

Information Capsule: A New Approach for Summarizing Medical Information

Abstract

Background: The diversities of medical information resources and health information needs in recent years have caused another form of summarization and abstract writing to appear in the information capsule (IC) versus various types of abstracts. The present study was conducted with the aim to analyze the current IC, giving a unique definition and a standard structure for the development of an IC, and how it can be represented and implemented. **Methods:** This study was conducted in three phases in the form of a qualitative study. In the first phase, a library review study was done on the relevant websites and international databases, such as PubMed, Science Direct, Web of Sciences, Google Scholar, ProQuest, and Embase. In the second phase, the results of the previous stage were discussed with a panel of experts. In the third phase, a suggested frame for an IC was stated. **Results:** A specific structure was suggested for IC so that, in addition to having parts of similar cases, they had extra parts. The suggested frame includes title, name of the IC writers and reviewers, question or goals, design or methods, setting, patient or community of the study, result, commentary, citation, topic, picture, and tag and can be used in different fields. **Conclusions:** Due to the importance of IC in summarizing information, our suggested structure should be used in other fields and be subject to trial and error.

Keywords: Capsule summary, information capsule, informative capsule, medical information, research brief

Introduction

The medical field suffers from the problem of information overload, and it is crucial for physicians and researchers to quickly and efficiently access up-to-date information based on their interests and needs. The growing volume and diversity of data have made information and knowledge management a real challenge in medical society. Thus, there is a strong need for improved means of facilitating information access.^[1-3]

Although advanced information retrieval technology has made it easier to manage medical information overload, there is a need for tools which screened lots of documents to find relevant information. Thus, text summarization approaches have been formed with aim to generate short, accurate, and informative summaries from larger text documents.^[4-6]

The summarization process is done in automatic and non-automatic ways, and their objectives are to extract content

from an information source and present information in a condensed form based on the user's needs. Automatic text summarizing is done by machine, whereas non-automatic text summarizing is done manually.^[7-9]

Abstracting, as a method that has been used to summarize information for many years, is an efficient way to address the most important parts of the manuscripts. There are three general types of abstracts: informative, indicative, and evaluative. Each of these abstracts has its own advantages and characteristics, and according to the goal of the researcher, one of them is used to summarize the content of the text.^[10-12] Besides the advantages, there are some drawbacks associated with text summarization, such as difficulty in detecting the main topic of the text and extracting proper sentences to describe these concepts. Also, rephrasing these sentences in a different way from the main text is not easy. So, there has always been a need for new methods that can resolve these problems.^[13]

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The diversity of sources and information needs in recent years has caused another form of summarization and abstract writing to appear, like information capsules (ICs). ICs are used in some fields like education, finance, medicine, and social sciences to continuously reduce time and cost.^[14-17] They are very useful for establishing a professional relationship. There are some synonyms for this term, such as informative capsule, capsule summary, and research brief.^[18-20] In this way, the present study was conducted with the aim of analyzing and reviewing current ICs, giving a unique definition and a standard structure for the development of an IC, and giving information about how an IC can be represented and implemented so that it can be used in different contexts, especially in the health context.

Methods

As a qualitative study, this work was accomplished in three phases. In phase 1, a review study was done in December 2022 on the relevant websites and international databases such as PubMed, Science Direct, Web of Sciences, Google Scholar, ProQuest, and Embase to identify current studies and cases that used IC, their definitions, and development methods for the implementation of an IC. Search keywords were IC, capsule summary, informative capsule, and research brief that were searched in the title abstract and topics of the studies. Inclusion criteria were all studies and cases that use the format of IC for summarizing information in English. Through searching the mentioned keywords in Google, the relevant websites that present IC and a summary of updated information were browsed and reviewed. Studies that did not match the inclusion criteria were excluded. In phase 2, the results of the previous stage were discussed with a panel of experts from different study fields including gastroenterology, medical informatics, medical librarianship, and health information studies. Experts were selected for this phase who in addition to having a personal desire to participate in the study, also had the experience of writing articles and summarizing information. Through an interview, 10 experts' opinions were asked about the structure and sections of an IC. The results of this stage were analyzed with MAXQDA 2020. In phase 3, a suggested theoretical framework for the development of an IC and information about methods for its representation and implementation were stated. Figure 1 presents a summary of the methodology of current study. This project was approved on 9 April 2022 by the Ethical Committee of Isfahan University of Medical Sciences.

Results and Discussion

In this part, we are presenting some information about the quiddity of an IC. Also, we will discuss our suggested structure for an IC, and how it can be presented and implemented.

