



A CRITICAL REVIEW OF ELECTRONIC MEDICAL RECORD SEARCH TECHNOLOGIES IN HEALTHCARE SETTINGS

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Abstract:

Healthcare institutions produce enormous volumes of data at an accelerating rate, creating both opportunities and challenges. The rapid expansion of unstructured clinical text has significantly increased the size of electronic health record (EHR) repositories. Patient medical records are extensively available and typically include essential clinical details such as vital signs, medication histories, demographic data, diagnostic examinations, treatment plans, progress notes, risk assessments, immunization records, allergy information, imaging reports, and laboratory results. These data are collected from multiple sources, including administrative systems for billing and care coordination, patient-reported surveys, and clinical documentation. All such information is stored within electronic medical databases.

Healthcare professionals use various terms—such as electronic health records, computerized patient records, and digital medical records—to refer to these systems. Despite their importance, retrieving relevant medical information from EHRs remains a complex process that demands high accuracy and efficiency. Furthermore, access to certain patient data is restricted due to privacy and confidentiality requirements, necessitating appropriate authorization. This study reviews existing research on EHR data retrieval, examining different search engines, information retrieval approaches, and techniques used to access healthcare data stored in medical databases. In addition, it highlights the key challenges and limitations associated with EHR search and retrieval processes.

Keywords: electronic health record

1. INTRODUCTION

A search engine is a web-based application designed to help users find information across the internet. People commonly rely on search engines for activities such as purchasing products, performing academic or professional research, and accessing entertainment content. Research has categorized search engines into three primary types: informational, navigational, and transactional. To better interpret user intent, leading search engines analyze search queries and evaluate users' objectives, enabling them to deliver the most relevant and appropriate results based on the users' needs.

2. RELATED WORK

Extensive research has focused on enabling patients and healthcare professionals to access accurate and trustworthy health information from medical databases. Limitations associated with traditional paper-based data management systems prompted the development of standardized approaches for handling drug-related data in clinical trials. With the advancement of digital healthcare, a wide range of electronic tools has been introduced to support the efficient collection, storage, and analysis of medication-related information.

Artificial intelligence (AI) has played a significant role in improving information retrieval, particularly through natural language processing (NLP), which allows computer systems to interpret human language. In addition, syntactic matching techniques analyze user-input text to identify relevant keywords and ensure accurate phrase-based searching. Semantic matching methods further enhance search performance by interpreting the intent of the user's query and aligning search results with the underlying meaning rather than relying solely on exact word matches.

3. METHODOLOGY

NATURAL LANGUAGE PROCESSING (NLP):

This study describes the application of natural language processing techniques to analyze notational language entered by ophthalmologists during patient consultations, with the goal of extracting structured information related to glaucoma diagnosis and disease progression [1]. Using NLP methods, unstructured query inputs can be processed, filtered, and organized into meaningful analytical categories. These techniques enable deeper insight into users' levels of understanding and the complexity of the health information they seek online, allowing for more accurate interpretation and analysis [2]. For instance, health information platforms can employ natural language-based search engines to assist users—particularly those with limited medical knowledge or language proficiency—in efficiently accessing relevant information. Ongoing research aims to further investigate future user query patterns and requirements.

Previous studies have shown that electronic health records (EHRs) support clinicians in improving patient outcomes, accelerating treatment processes, and minimizing medication-related errors. Several studies reviewed in this paper demonstrate how NLP techniques can be applied to EHR data to help clinicians more effectively monitor post-operative events and patient progress [3].

The manual review of large volumes of clinical notes presents a major challenge for researchers and healthcare professionals. NLP addresses this issue by enabling the automated interpretation of EHR data through contextual analysis of medical terminology and clinical phrases, thereby allowing high-speed computational analysis. NLP applications range from automated quality assessment to comparative effectiveness research. Notably, techniques such as Part-of-Speech (POS) tagging have been shown to enhance information retrieval (IR) models by improving identification accuracy in biomedical domains. Further experiments are underway to assess the effectiveness of machine learning approaches combined with POS-based categorization for IR tasks.

Although POS tagging has demonstrated substantial improvements in biological information retrieval applications, the reviewed studies acknowledge certain limitations, including reliance on a single POS tagger. Future research is recommended to compare multiple NLP techniques across diverse clinical scenarios. Additionally, the generalizability of the findings remains uncertain, as the data used were obtained from a single healthcare institution.

