
		risky	C0871885	Monitoring
		pelvic lymphadenopathy	C1264124	Monitoring
		Locally advanced prostate cancer	C0677984	Monitoring
		Aortobiiliac	C0918078	Monitoring
		metastatic disease	C2939420	Monitoring
		wound of skin debridement	C0191342	Monitoring
		controlling weight	C0920298	Monitoring
		hemorrhoid bleeding	C0265031	Monitoring
		hepatic ascites	C0401037	Monitoring
		kinking within the catheter	C3665945	Monitoring
		humoral rejection	C1608974	Monitoring
		Nail fungal infection	C0040261	Monitoring
		cellulitis infections	C0743758	Monitoring
		intellectual developmental delay	C1408678	Monitoring
		Risk for hepatocellular carcinoma	C1862761	Monitoring
		penile	C0030851	Monitoring
		in liver disease	C0393841	Monitoring
		bleeding after	C0156406	Monitoring
		interstitium	C2328510	Monitoring
		white	C0043157	Monitoring
		basal ganglia	C0004781	Monitoring
		ankle wound	C1396654	Monitoring
		pulmonary granulomas	C0235557	Monitoring
		constitutional symptoms	C0009812	Monitoring
		Prostate Weight	C2142671	Monitoring
		chronic smoker	C0848477	Monitoring
		or choking	C0546947	Monitoring
		yellow nodule under skin	C2126329	Monitoring
		risk for cardiovascular events	C1273410	Monitoring
		uric acid levels in the blood	C0373739	Monitoring
		Dyspepsia	C0013395	Monitoring

			Unprovoked	C0541789	Monitoring
			low likelihood coronary artery disease	C3463819	Monitoring
			Carotid atherosclerosis	C0577631	Monitoring
			Chronic plantar fasciitis	C1136148	Monitoring
			inguinal hernia repair mesh	C0405615	Monitoring
			chronic malnutrition	C0746367	Monitoring
			Ewing sarcoma	C0553580	Monitoring
			biventricular heart	C0685095	Monitoring
			head fractures	C0744604	Monitoring
			stone attacks	C3267184	Monitoring
			chronic recurrent pancreatitis	C2074913	Monitoring
			subcutaneous nodules	C0151811	Monitoring
			foot infection	C0555973	Monitoring
			Cystoid macular edema	C0024440	Monitoring
			wound discharge	C0406834	Monitoring
			chronic degenerative disk disease	C0685106	Monitoring
			probe	C0182400	Monitoring
			chronic heart	C0175708	Monitoring
			chronic relapsing	C0278787	Monitoring
			defers	C0205421	Monitoring
			soda	C0683086	Monitoring
			VRE urinary tract infection	C2368066	Monitoring
			Cardiac arrhythmias	C0003811	Monitoring
			chronic knee arthralgias	C0741218	Monitoring
			exit site	C0449669	Monitoring
			Focal calcifications	C1265880	Monitoring
			chronic coronary	C1533195	Monitoring
			Chronic leukopenia	C0745710	Monitoring
			Anemia of renal disease	C0472713	Monitoring
			vomiting or	C1822400	Monitoring
			discuss weight	C0419897	Monitoring
			infection or abscess	C1542840	Monitoring
			rectus sheath hematoma	C0238408	Monitoring
			or epidural abscess	C2875032	Monitoring
			chronic mouth	C0281800	Monitoring
			edema or chest	C2732581	Monitoring
			bowel volvulus	C0042961	Monitoring
			requiring skin graft	C0748750	Monitoring