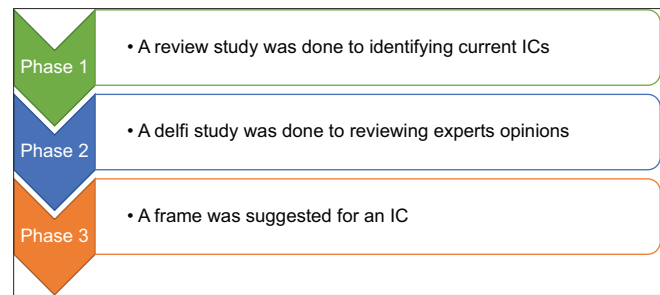


Figure 1: An overview of study methodology

Meaning of the information capsule

The term IC is taken from the word capsule, which refers to a concise report, a brief outline, or a short block of information.^[21] The phrase “research brief” is another synonym for the “information capsule.”^[22] A research brief is a short, non-technical summary of a paper that is useful for decision-makers, with a focus on the paper’s relevant findings. There isn’t a unique structure for writing an IC, and only some studies have stated a relative structure for that.^[23-27] Based on this format, each capsule should at least include a title, an introduction, a story about the main study, key points about the results of the main study, bibliographical information about that capsule, and citations for the main study.^[22,28-30] Different scopes have used different structures for an IC.^[14,31] For example, in the field of medicine, there are six cases that summarize information in the format of an IC differently.^[23-27] Title, the name of the writer, information about the main study methods, results, characteristics of the main study population, and giving bibliographical information about the main study are common parts among ICs of ACP Journal Club, NEJM Journal Watch, Medscape, MDLinx, and MedicalUpdateOnline. Also, all of them have an editorial board that includes experts from different fields of medicine.^[23-27] In the Medscape editorial board, librarians are one of the editorial board members and are responsible for writing IC.^[32] Although the use of artificial intelligence (AI) is a trend these days, it has not been used in producing the IC in the mentioned cases.^[33] The details of these cases are shown in Table 1.

Structure the information capsule

Based on the review of the current IC, we will present a unique structure. The present frame is designed so that, in addition to medicine, it can be used in other fields of science. In the fields of education, finance, and social sciences, the term “information capsule” and its synonyms are used, but there isn’t a specified structure for writing it.^[14,16,34,35] In contrast, in the field of medicine, the term “information capsule” or any specified phrase for it doesn’t exist. Instead, there are some predefined structures for summarizing information in the format of IC. In other words, in the field of medicine, IC is known as a new kind of summary. Though IC in this scope doesn’t have a defined

Table 1: A comparison between existing cases that use the IC format to summarize information in the health context

	Name of the cases					
	ACP Journal Club	NEJM Journal Watch	Medscape	MDLinx	Medical Update Online	WebMD
Parts of the information capsule						
Title	*	*	*	*	*	*
Capsule writer and reviewer names	*	*	*	*	*	*
Introduction of the main study		*	*	*	*	*
Questions of the main study	*					
Methods of the main study	*	*	*	*	*	
Places that the main study was set in	*					
Patients and the characteristics of the main study's population	*	*	*	*	*	
Risk factors that have been revealed during the main study	*					
Information about funding and sponsors for the main study	*					
Results of the main study	*	*	*	*	*	*
Conclusion of the main study					*	
Comment by an expert	*	*				
bibliographic information of the main study, summarizers, and reviewers	*	*	*	*	*	
Table	*					
Tag	*				*	*
Written by						
Human	*	*	*	*	*	*
Artificial intelligence (AI)						
Human and AI (hybrid)						
Information capsule volume						
One paragraph			*			
Two paragraphs or more	*	*		*	*	*

name, they have a nearly defined structure.^[23-27] Since we use IC from this scope to present a unique frame, our suggested framework includes parts from medical IC but has other sections that we think are essential for an IC.^[23-27]

Versus different types of abstracts, an IC structure should include 11 parts, such as title, name of the IC writers and reviewers, question or goals, design or methods, setting, patient or community of the study, result, commentary, citation, topic, picture, and tag.

Part 1: Tags

At the start of an IC, it is better to use some tags that show the types of articles, for example, the original article, the review article, the clinical practice guideline, etc.^[23,27,36]

Part 2: Title

The title part should be presented in news format and be short and precise. Sometimes the title of the main study can be used as a title for an IC.