SYNTACTIC SEARCH:

Medical or clinical data consists of health-related information generated during routine patient care or within clinical research programs. Patient and disease registries play a crucial role in collecting and monitoring clinical data for defined patient populations. An electronic health record (EHR) represents a standardized digital compilation of a patient's medical history. The practice of repurposing previously collected healthcare data for objectives beyond its initial use is referred to as data reuse. EMERSE is a flexible and efficient search system designed to retrieve free-text documents from electronic medical records (EMRs). This section also reviews related studies that explore similar approaches to clinical data retrieval.

SEARCHENGINES:

At the University of Michigan Health System, more than 90% of patient identification within registries is performed through manual screening. This labor-intensive and time-consuming process can be significantly improved through automation using computer-based systems, which offer greater efficiency and accuracy [6]. To support automated identification of cancer-related information in unstructured clinical text, a system was developed that incorporates more than 800 SNOMED codes along with over 2,500 associated terms and phrases. Known as the Case Finding Engine (CaFE), this tool scans free-text medical documents to identify relevant terms and flags them for subsequent manual review. Registry personnel have reported high levels of satisfaction with CaFE's accuracy and efficiency, and ongoing refinements have been made in response to user feedback. Additional research focused on specific disease domains could further enhance the system's performance and usability.

The article also outlines the use of the Star Tracker medical database, which was employed to design a search functionality that integrates demographic, clinical, and diagnostic information to assist in patient classification and population management [7]. While the development of an enterprise-level data warehouse is often considered the most comprehensive solution, it requires substantial time and resources. In contrast, alternative approaches that are compatible with legacy systems can deliver considerable value without requiring extensive system integration. The Star Tracker search engine enables large-scale population searches using existing infrastructure and database technologies.

Advances in information technology aim to support the rapid extraction and analysis of large volumes of unstructured clinical text, a capability that is increasingly vital in healthcare environments. Timely access to relevant information is critical for effective patient care, and future healthcare systems will depend on more advanced methods for retrieving sensitive data embedded within extensive patient records. One promising enhancement to current keyword-based search methods in Personal Health Records (PHRs) involves applying information retrieval (IR) techniques to extract meaningful terms from clinical narratives, rather than relying solely on predefined item titles.

DATA WAREHOUSING AND REUSE OF CLINICAL DATA

A comprehensive framework has been developed to support the creation of Personal Health Records (PHRs) and to evaluate the usefulness of their features. Although this framework was originally designed for PHRs, it has also been adapted to assess other healthcare information systems. The framework and its associated methods provide a detailed approach for measuring the value of PHRs. In addition, the author examines how prescription data are coded in multi-site research environments and identifies medication data classification, reporting, and analysis as important areas for further research. Future studies should focus on evaluating the feasibility, accuracy, consistency, and scalability of different classification techniques, as well as improving how drug classification is integrated into data management and analytical processes.

To support effective data reuse, it is essential to develop methods that allow electronic health record (EHR) data to be standardized, aggregated, and queried efficiently. The authors propose a data warehouse (DW) approach based on EHRs that facilitates data reuse, interoperability, and rapid data aggregation across multiple healthcare settings. This approach enables EHR data to be modeled, transformed, integrated, standardized, and stored for future use by leveraging appropriate technologies.

Acknowledging the critical role of clinical data modeling in both data reuse and healthcare improvement, the proposed method aims to simplify and speed up patient information retrieval, which is often a time-consuming and labor-intensive task. The authors also introduce a new data warehouse design for medical information systems that ensures clinical data remain current and makes it easier for data analysts and clinical managers to access and analyze

information. However, a major limitation of this approach is the increased maintenance effort required due to the large volume of stored data.

USING EMERSE

A study investigating aneurysms in patients who have undergone abdominal organ transplants aimed to determine how common these aneurysms are and to identify their typical clinical presentations. The research specifically focused on detecting arterial aneurysms in individuals who had received liver or kidney transplants more than eleven years earlier. The analysis was limited to electronic medical records available within the institution, as some patient information existed only in paper form, in non-digital systems, or had been transferred to external healthcare facilities.

In addition, the study reported that regular use of antacids may offer significant benefits for patients with Head and Neck Squamous Cell Carcinoma (HNSCC), suggesting a potential role for low-toxicity treatment and preventive approaches. By using the EMERSE application to review patient charts, researchers were able to identify medications taken before and after therapy, along with relevant clinical, demographic, and histological characteristics. The system enabled the creation of customized and complex search queries to efficiently extract the required data.

