MedlinePlus

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Synonyms

[MedlinePlus](#); [MEDLINEplus](#)

Definition

MedlinePlus (medlineplus.gov) is a website that provides free, reliable, consumer-oriented health information for the general public, such as patients and their families and friends (Schnall and Fowler [2013](#); Amith et al. [2017](#); U.S. National Library of Medicine [2018a](#)). It is produced and maintained by the US National Library of Medicine (NLM), the world's largest medical library.

Overview

With over one million daily visits, MedlinePlus provides the authoritative, relevant health information that is useful for consumers to make informed health decisions and self-care

management (Lacroix and Mehnert [2002](#); Amith et al. [2017](#)). The information is provided in easy-to-understand language, covering a broad range of health topics such as diseases, disorders, conditions, wellness issues, prescription drugs, over-the-counter medicines, herbs, and supplements (Burgess et al. [2012](#); U.S. National Library of Medicine [2018a](#)). The presentation format is diverse. It features an illustrated medical encyclopedia, health videos, surgery videos, interactive tutorials, health games, health check tools, and the NIH MedlinePlus magazine with the latest breakthroughs from NIH-supported research (Schnall and Fowler [2013](#); U.S. National Library of Medicine [2019a](#)). MedlinePlus links to clinical trials for drug and treatment studies, the websites of health organizations and directories, and health information in languages other than English.

Key Research Findings

Development History

As part of the US National Institutes of Health (NIH), NLM plays a pivotal role in translating biomedical research into practice. As the world's largest biomedical library, NLM provides health information services to users worldwide since the early 1960s (Lacroix and Mehnert [2002](#)). It creates and hosts major resources, tools, and services for literature, data, standards, and sending more than 100 terabytes of data to nearly five million users and receiving more than ten terabytes of data

from more than 3,000 users every workday (U.S. National Library of Medicine 2018b). In 1964, Medical Literature Analysis and Retrieval System (MEDLARS), an operational electronic storage and retrieval system, was built by NLM to store the bibliographic information of academic biomedical references in electronic formats (Rogers 1964). An online version of MEDLARS, named MEDLINE (i.e., the abbreviation of MEDlars onLINE), was launched in 1971. In 1997, NLM began to provide it to the general public freely (Lindberg 2000). In a short 1-year timeframe, the annual MEDLINE searches increased from 7 million to 120 million, with one-third of these searches being conducted by the general public (Schloman 2006). This statistic number indicates the need of the general public to have immediate access to current, reliable medical and health information; this caught the attention of the NLM (Lacroix and Mehnert 2002).

With the mission of helping the general public to find reliable information on the Web to answer their health questions, NLM launched MedlinePlus in 1998 (Miller et al. 2000). The original name MEDLINEplus symbolizes the link to MEDLINE, whereas the added “plus” indicates the additional features, such as an illustrated medical encyclopedia and interactive tutorials on health (U.S. National Library of Medicine 2019b). In response to its popularity, a new capitalization format, MedlinePlus, was introduced in 2004 to replace the original name MEDLINEplus (U.S. National Library of Medicine 2019c).

MedlinePlus Content and Features

The content of MedlinePlus covers three main areas: Health Topics, Drugs and Supplements, and Video and Tools. In addition, MedlinePlus has many features.

Health Topics

Health topics are the core content of MedlinePlus. Each health topic includes the basic information about the disease or condition (e.g., symptoms), treatments and therapies, images and health check tools, patient handouts, links to statistics and research, clinical trials, and journal articles with

references and abstracts from MEDLINE, the relevant terms in the medical encyclopedia, and the other related health topics. The following example for health topic “Dementia” (U.S. National Library of Medicine 2019d) shows typical coverage given to a health topic in MedlinePlus:

- **Summary** (of dementia disease)
- **Start here** (brief introduction information to dementia)
- **Symptoms** (such as frontotemporal disorders: common symptoms)
- **Diagnosis and tests** (such as dementia: diagnosis and tests)
- **Prevention and risk factors** (such as brain training for seniors)
- **Treatment and therapies** (such as medications for memory loss)
- **Living with** (dementia)
- **Related issues** (such as caring for a person with frontotemporal disorder)
- **Specifics** (such as types of dementia)
- **Genetics** (such as Genetics Home Reference: dementia with Lewy bodies)
- **Statistics and research** (such as caregiving for Alzheimer’s disease or other dementia)
- **Clinical trials** (ClinicalTrials.gov: dementia)
- **Journal articles** (articles from MEDLINE, such as “Psychiatric Manifestation in Patients with Parkinson’s Disease”)
- **Find an expert** (links for consumers to find an expert in the United States, such as the National Institute on Aging)
- **Patient handouts** (such as dementia – daily care)
- **Information from the medical encyclopedia** (such as dementia – daily care, dementia – behavior and sleep problems, mental status testing)
- **Related health topics** (such as Alzheimer’s disease, delirium, Lewy body disease, and memory)

Drugs and Supplements

The Drugs section provides information on adverse effects, dosages, and special precautions for over 1,000 prescription and over-the-counter

drugs (U.S. National Library of Medicine 2015). These are listed alphabetically by both their brand and generic names. The Herbs and Supplements section has information about dietary supplements and herbal remedies and their effectiveness, usual dosage, and drug interactions.

Video and Tools

MedlinePlus provides health videos, surgery videos, interactive tutorials, health check tools, and games. Consumers can watch animated health videos showing the anatomy of body parts and organ systems and how diseases and conditions affect them. Videos of actual operations and surgical procedures performed at medical centers in the United States are also provided (U.S. National Library of Medicine 2018c). MedlinePlus also provides interactive calculators; quizzes and questionnaires for consumers to self-assess their health conditions, such as risk for health disease; and depression screening. Interactive health games help consumers to boost their health knowledge (U.S. National Library of Medicine 2019e), such as the games “To Tell the Tooth” to teach child dental health and “Food Detective: Fight Bac” about food safety. Tutorials teach consumers to evaluate health information on the Web and understand medical terms (U.S. National Library of Medicine 2019e).

Free Access

MedlinePlus is free and open to the general public without registration (Miller et al. 2004). As MedlinePlus is a website, it can be accessed through any computers and mobile devices anytime and anywhere with internet connection (U.S. National Library of Medicine 2018a). It can also be accessed through electronic health records (EHRs) and patient portals via MedlinePlus Connect (Schnall and Fowler 2013). In addition, MedlinePlus provides users with timely health news and information on the major social media platforms such as Facebook, Google+, and Twitter (U.S. National Library of Medicine 2019c).

Consumer-Level Language

MedlinePlus use consumer-level language instead of medical terminology to facilitate consumers to understand health information (Miller et al. 2000). For example, heart attack is the term used instead of myocardial infarction, dementia is used instead of senility, and high blood pressure is used instead of hypertension. To enable understanding by the consumers who have reading or understanding difficulty, certain materials are presented for a person with the literacy level of a Year 7 or Year 8 student (U.S. National Library of Medicine 2017). MedlinePlus information is available in English and Spanish. Some selected information is presented in over 50 other languages (Frant et al. 2012; U.S. National Library of Medicine 2019c, f).

Quality Content

The motto of MedlinePlus is “Trusted Health Information for You,” i.e., to provide reliable, high-quality health information for the users. MedlinePlus quality guidelines (outlined at <https://medlineplus.gov/criteria.html>) are used by the health science librarians of NLM to identify and select health information produced by NLM, NIH, and the other US government agencies and authoritative international health organizations (Miles 2011), such as the AGS Foundation for Health in Aging and the Centers for Disease Control and Prevention (CDC). The strict quality control process has safeguarded the consumers from the overwhelming health information with varying quality (Miller et al. 2004). MedlinePlus is updated daily and free of advertisements and product endorsements (Miller et al. 2004; U.S. National Library of Medicine 2018a).

MedlinePlus Connect

Built in 2010, MedlinePlus Connect links patient portals, patient health records (PHRs), and electronic health records (EHRs) to MedlinePlus health information (Borbolla et al. 2014; U.S. National Library of Medicine 2018d). It is intended for use within the US healthcare

system and supports the HL7 Context-Aware Knowledge Retrieval standard (U.S. National Library of Medicine 2018d).