Part 3: Bibliographical information about IC

The third part is dedicated to introducing the writers and reviewers of an IC. The importance of this section is that it shows that the prepared content has passed through various filters and is scientifically rich enough.^[23-27,36]

Part 4: Questions

In part “question,” the questions of the main study, or in other words, the goals, will be discussed.^[23]

Part 5: Design and methods

Section “design” is dedicated to giving some information about the method. In this part, the type of study, dates, and some information about the method of the main study will be presented. The volume of presented details depends on the main study. Sometimes we should explain a method with fewer words, but sometimes we should explain more. We just have to pay attention to the fact that this part should not be more than ten lines.^[23-27]

Part 6: The name of places

In the sixth part, we'd better introduce the country in which the main study was conducted.^[23]

Part 7: Study community

In the section “patient,” the community of the main study will be introduced. In some studies, where the details of the characteristics of the community are important, we can present extra details in table format.^[23-27]

Part 8: Results

Part “results” is dedicated to the results of the main study. In this part, we can use text, a table, or a combination of them. We should pay attention to the fact that this sector should not be longer than ten lines or include a large table.^[23-27,36]

Part 9: Commentary

“Commentary” is assigned to opinions and comments from a reviewer about that IC in terms of its scientific importance. This part will be written in just one paragraph and reveal scientific aspects through discussion.^[23,24]

Part 10: Bibliographical information about the main study

At the end of IC, there is a need for a citation. This means we should give bibliographical information about the main study, its DOI, and a link to the main article.^[23,24]

Part 11: Picture

Also, it is better to attach a photo of the content of the main article to the capsule.

A semantic model of our structure was presented in Figure 2 and includes parts such as the type of article, title, name of the writer, citations, place names, commentary, pictures, tags, methods, results, and goals.

It is suggested to use Clinical Informationists and clinical librarians for writing IC because they are skilled in summarizing information and can play a crucial role in producing these ICs in the field of medicine and health.^[37] These specialists, besides having base medical knowledge, are experts in searching and retrieving information, so they can identify new information, read it, and summarize it in the format of IC.^[38-40]

Representing an information capsule

Based on the expert’s panels’ opinions and current studies can state that among the existing standards for representing and exchanging information (XML, JSON, and RDF), the resource description frameworks (RDFs) are suitable standards for holding relationships between IC and transferring them between diverse systems and tools.^[41,42]

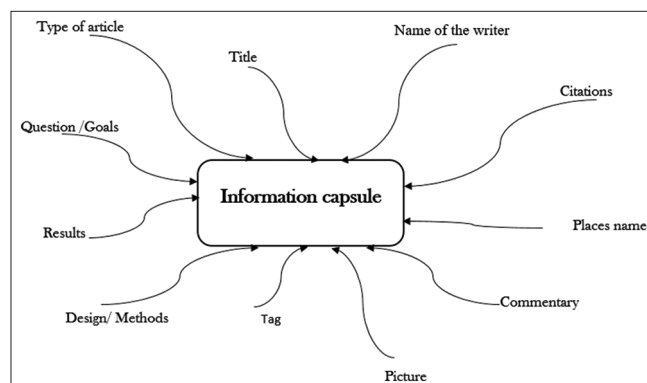


Figure 2: A semantic model of an information capsule structure

As a W3C standard, RDF is a language for representing information about resources on the World Wide Web and can be used to represent information about things that can be identified on the Web.^[43,44] In situations where information needs to be processed by applications, RDFs are suitable. RDFs provide a conceptual framework for representing this information so that it can be interchanged between various applications without losing meaning.^[45,46] Since RDFs are based on the idea of recognizing things through Uniform Resource Identifiers (URLs), they can describe resources in terms of plain features and property values through graphs of nodes and arcs. These graphs can be recorded and exchanged using an XML-based syntax (called RDF/XML).^[47,48] This RDF/XML is machine-processable and, using URIs, can link pieces of information across the Web. RDFs are understandable, reachable, and machine-readable. So they have the ability to import and export from one system to another.^[49-52]

Implementing an information capsule

The model designed for an IC is independent of the implementation and can be used on different platforms, such as websites or applications. Six cases that were mentioned in this study make accessibility of IC through their websites and applications.^[23-27] Since WordPress has the ability to read RDFs and can interchange data among various applications without losing meaning, we propose designing websites with this content management system.^[53,54]

Conclusions

The study has provided a valuable, unique structure and framework about the methods for representing, implementing, and using IC so that it can be used in health contexts and other fields. Since this framework has different parts and each one gives a summary of information, users can take important data more easily and in just one or two pages instead of browsing the whole of an article. This feature is helpful for retrieving medical information in databases and information systems.