			Acinetobacter Pneumonia	C2063075	Monitoring
			subclavian vein thrombosis	C0749087	Monitoring
			acute pancreatitis	C0001339	Monitoring
			Hemorrhagic renal cyst	C1168323	Monitoring
			Integrity	C0443238	Monitoring
			facial tic	C0338467	Monitoring
			IgE	C0020846	Monitoring
			C infections	C0010414	Monitoring
			continued loss	C2749246	Monitoring
			intertriginous	C0205268	Monitoring
			headaches or	C0239885	Monitoring
			gastric dilatation	C0038353	Monitoring
			swelling not	C2184237	Monitoring
			Metastatic gastric adenocarcinoma	C3160888	Monitoring
			chronic dilatation	C1265762	Monitoring
			outpt	C0551586	Monitoring
			Congenital vascular disease	C1275966	Monitoring
			flaxseed oil	C0023754	Monitoring
			Psuedomonas	C3460694	Monitoring
			breast swelling	C0006152	Monitoring
			pneumocystis pneumonia	C1535939	Monitoring
			chronic pancytopenia	C0747203	Monitoring
			incarcerated inguinal hernia	C0740375	Monitoring
			fungernail fungal infection	C0744036	Monitoring
			compression fracture	C0521169	Monitoring
			spicy food intake	C0559575	Monitoring
			stiffness in any joints	C0162298	Monitoring
			Subaortic stenosis	C0340375	Monitoring
			Unprotected sexual intercourse	C1578545	Monitoring
			bread intake	C0556171	Monitoring
			Sessile polyp	C0522621	Monitoring
			shooting pains	C0278146	Monitoring
			Peripheral edema	C0085649	Monitoring
			pulmonary infiltrates	C0235896	Monitoring
			raise arm	C0231810	Monitoring
			tendon tears	C0850773	Monitoring
			or vascular lesion	C0423793	Monitoring
			atrophic skin	C0151514	Monitoring



			chronic urethritis	C0150001	Monitoring
			Kaposi sarcoma	C0036220	Monitoring
			Hydrops of gallbladder	C0152445	Monitoring
			Nontraumatic subdural hemorrhage	C0265080	Monitoring
			chronic graft	C0301948	Monitoring
			Chronic eustachian tube	C0155430	Monitoring
			crohns colitis	C0156147	Monitoring
			chronic active colitis	C2826588	Monitoring
			misunderstood	C4061919	Monitoring
			arthritic pains	C0857177	Monitoring
			chronic systemic	C1290611	Monitoring
			chronic suprapubic	C0749927	Monitoring
			chronic flank	C2074632	Monitoring
			bladder irritation	C2945586	Monitoring
			healed fractures	C0162542	Monitoring
			hydronephrosis or renal calculus	C1391794	Monitoring

Medication			Other		
C0020740	Ibuprofen	Intervening	joint	C0022417	Intervening
C0002144	allopurinol	Intervening	renal	C0022646	Intervening
C0699241	Nitrostat	Intervening	vitamin	C0042890	Intervening
C0025810	Methylphenidate	Intervening	Hepatitis C	C0019196	Intervening
C0056732	Cyclobenzaprine	Intervening	chest	C0817096	Intervening
C0024002	Lorazepam	Intervening	sildenafil	C0529793	Intervening
C0002658	Amphetamines	Intervening	Neosporin	C0068536	Intervening
C0040207	TICLOPIDINE	Intervening	Torse mide	C0076840	Intervening
C0020404	hydroxyzine	Intervening	Vitamin C	C0003968	Intervening
C0033405	promethazine	Intervening	adjuvant	C1522673	Intervening
C0146011	tizanidine	Intervening	claritin	C0701055	Intervening
C0053799	Bisoprolol	Intervening	macrobid	C0591750	Intervening
C0025242	Memantine	Intervening	blood uric acid	C0373739	Intervening
C0010980	Dapsone	Intervening	attack of gout	C2712871	Intervening
C0730920	Thymoglobulin	Intervening	Ventolin	C0033744	Intervening
C0663448	Viagra	Intervening	groin	C0018246	Intervening
C0008783	Cimetidine	Intervening	vitamin D	C0042866	Intervening
C0053229	Benzonatate	Intervening	Multivit	C0301532	Intervening
C0124498	Kayexalate	Intervening	stores	C1698986	Intervening
C0025376	Meperidine	Intervening	David	C3809991	Intervening