EMERSE, developed at the University of Michigan, is a full-text search engine designed to retrieve information from electronic health records. Evaluation studies have demonstrated that EMERSE improves both sensitivity and specificity, making chart review processes more accurate and efficient. However, incorporating information retrieval capabilities into EHR systems remains challenging, as it requires addressing the diverse needs and objectives of users who access archived clinical data.

OTHERS

The CER Hub is a system created to enable large-scale, systematic extraction, integration, and analysis of clinical data from multiple healthcare institutions. It addresses key challenges in comparative effectiveness research by allowing clinicians to rapidly identify patient populations similar to their own and derive meaningful clinical insights. The platform supports physician-guided cohort selection and stratified survival analysis, enabling findings such as the prevalence of BRAF mutations and survival outcomes for patients with BRAF-mutated tumors treated with BRAF inhibitors. However, additional research is required to determine the most effective ways to integrate this functionality into electronic medical record (EMR) workflows to support real-time clinical decision-making.

OPEN-SOURCE SEARCH ENGINES

Although general web search engines provide vast amounts of information, they do not automatically link data to specific biological or clinical applications. CDAPubMed is an open-source, platform-independent tool that allows literature searches based on keywords extracted from electronic health records. Its design enables seamless integration with traditional PubMed interfaces, making it function like an extension of a web browser. The modular architecture of CDAPubMed encourages contributions from the biomedical informatics community and allows for future system expansion. It supports multiple operating systems and is freely available for non-commercial use.

At the Léon Bérard Cancer Treatment Centre in France, a full-text search engine has been adopted as part of routine clinical practice. This system employs multi-level modeling within openEHR-based architectures, substantially reducing the time needed to process data for the GastrOS application. The use of openEHR model-driven development enhances software maintainability. However, the study identified limitations, including reliance on a single developer for software updates, which led to a lack of coordination and awareness of parallel changes. Additionally, prior to the

study, the developer responsible for GastrOS and clinical rule implementation lacked sufficient domain expertise and experience with openEHR deployments.

CLINICAL CORRELATION

The authors' research primarily emphasizes the integration of unstructured data—such as clinical notes, discharge summaries, diagnostic reports, and research databases—with structured medical data, including vital signs, medications, and laboratory test results. Their future work aims to unify these diverse data types within a temporal framework, enabling more comprehensive and longitudinal analyses of patient information. As an example, the authors combined structured and free-text data from electronic health records (EHRs) to develop an algorithm for diagnosing exfoliation syndrome (XFS). This algorithm generated a probability score indicating the likelihood of XFS in individual patients and demonstrated higher sensitivity and specificity than traditional diagnostic approaches. They also note that the algorithm's accuracy is expected to improve as larger volumes of EHR data become available.

EMERSE

EMERSE (Electronic Medical Record Search Engine) is an effective tool for retrieving free-text information from electronic medical records. It was developed to support research activities and data abstraction by enabling efficient searches of clinical documentation. Designed to be user-friendly, EMERSE allows users with minimal technical expertise to construct advanced search queries. It is particularly valuable for identifying patient populations affected by specific issues, such as medication recalls. Beyond research applications, EMERSE can also support direct patient care by simplifying the review of a patient's medical history and highlighting important clinical events, which is especially useful in fast-paced clinical environments.

OTHERS

The centralization of healthcare information systems presents challenges, as rigid system structures often limit adaptability to evolving clinical and research needs. Real-world applications of medical informatics reveal that existing systems still have significant untapped potential for improved data collection and secondary data use, including research, quality monitoring, and public health surveillance. In clinical trials, data quality remains a major concern; however, the growing availability of electronically accessible patient data has improved patient recruitment and trial documentation processes.

The study also demonstrated that intensive care unit (ICU) data could be automatically repurposed for research, substantially reducing the time required for manual data collection. Nevertheless, this approach introduces potential data quality issues, such as typographical errors and inconsistencies. To address these challenges, the authors recommend enabling bulk data entry through web-based platforms in future multi-center research systems.

Regarding clinical narrative text, a flexible framework has been proposed to represent both the textual content and temporal relationships within EHR data. This framework aims to enhance future research by better integrating time-based structures with narrative information and by exploring more advanced methods for measuring similarities across data sources.