In addition to being structured, this framework uses tags and labels to improve the likelihood of being seen and read ICs. This feature can improve the altmetrics index of medical articles. The mentioned structure has a part for expert comments that can increase the scientific value of IC since connoisseurs give their opinions about a specific study. They judge studies from different aspects, such as methodology, results, and usability for the community so users can gain sufficient information from different studies and use it in their research. It can be said that the most important and different parts of the proposed structure compared to other types of summarizing formats is this part. In this section, in addition to reviewing existing knowledge in a specific field, tacit knowledge generation also occurs. Through examining the strengths and weaknesses of past

studies, new concepts and knowledge are created in a subject area.

Limitations

The absence of standard vocabulary across sources and subject areas in describing this summarizing technique was one of the primary issues with this study project. This had made it challenging to locate research and historical information in this area.

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Conflicts of interest

There are no conflicts of interest.

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References

- Wang M, Wang M, Yu F. A systematic review of automatic text summarization for biomedical literature and EHRs. *J Am Med Inform Assoc* 2021;28:2287-97.
- Mishra R, Bian J, Fiszman M, Weir CR, Jonnalagadda S, Mostafa J, *et al.* Text summarization in the biomedical domain: A systematic review of recent research. *J Biomed Inform* 2014;52:457-67.
- Afantenos S, Karkaletsis V, Stamatopoulos P. Summarization from medical documents: A survey. *Artif Intell Med* 2005;33:157-77.
- Sarker A, Yang YC, Al-Garadi MA, Abbas A. A light-weight text summarization system for fast access to medical evidence. *Front Digit Health* 2020;2:585559.
- Zhang M, Zhou G, Yu W. A comprehensive survey of abstractive text summarization based on deep learning. *Comput Intell Neurosci* 2022;2022:7132226.
- Yao K, Zhang L, Du D, Luo T, Tao L, Wu Y. Dual encoding for abstractive text summarization. *IEEE Trans Cybern* 2020;50:985-96.
- Afzal M, Alam F, Malik KM, Malik GM. Clinical context-aware biomedical text summarization using deep neural network: Model development and validation. *J Med Internet Res* 2020;22:e19810.
- King S, Boyedoe H, Chacon A, Hall M, Krizansky M, O'Bryant K, *et al.* Revisiting Indexing & Abstracting in the Digital Era. 2018.
- Workman TE, Fiszman M, Hurdle JF. Text summarization as a decision support aid. *BMC Med Inform Decis Mak* 2012;12:41.
- Jiang JJ, Tsai JC-A. Constructing an effective abstract: Guidelines and new standards in PAJAIS. *Pac Asia J Assoc Inf Syst* 2019;11:1.
- Shah-Shojae A. Types of abstracts and their functions. *IranDoc* 1998;13:77-89.
- Hutchins J. Summarization: Some problems and methods. *Meaning: The frontier of informatics* 1987;9:151-73.
- Givchi A, Ramezani R, Baraani-Dastjerdi A. Graph-based abstractive biomedical text summarization. *J Biomed Inform* 2022;132:104099.
- Capsule Financial Information (Glossary): Thomson Reuters 2023. Available from: [https://uk.practicallaw.thomsonreuters.com/6-517-7905?transitionType=Default&contextData=\(sc.Default\)&firstPage=true](https://uk.practicallaw.thomsonreuters.com/6-517-7905?transitionType=Default&contextData=(sc.Default)&firstPage=true). [Last accessed on 2023 May 15].
- Bertram R, Blase K, Shern D, Shea P, Fixsen D. Policy Research Brief: Implementation Opportunities and Challenges for Prevention and Promotion Initiatives. Alexandria, VA: National Association of State Mental Health Program Directors (NASMHPD); 2011.
- Harris JK, Hawkins JB, Nguyen L, Nsoesie EO, Tuli G, Mansour R, *et al.* Using twitter to identify and respond to food poisoning: The food safety STL project. *J Public Health Manag Pract* 2017;23:577-80.
- Darling-Hammond L, Satcher L, Carver-Thomas D. Teacher Shortages in California: Status, Sources, and Potential Solutions. Research Brief. Learning Policy Institute. 2018.
- Blazer C. Strategies for Reducing Math Anxiety. Information Capsule. Volume 1102. Research Services, Miami-Dade County Public Schools. 2011.
- Hunt R. Service-Learning: An Eye-Opening Experience that Provokes Emotion and Challenges Stereotypes. *Research Briefs* 2007;46:1-5.
- Ornes LL, Gassert C. ResearCh BRIEfs. *Nursing* 1998;1997:75-80.
- Definition of capsule 2022. Available from: <https://www.collinsdictionary.com/dictionary/english/capsule>. [Last accessed on 2022 Jun 12].
- Berck C. What is a research brief?: International Academic Editorial Services; 2017. Available from: https://www.efdfinitiative.org/sites/default/files/instructions_for_research_briefs_oct_24_2017.pdf. [Last accessed on 2022 Oct 12].
- ACP Journal Club: American College of Physicians and BMJ Publishing Group; 2023. Available from: <https://www.acponline.org/clinical-information/journals-publications/acp-journal-club>. [Last accessed on 2023 Aug 08].
- NEJM Journal Watch: NEJM Group; 2023. Available from: <https://www.jwatch.org/about/journal-watch>. [Last accessed on 2023 Aug 08].
- Medscape WebMD LLC; 2023. Available from: <https://www.medscape.com/public/about>. [Last accessed on 2023 Aug 08].
- MDlinx: M3 Group; 2023. Available from: <https://www.mdlinx.com/s/about-us>. [Last accessed on 2023 Aug 08].
- MedicalUpdateOnline: International Medical Information; 2023. Available from: <https://medicalupdateonline.com/about-us/>. [Last accessed on 2023 Aug 08].
- Blazer C. Information Capsule. Miami: Miami Dade Country Public Schools; 2007.
- Merson M, Parker-Geisman A, Allen LC, Hristov NI. Research briefs through interpreters' eyes: Recommendations for scientists sharing park-based research. *Bull Ecol Soc Am* 2021;102:e01739.
- Hanna M. The capsule summary. In: Hanna M, editor. *How to Write Better Medical Papers*. Cham: Springer International Publishing; 2019. p. 175-6.
- Bahariniya S, Ezatiasar M, Madadzadeh F. A brief review of the types of validity and reliability of scales in medical research. *J Community Health Res* 2021;10:100-2.
- Frishauf P. Medscape—The first 5 years. *MedGenMed* 2005;7:5.
- Salvagno M, Taccone FS, Gerli AG. Can artificial intelligence help for scientific writing? *Crit Care* 2023;27:75.
- Blazer C. Social Networking in Schools: Benefits and Risks; Review of the Research; Policy Considerations; and Current Practices. Information Capsule. Volume 1109. Research Services, Miami-Dade County Public Schools. 2012.
- Blazer C. Review of the Research on Inclusive Classrooms: Academic and Social Outcomes for Students with and without Disabilities; Best Practices; and Parents' Perceptions of Benefits and Risks. Information Capsule. Volume 1701. Research Services, Miami-Dade County Public Schools. 2017.
- WebMD 2023. Available from: <https://www.webmd.com/about-webmd-policies/default.htm>. [Last accessed on 2023 Aug 08].