C0699177	Plaquenil	Intervening	blood	C0005767	Intervening
C0033429	Propafenone	Intervening	Flecainide	C0016229	Intervening
C0021246	indomethacin	Intervening	insomnia	C0917801	Intervening
C0015772	Felodipine	Intervening	hep C	C2148557	Intervening
C0033228	Fenofibrate	Intervening	evaluation of chest	C0742295	Intervening
C1170736	zetia	Intervening	Betamethasone	C0005308	Intervening
C1579314	DtaP	Intervening	Accolate	C0526502	Intervening
C0053091	benazepril	Intervening	aleve	C0718343	Intervening
C0720193	Enbrel	Intervening	renal toxins	C0597372	Intervening
C0072973	Ramipril	Intervening	vitamin D levels	C0428586	Intervening
C0012522	diphenhydramine	Intervening	blastomycosis	C0005716	Intervening
C0064636	lamotrigine	Intervening	renal c	C0439042	Intervening
C0069751	oxcarbazepine	Intervening	Hypophosphatemia	C0085682	Intervening
C0033209	probenecid	Intervening	twice	C1948050	Intervening
C0025872	metronidazole	Intervening	Synthroid	C0728762	Intervening
C0526512	Synercid	Intervening	Atarax	C0684229	Intervening
C0279284	Doxil	Intervening	stomach	C0038351	Intervening
C0034259	Pyridium	Intervening	toxins	C0040549	Intervening
C1170407	mucinex	Intervening	insipidus	C0011848	Intervening
C0699770	Proventil	Intervening	heart and kidney	C0155602	Intervening
C1570232	Lyrica	Intervening	vitamin K levels	C0443768	Intervening
C1636686	byetta	Intervening	Hepatitis C liver	C1391577	Intervening
C0162723	zyrtec	Intervening	melatonin	C0025219	Intervening
C0002403	amantadine	Intervening	assays	C1510438	Intervening
C0596004	Hyoscyamine	Intervening	sickle C	C0019034	Intervening
C0087119	Elavil	Intervening	FOSAMPREN AVIR	C1176315	Intervening
C0595425	Zanaflex	Intervening	pian	C0043388	Intervening
C1505021	Cymbalta	Intervening	Pramoxine	C0071810	Intervening
C0030049	oxycodone	Intervening	Psycho	C0871175	Intervening
C0700003	Lopid	Intervening	Gallstones	C0242216	Intervening
C0032143	TPA	Intervening	vitamin B	C0042849	Intervening
C1996201	Actonel	Intervening	intertrigo	C0021807	Intervening
C0071097	pioglitazone	Intervening	APAP	C0000970	Intervening
C0721436	Lotensin	Intervening	divalproex	C0042291	Intervening