Although the use of EHR data in research offers significant benefits, it also presents challenges related to data integration, privacy, and usability. Ongoing discussions continue regarding the most effective ways to incorporate research data collection into routine clinical workflows. Privacy constraints often limit dataset size, but advances in medical visual information retrieval are helping to overcome some of these challenges. Because visual data is difficult

to interpret without adequate clinical context, integrating multimodal data sources is increasingly important, with data fusion techniques playing a key role in future research. Despite these advancements, limited clinical adoption remains a persistent challenge.

SEMANTIC SEARCH IN CLINICAL DATA

The Bio Patent Miner is a tool designed to identify and analyze biomedical patents by examining physiologically relevant terminology and establishing semantic links between related terms. To enhance its effectiveness, the tool aims to expand its pattern-recognition capabilities by incorporating additional templates that detect relationships within phrases. In parallel, the study highlights the emergence of on-demand mobile healthcare services, which use secure wireless technologies to connect patients, healthcare providers, and hospital information systems, enabling the delivery of medical care directly to patients' homes.

The research also examines various semantic similarity measures commonly used in web-based applications. However, determining the degree of semantic relatedness between two statements remains a complex challenge. Traditional ontology-based approaches typically assume that semantically related concepts reside within the same branch of a conceptual hierarchy. This assumption becomes increasingly difficult to maintain due to the immense size, diversity, and continuous growth of online information.

SEMANTIC ANALYSIS

Over the past twenty years, the volume of digital information across multiple domains, including healthcare, has expanded rapidly. This growth has supported faster and more accurate diagnoses by enabling efficient extraction of critical information from medical records. The authors focus on enhancing information extraction through semantic analysis by incorporating advanced capabilities such as spelling correction, detection of negated expressions, and evaluation of clinical assertions involving uncertainty or speculation.

Their objective is to develop a multilingual system capable of operating across different languages, provided that appropriate dictionary and knowledge-base resources are available. To further improve retrieval performance, the authors propose a new medical information retrieval system that employs a two-stage query expansion strategy.

MEDICAL RECORDS SEARCH ENGINE

Conventional search engines often struggle to interpret user intent, which is particularly problematic in healthcare-related searches. To address this limitation, the authors introduce a specialized medical search engine that personalizes search results based on an individual patient's medical history, thereby increasing the relevance of retrieved information. The system was evaluated with 18 volunteers to assess how information retrieval techniques could enhance the search process by extracting meaningful terms directly from patient records.

The findings indicate that general-purpose search engines, such as Google and Yahoo, frequently return results that lack clinical relevance. In contrast, a targeted question-and-answer-based search engine delivers more precise and clinically useful information. The study also demonstrates that semantic search methods can support improved clinical decision-making by helping physicians efficiently navigate large datasets and reducing information overload. The authors suggest that further evaluation with larger participant groups is necessary to fully assess the system's effectiveness.

OTHERS

The authors plan to extend their model by integrating additional health information systems. In a follow-up study involving 10 participants, two information retrieval scenarios were tested. The first provided precise, patient-specific data, while the second incorporated a semantic search tool capable of identifying relevant terms within a patient's electronic health record (EHR). Post-study interviews were conducted to understand participants' experiences with EHR systems and to evaluate how semantic search tools can reduce cognitive workload in clinical decision-making.

The authors also propose that displaying a list of searchable terms may enhance user trust and perceived system accuracy. Monitoring how these perceptions evolve over time could provide valuable insights in future research. Additionally, they introduce a system that analyzes free-text clinical reports to identify patterns and outcomes, links these findings to external knowledge sources, and personalizes patient records accordingly.

A key limitation of current search engines is their inability to explain why specific results are relevant to a given query, which can confuse users and hinder effective query refinement. To overcome this issue, the authors recommend an information retrieval approach that incorporates domain-specific ontologies and offers graphical explanations of search results, thereby improving transparency, usability, and user understanding.

COLLABORATIVE SEARCH

The authors investigate a collaborative search approach that combines the Unified Medical Language System (UMLS) with electronic health data. UMLS is a comprehensive collection of biomedical vocabularies and standards that enables interoperability between computer systems and electronic health records (EHRs). In their study, a human-computer collaborative method was used to identify common data elements (CDEs) within clinical trial eligibility criteria for conditions such as cardiovascular disease and breast cancer. This approach demonstrates how eligibility data from multiple clinical trials can be harmonized and reused to support more efficient and integrated research.