A Medical Encyclopedia

An illustrated medical encyclopedia, *Animated Dissection of Anatomy for Medicine (ADAM)*, is incorporated into MedlinePlus in 2000 (U.S. National Library of Medicine 2019c, g). It brings to consumers an extensive library of medical images and videos and over 4,000 articles about diseases, tests, symptoms, injuries, and surgeries (U.S. National Library of Medicine 2019g).

Medical Test Information

Consumers can learn about medical tests on MedlinePlus website. This includes the purpose and content of the test, reasons for ordering it, and the meaning of the test results (U.S. National Library of Medicine 2019h).

Links to ClinicalTrials.gov

Since 2000, MedlinePlus has incorporated a link to ClinicalTrials.gov, the NLM database of privately and publicly funded clinical research studies conducted around the world. In January 2019, it lists more than 295,000 research studies in all 50 states of the United States and 208 countries (U.S. National Library of Medicine 2019i).

Links to Organizations and Directories

MedlinePlus offers links to the authoritative organizations providing health information and health directories to enable consumers to find libraries, health professionals, services, and facilities in the United States. However, NLM explicitly announced that “NLM does not endorse or recommend the organizations that produce these directories, nor the individuals or organizations that are included in the directories” (U.S. National Library of Medicine 2019j).

NIH MedlinePlus Magazine

Launched in 2006, NIH MedlinePlus magazine is a quarterly guide for consumers about the latest medical and healthcare information from NIH

(Zerhouni 2006). The magazine is also featured online at the MedlinePlus website.

Use of MedlinePlus

The NLM has continuously provided resources, such as grants, to promote the use of MedlinePlus, particularly for the consumers from medically underserved communities in the United States (Olney et al. 2011; Ancker et al. 2016), for example, a MedlinePlus-conducted health information outreach project for high school students from medically underserved communities (Olney et al. 2011). The study results suggested that MedlinePlus is useful for the targeted school students to research health conditions, get information about medications, help their families and friends with health issues, and locate relevant health services (Olney et al. 2011).

As a dynamic online resource, MedlinePlus has kept expanding to enable users to access a greater breadth and depth of reliable health information (Miller et al. 2000). It initially provided 22 health topics in English in 1998. In 2018, it has expanded to cover 1,030 health topics in English and 1,027 in Spanish (U.S. National Library of Medicine 2019k). It received over 324.5 million unique visitors around the world browsing approximately 695 million web pages in 2018 (U.S. National Library of Medicine 2019k).

As the focus of MedlinePlus is on serving residents of the United States (Miller et al. 2000), some of its information services are only provided to the users in the United States, not available for users in other countries. For example, the service of “Find an Expert” only offers links to find an expert in the United States.

Research suggests that about 70% of MedlinePlus users are the general public, such as patients and students (Lacroix and Mehnert 2002). A 2013 survey found that end user satisfaction with MedlinePlus was high. 82% of the site visitors were satisfied with usefulness of the information (Coberly et al. 2013); 95% were satisfied with ease of use and informativeness of the information; and 94% claimed that the information provided by MedlinePlus would assist them in making better health decisions (Smalligan et al. 2008).

Not only used by the general public, MedlinePlus is also regarded as a reliable health resource by librarians to serve their customers (Miller et al. 2004) and is used by health professionals for health information prescription (HIP) (Coberly et al. 2013) and patient education (Schnall and Fowler 2013). Moreover, physicians report using the site to stay current in health areas outside their expertise (Miller et al. 2004; Schloman 2006).

MedlinePlus has been chosen as a source to conduct academic research studies about health information. For example, researchers used it to extract patient-level cancer information for the development of an ontology in the HPV-related cancer domain (Amith et al. 2017). In addition, using health information from MedlinePlus and two other websites, one researcher created an information leaflet to guide patients to search for high-quality drug information on the Web (Coleman 2003; Schloman 2006). Researchers also used MedlinePlus as a benchmark for comparing the quality of patient education materials and the readability of medical documents (Wu et al. 2013).