C0040610	Tramadol	Intervening	blood levels	C0151539	Intervening
C0004745	Barbiturates	Intervening	danazol	C0010961	Intervening
C2137913	joint corticosteroid	Intervening	lupus	C0024131	Intervening
C0592245	valtrex	Intervening	joint discomfort	C3544124	Intervening
C0593507	advil	Intervening	joint dis	C0022408	Intervening
C0700727	Sudafed	Intervening	repeat	C0205341	Intervening
C0001617	corticosteroid	Intervening	stomach upset	C0235309	Intervening
C1174784	Ranexa	Intervening	Robert	C0331964	Intervening
C1170019	Abilify	Intervening	Hep C RNA	C0973340	Intervening
C0068334	Nabumetone	Intervening	PMR	C0032533	Intervening
C0536495	Moxifloxacin	Intervening	joint pains	C0003862	Intervening
C0728767	Marinol	Intervening	upset	C3887804	Intervening
C0700517	Keflex	Intervening	attack	C0004063	Intervening
C0876139	Protonix	Intervening	aphonia	C0003564	Intervening
C0033148	Primidone	Intervening	hemostat	C0019120	Intervening
C0591237	Casodex	Intervening	joint c	C0408229	Intervening
C0876226	Zyvox	Intervening	LVAD	C0181598	Intervening
C0663241	Linezolid	Intervening	gloves	C0441051	Intervening
C0249529	febuxostat	Intervening	backup	C1552560	Intervening
C0936278	vistaril	Intervening	Tracy	C3391642	Intervening
C0010137	Cortisone	Intervening	sarcoid	C0036202	Intervening
C0687812	allopurinol 100mg	Intervening	treatment	C0741107	Intervening
C0012093	Dicloxacillin	Intervening	propylthiouracil	C0033511	Intervening
C0127096	Maxzide	Intervening			
C0009316	COLISTIN	Intervening			
C0305648	Citrucel	Intervening			
C0216784	Valsartan	Intervening			
C0249458	valACYclovir	Intervening			
C0350186	TNG	Intervening			
C0008294	Chlorthalidone	Intervening			
C1528494	truvada	Intervening			
C0066685	Moexipril	Intervening			
C0592157	Tagamet	Intervening			
C0701009	bumex	Intervening			
C0064238	kaopectate	Intervening			
C0015620	famotidine	Intervening			
C0875968	Avelox	Intervening			

C0701281	Biaxin	Intervening			
C0592168	Tenormin	Intervening			
C0002645	amox	Intervening			
C0700187	macrochantin	Intervening			
C0700016	Mysoline	Intervening			
C0075870	tazobactam	Intervening			
C0051696	amlodipine	Intervening			
C0678162	pulmicort	Intervening			
C0723893	Tricor	Intervening			
C0013881	Librium	Intervening			
C1527845	Vytorin	Intervening			
C0876218	Xopenex	Intervening			
C0024027	lovastatin	Intervening			
C0012125	Dicyclomine	Intervening			
C0069177	NyQuil	Intervening			
C0594040	Nasacort	Intervening			
C0022209	Isoniazid	Intervening			
C0034261	pyridostigmine	Intervening			
C0730987	Exelon	Intervening			
C0282386	levofloxacin	Intervening			
C1110594	Allegra	Intervening			
C0380393	ziprasidone	Intervening			
C0878174	Arimidex	Intervening			
C0075632	SUMATriptan	Intervening			
C0053526	Bethanechol	Intervening			
C0013085	Doxepin	Intervening			
C0700023	bentyl	Intervening			
C0038425	STREPTOMYCIN	Intervening			
C0593342	Requip	Intervening			
C0719197	ceftin	Intervening			
C0016365	fluoxetine	Intervening			
C0591139	Bactrim	Intervening			
C1122245	benicar	Intervening			
C0876060	Keppra	Intervening			
C1330412	Namenda	Intervening			
C0707987	Claritin 10mg	Intervening			
C0027358	Naloxone	Intervening			
C0060282	FeSO4	Intervening			

C1702177	Januvia	Intervening			
C0720403	Feosol	Intervening			
C0700798	indocin	Intervening			
C0007555	cefotetan	Intervening			
C0699932	Senokot	Intervening			
C0017696	Glucan	Intervening			
C0878061	Altace	Intervening			
C0111046	creon	Intervening			
C0022860	labetalol	Intervening			
C0014695	Ergocalciferol	Intervening			
C0040805	Trazodone	Intervening			
C0290795	Adderall	Intervening			
C0031379	Phenazopyridine	Intervening			
C0723743	Tiazac	Intervening			
C0666743	infliximab	Intervening			
C0012091	diclofenac	Intervening			
C1174767	Fosrenol	Intervening			
C0061851	ondansetron	Intervening			
C0876768	Vioxx	Intervening			
C0483244	anusol	Intervening			
C0040165	levothyroxine	Intervening			
C0721044	Imitrex	Intervening			
C0004482	azathioprine	Intervening			
C0718244	Actigall	Intervening			
C0733842	Stelazine	Intervening			
C1170286	Forteo	Intervening			
C0722336	Oscal	Intervening			
C1170079	Avodart	Intervening			
C1174734	Uroxatral	Intervening			
C0700899	benadryl	Intervening			
C0064113	itraconazole	Intervening			
C0722138	asprin	Intervening			
C0699439	Nizoral	Intervening			
C0210355	Arthrotec	Intervening			
C0003289	antidepressants	Intervening			
C0069805	oxybutynin	Intervening			
C0701348	Femara	Intervening			
C0698978	Plaquenil 200mg	Intervening			
C0042553	Versed	Intervening			