CRITERIA CODES AND SEMANTIC ANNOTATION

The study presents a technique for extracting and analyzing UMLS concepts from free-text eligibility criteria in clinical trials. A semantic annotation tool was employed to identify relevant medical terms, though it occasionally produced false positives, such as unrelated words like "arrange" or "repair." By incorporating domain-specific knowledge through tools such as MetaMap and UMLS, the approach enhances retrieval speed and accuracy by expanding the conceptual search space. This work highlights the importance of leveraging medical ontologies and domain knowledge to improve the performance of clinical information retrieval systems.

ELECTRONIC HEALTH RECORD (EHR) SEARCH SYSTEMS

The authors identify a key limitation of existing EHR search systems: many users lack expertise in search technologies or deep medical domain knowledge. To address this challenge, they developed a collaborative search tool that supports teamwork in documenting, refining, and sharing search strategies. By encouraging social information-foraging behaviors, the system improves both the accuracy and efficiency of healthcare information retrieval. The authors also explore the integration of temporal information, such as timestamps, to enhance search relevance by aligning query results with time-based patterns in EHR data. Future research will focus on combining temporal analysis with medical ontologies to further improve EHR search capabilities.

QUERY-BASED SEARCH AND LOG ANALYSIS

The research also examines query-based search methods and the analysis of query logs to better understand user information-seeking behavior. Query log analysis can reveal usage trends, system effectiveness, and common search patterns. However, it often lacks contextual information about users' backgrounds and prior knowledge. To overcome this limitation, the authors suggest supplementing log analysis with surveys and observational studies. They also propose improving retrieval performance by offering intelligent query suggestions based on UMLS, supporting more effective access to electronic medical record (EMR) data.

QUERY FORMULATION

This work emphasizes the importance of user control and flexibility in querying EHR systems. By allowing biomedical researchers to conduct reference interviews and define search criteria around predefined topics, the authors aim to empower users in shaping their search strategies. However, they acknowledge that relying solely on preselected topics may exclude relevant information. As a result, they recommend a more comprehensive and adaptable approach to query formulation. The study also discusses ongoing challenges in query mediation and communication within clinical research, highlighting the need for further investigation in this area.

DUPLICATE DOCUMENT DETECTION

The study addresses the problem of duplicate documents in clinical and medical research systems, where multiple documents may contain identical or highly similar content. Duplicate document detection is achieved through document transformation techniques that convert files into formats suitable for analytical comparison. The proposed framework establishes a foundation for identifying and removing duplicate records, thereby improving the quality, reliability, and efficiency of information retrieval.

DUPLICATE DOCUMENT DETECTION AND FILE TRANSFORMATION

Building on this concept, the research emphasizes the importance of detecting and eliminating duplicate and near-duplicate documents in EHR systems to enhance search performance. Duplicate files—whether identical in content, size, or name—can negatively affect search relevance and efficiency. To mitigate this, the authors introduce algorithms that identify document similarities during the indexing process, improving indexing speed and reducing system runtime.

The study explores advanced techniques for near-duplicate detection, including sentence-level comparison, fingerprinting, and shingling methods. These approaches are useful for identifying plagiarism, related citations, and redundant clinical documents. Overall, the framework supports efficient duplicate detection in large datasets and improves automated, content-based file renaming, contributing to more accurate and streamlined clinical information retrieval.

CHARACTER SHAPE CODING (CSC) AND DETECTION METHODOLOGIES

The study presents the Character Shape Coding (CSC) technique, which maps character images based on their shape and position to support duplicate document detection. By concentrating exclusively on textual elements, this method efficiently filters out non-textual content. When tested on datasets containing up to 100,000 records, CSC proved to be both cost-effective and reliable. The research also evaluated several duplicate detection models, including full-content, partial-layout, full-layout, and document-content duplication approaches. These models demonstrated strong robustness in identifying duplicates and achieved higher accuracy than traditional Optical Character Recognition

(OCR)–based techniques. Additionally, fingerprinting methods and signature stability analysis were applied to detect identical or highly similar documents, with experiments conducted on collections as large as 50 million documents.

FINGERPRINTING AND SIGNATURE STABILITY

The research illustrates how digital fingerprints and document signatures can be effectively used to identify duplicate records in large-scale datasets ranging from 30 MB to 2 GB. When compared to alternative techniques such as syntactic filtering and shingling, fingerprinting delivered comparable or superior accuracy while requiring significantly less processing time. The study also assessed duplicate detection performance in document image repositories, including scenarios involving false duplicates. These findings established a clear empirical relationship between duplication models, similarity measures, and overall detection effectiveness.