MedlinePlus for Older People

MedlinePlus has been proved to be an easy-to-use resource for older people to search for health information and improve their health literacy (Xie 2012). It provides the older people with a special section called Seniors. This section contains more than 100 health topics that are directly related to older people, such as Exercise for Seniors, Nutrition for Seniors, and Seniors' Health.

The primary NIH organization for research on health topics for Seniors is the National Institute on Aging. MedlinePlus provided links to the NIHSeniorHealth.gov Website to meet the further needs of older people for evidence-based health information in a format that meets their cognitive and visual needs (Dine and Dailey 2017). Unfortunately, the link was deleted due to the retirement of the NIHSeniorHealth.gov website in 2017 (Dine and Dailey 2017).

MedlinePlus Response to the COVID-19 Pandemic

MedlinePlus' mission is to help the general public to find reliable health information on the Web. In the face of a global pandemic like COVID-19 (coronavirus disease 2019), helping people to get the reliable information to stay safe and healthy is more important than ever. To achieve it, MedlinePlus provided links to the latest and authoritative information about COVID-19 from CDC and NIH.

Challenges for MedlinePlus

Despite its leading position all over the world, Sanders et al. (2018) found that MedlinePlus is still underutilized. The possible reasons can be the barriers of information not easy to understand and lack of relevance for patients at the point of care.

As a dynamic resource, the improvement of MedlinePlus has been user-driven. This has been achieved through analyzing user demand and feedback since the beginning (Miller et al. 2000; Lacroix and Mehnert 2002). For instance, in 2001, MedlinePlus Go Local was created to connect users of MedlinePlus to health services in their local communities and to provide users of the Go Local Web sites with access to MedlinePlus health information (Klein 2010). For about 10 years, NLM had provided support and resources to create and maintain Go Local projects around the United States. However, the usage of MedlinePlus Go Local had not increased as expected. The users of Go Local chose not to return, nor share with a friend, nor bookmark the resource (Klein 2010). As a result, MedlinePlus Go Local was closed in 2010.

Despite being in existence for more than 20 years, many of the evaluation studies about MedlinePlus were conducted by US organizations, to be funded by NLM. This lack of independence inevitably compromises the quality of evidence. There is little independent, third-party evaluation about the strategy and speed of the site development, the efficacy of its outreach efforts, the special features, and its use for patient

education. A lack of rigorous evidence has limited the optimal development and uptake of MedlinePlus.

Future Directions of Research

Further research needs to evaluate the structure and process of developing and maintaining MedlinePlus, the efficacy of the outreach efforts, the usage and efficacy of the special features for patient education, and the issues related to access, use, and value for users in other countries. Further research into other areas about MedlinePlus could also be useful, such as the effect of MedlinePlus on helping consumers to change health behavior. As mentioned above, due to a low adoption by the older people, the Web resources specifically targeted at the older people's needs were no longer offered; therefore, MedlinePlus is yet to develop acceptable information source that will truly meet the older people's information needs and be accepted by this cohort of population.

Further promotion of MedlinePlus is also beneficial for maximizing its adoption and use by the public including clinicians, nurses, patients and improving health prevention in citizens, including the older people. Finally, although an ontology of MedlinePlus Health Topics was developed in 2016 and was published on BioPortal website (see <https://bioportal.bioontology.org/ontologies/MEDLINEPLUS>), there is a lack of information about how it was developed and implemented. This could be another interesting research area.

Summary

MedlinePlus is a consumer health information website developed and maintained by NLM in the United States. With the initial motivation of providing the accurate and up-to-date health information to the general public, MedlinePlus has achieved its goal of providing reliable health information to the general public about diseases, conditions, prescription drugs, over-the-counter medicines, herbs, and supplements in easy-to-understand language. Many unique features

make MedlinePlus the most rich and valuable source of health information repository. As a dynamic online resource, MedlinePlus has kept expanding in its coverage of health topics and services, such as the creation of MedlinePlus Connect. Despite being an easy-to-use resource for older people to search for health information, MedlinePlus needs to further develop information services that specifically target older people's need.

Cross-References

- [Consumer Health Informatics](#)
- [Health Information Exchange](#)
- [Mobile Health](#)

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