C0244821	Ropinirole	Intervening			
C0699547	Azulfidine	Intervening			
C0019139	LMWH	Intervening			
C0253563	eptifibatide	Intervening			
C0011812	Dextroamphetam ine	Intervening			
C1170699	Ultracet	Intervening			
C0723012	remicade	Intervening			
C0016277	Fluconazole	Intervening			
C0939692	DuoNeb	Intervening			
C0028833	Octreotide	Intervening			
C0165921	Entacapone	Intervening			
C0078844	Zonisamide	Intervening			
C0292855	zestoretic	Intervening			
C0720318	evista	Intervening			
C0674427	Sustiva	Intervening			
C0700524	amoxil	Intervening			
C0974285	amlodipine 10mg	Intervening			
C0030863	Pentamidine	Intervening			
C0070895	foscarnet	Intervening			
C1098320	Olmesartan	Intervening			
C1631198	Florastor	Intervening			
C0014563	EPINEPHrine	Intervening			
C0875967	Avandia	Intervening			
C0699065	Thorazine	Intervening			
C0939530	Welchol	Intervening			
C0033798	PSEUDOEPHE DRINE	Intervening			
C0718644	arava	Intervening			
C0965129	Rosuvastatin	Intervening			
C0246689	Repaglinide	Intervening			
C0289313	Rosiglitazone	Intervening			
C0701094	Darvon	Intervening			
C0876064	lantus	Intervening			
C0057144	daptomycin	Intervening			
C0875952	Aciphex	Intervening			
C0700017	Naprosyn	Intervening			
C0073374	Rifaximin	Intervening			
C0009279	colestipol	Intervening			

C0003138	Antacid	Intervening			
C0876173	tamiflu	Intervening			
C0687813	Allopurinol 300mg	Intervening			
C0591292	Corgard	Intervening			
C1101609	viread	Intervening			
C0004599	bacitracin	Intervening			
C0008273	Chlorothiazide	Intervening			
C1314782	Levemir	Intervening			
C0538927	Celecoxib	Intervening			
C0591275	Cogentin	Intervening			
C0728743	Cefzil	Intervening			
C0123931	irinotecan	Intervening			
C0085795	amphotericin	Intervening			
C0069717	oxaliplatin	Intervening			
C0728751	Betapace	Intervening			
C0981097	vitamin C 500mg	Intervening			
C0721298	lamisil	Intervening			
C0690835	Torseamide 10mg	Intervening			
C1698963	Sutent	Intervening			
C0042397	vasopressors	Intervening			
C0070384	Percodan	Intervening			
C0006462	busPIRone	Intervening			
C0678117	Sandostatin	Intervening			
C1602236	ferrex	Intervening			
C0701331	Relafen	Intervening			
C0595301	Avapro	Intervening			
C0939412	Novolog	Intervening			
C0014964	Ethambutol	Intervening			
C0722882	Provigil	Intervening			
C3215523	vitamin D pill	Intervening			
C1418193	OTC	Intervening			
C1145759	atazanavir	Intervening			
C1516119	Sorafenib	Intervening			
C0702216	Soma	Intervening			
C1579761	Lunesta	Intervening			
C0699926	Robaxin	Intervening			
C0732355	Rituxan	Intervening			
C0594492	Nasonex	Intervening			