TRIE-TREE STRUCTURE AND SPAM DETECTION

A novel duplicate detection method using a trie-tree structure was introduced, in which 64-bit document fingerprints are stored for efficient comparison. This approach demonstrated improved accuracy in identifying duplicate content and was successfully applied to spam email detection, highlighting its versatility beyond document management. Furthermore, the study proposed a content-based file management strategy for automatic file renaming, which incorporates document content analysis, semantic validation of filenames, and file categorization.

EHR SEARCH CHALLENGES AND SOLUTIONS

The study also addresses the complexity of searching electronic health records (EHRs), which contain a wide range of patient data, including diagnoses, laboratory results, treatments, and follow-up information. Searching EHRs is challenging due to the presence of ambiguous medical terminology, spelling errors, abbreviations, acronyms, and synonymous expressions. Clinicians often use varying terms to describe the same condition, and inconsistencies in punctuation and terminology further complicate information retrieval. To address these issues, advanced free-text search engines such as EMERSE are required. EMERSE is designed to support researchers and clinicians by enabling efficient retrieval of relevant EHR information while accounting for contextual meaning, synonym handling, and privacy constraints. However, limitations related to data security and patient confidentiality remain significant concerns.

KEY CHALLENGES AND FUTURE DIRECTIONS

The discussion highlights several critical considerations for improving EHR information retrieval:

1. **Future Data Integration:** Since not all clinical data can be effectively visualized, future EHR search systems must incorporate multimodal data integration to enhance retrieval performance.
2. **Underutilization of Clinical Data:** Clinical information is frequently underexploited, limiting its potential value. Strengthened security measures will be essential to ensure safe access to sensitive patient data.
3. **Data Standardization and Organization:** Natural language processing (NLP) techniques will play a key role in structuring and standardizing unstructured clinical notes, making them more accessible for research and clinical use.
4. **Efficient and Scalable Solutions:** Information retrieval systems must be adaptable and scalable to handle large volumes of disorganized and complex medical text.
5. **Accurate Patient Information:** Reliable and comprehensive patient data are essential for meaningful analysis and informed clinical decision-making.

4. CONCLUSION

The literature review examines multiple approaches to retrieving information from electronic health records, outlining both their strengths and limitations. As the volume of clinical data continues to grow, efficiently extracting relevant information in response to user queries becomes increasingly difficult. To overcome these challenges, ongoing advancements in EHR search technologies are necessary. However, the review also emphasizes a lack of in-depth understanding of user information needs and cautions against the potential risks associated with integrating advanced information retrieval features into EHR systems, particularly with respect to privacy, security, and usability.

References

- [1] Ethun, Cecilia G., et al. "Frailty and cancer: implications for oncology surgery, medical oncology, and radiation oncology." *CA: a cancer journal for clinicians* 67.5 (2017): 362-377
- [2] Calabresi, Paul, Philip S. Schein, and Saul A. Rosenberg. "Medical oncology: basic principles and clinical management of cancer." (1985).
- [3] Schrag, Deborah, and Morgan Hanger. "Medical oncologists' views on communicating with patients about chemotherapy costs: a pilot survey." *Journal of Clinical Oncology* 25.2 (2007): 233-237
- [4] McDermott, Ultan, and Jeff Settleman. "Personalized cancer therapy with selective kinase inhibitors: an emerging paradigm in medical oncology." *Journal of Clinical Oncology* 27.33 (2009): 5650-5659.
- [5] Muscaritoli, Maurizio, et al. "Prevalence of malnutrition in patients at first medical oncology visit: the PreMiO study." *Oncotarget* 8.45 (2017): 79884.
- [6] Tong, Ho, Elisabeth Isenring, and Patsy Yates. "The prevalence of nutrition impact symptoms and their relationship to quality of life and clinical outcomes in medical oncology patients." *Supportive care in Cancer* 17 (2009): 83-90.
- [7] Newell, Girgis, and Ackland. "The physical and psycho-social experiences of patients attending an outpatient medical oncology department: a cross-sectional study." *European journal of cancer care* 8.2 (1999): 73-82.
- [8] Fadul, Nada, et al. "Supportive versus palliative care: What's in a name? A survey of medical oncologists and midlevel providers at a comprehensive cancer center." *Cancer* 115.9 (2009): 2013-2021.