C0689174	Ibuprofen 600mg	Intervening			
C0718711	Atacand	Intervening			
C0290883	Anastrozole	Intervening			
C1724016	Atripla	Intervening			
C0689206	indomethacin 50mg	Intervening			
C0020336	hydroxychloroquine	Intervening			
C1450020	levothyrox	Intervening			
C0733418	Ticlid	Intervening			
C0037688	Sorbitol	Intervening			
C0700712	Micronase	Intervening			
C0017628	glyBURIDE	Intervening			
C1174890	levitra	Intervening			
C0171023	Olanzapine	Intervening			
C0795227	allopurinol 500mg	Intervening			
C0003360	antihistamine	Intervening			
C0678171	Pentasa	Intervening			
C0036557	sedatives	Intervening			
C0026078	Midodrine	Intervening			
C0591055	Aldomet	Intervening			
C0688870	flecainide 100mg	Intervening			
C1577528	Nifedical	Intervening			
C0699595	Septra	Intervening			
C1260298	tigecycline	Intervening			
C0591224	Capoten	Intervening			
C0701890	Duricef	Intervening			
C0762662	Rofecoxib	Intervening			
C0001367	Acyclovir	Intervening			
C0699279	imuran	Intervening			
C0007713	Cepacol	Intervening			
C0936148	Posaconazole	Intervening			



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## VITA

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#### EDUCATION

Northern Kentucky University, Highland Heights, KY

**M.S. in Business Informatics** 2016

Graduate Certificate in Health Informatics

Capstone: *Merging Companies-Merging Information Systems: A Case Study*

University of Kentucky

**B.A. in Linguistics** 2011

Minor: Spanish

Senior Capstone: *Moving Toward a Collective Identity: The Role of Soviet Censuses in "Russification"*

Bluegrass Community & Technical College

**A.A.S. with Distinction in Business Technology** 2007

Specialization: Real Estate Management

#### PUBLICATIONS

Lenert, A., Russell, M., Segerstrom, S., & Kim, S. (2020). Accuracy of U.S. administrative claims codes for the diagnosis of autoinflammatory syndromes. *Journal of Clinical Rheumatology*. doi: 10.1097/RHU.0000000000001319. [Epub ahead of print]

#### AWARDS and HONORS

ISPE All Access Scholarship 2020

Research Assistantship, University of Kentucky 2017-2020

Teaching Assistantship, University of Kentucky 2016-2020

Dean's List, University of Kentucky 2009

Dean's List, Bluegrass Community & Technical College 2005-2007

#### PRESENTATIONS

"Predicting Gout Flares Using Administrative and Rheumatology Reports". International Conference on Pharmacoepidemiology & Therapeutic Risk Management, September 16-17, 2020.

- “Phenotyping Gout Patient Information Requirements Using Value Chain Analysis.”  
Center for Clinical & Translation Sciences Spring Conference, April 21, 2020.  
(Conference canceled)
- “Information Technology and the U.S. Healthcare System: An Economic Perspective.”  
Center for Clinical & Translation Sciences, April 15, 2019.
- “Assessing Rheumatology Patient Education Materials: Medical Complexity and  
Readability Perspectives”. Center for Clinical & Translational Science, April 15,  
2019.

#### **TEACHING EXPERIENCE**

**University of Kentucky** 2016-2020  
Teaching Assistant  
**College of Communication & Information**

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**University of Kentucky**  
Research Assistant 2017-  
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**Institute for Biomedical Informatics**

#### **NONACADEMIC WORK**

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Webmaster, October 2013-December 2015

*Mitchell Enterprises*, Lawrenceburg, KY, Executive Assistant, December 2001-April  
2006