37. Tahmasebi M, Adibi P, Zare-Farashbandi F, Papi A, Rahimi A. The educational role of clinical informationist on improving clinical education among medical students: Based on Kirkpatrick model. *J Educ Health Promot* 2020;9:28.
38. Hashemzadeh M, Adibi P, Rahimi A. The presence of a clinical informationist on ward rounds: An action research study. *J Hosp Librariansh* 2021;21:245-56.
39. Zare-Farashbandi E, Zare-Farashbandi F, Adibi P, Rahimi A. Pre-requisites, barriers and advantages of clinical informationist participation in grand round: A qualitative study. *Health Info Libr J* 2020;37:143-51.
40. Zare-Farashbandi E, Rahimi A, Adibi P, Zare-Farashbandi F. Involving clinical librarians in clinical settings: Skills, roles, advantages and barriers. *J Hosp Librariansh* 2019;19:144-55.
41. Candan KS, Liu H, Suvarna R. Resource description framework: Metadata and its applications. *ACM SIGKDD Explor Newsl* 2001;3:6-19.
42. Shan J, Lu J, Chen X, Yan L, Ma Z. A semantics-preserving approach for extracting RDF knowledge from object-oriented databases. *J Web Eng* 2023;22:197-220.
43. Rahimi A, Parameswaran N, Ray PK, Taggart J, Yu H, Liaw S-T. Development of a methodological approach for data quality ontology in diabetes management. *Int J E-Health Med Commun (IJEHMC)* 2014;5:58-77.
44. Bansal R, Chawla S. Role of RDF in distributed learning environment. *IJERT* 2012;1:10.
45. Hogan A, Hogan A. Resource description framework. *The Web of Data*. Springer. 2020. p. 59-109.
46. Lourdasamy R, Mattam XJ. Chapter 6-Resource description framework based semantic knowledge graph for clinical decision support systems. In: Jain S, Jain V, Balas VE, editors. *Web Semantics*. Academic Press; 2021. p. 69-86.
47. Hnin WL, Tun KNN. Efficient Query Processing for RDF data Using XML Repository: MERAL Portal.
48. rdf-syntax-grammar: W3C 2023. Available from: <https://www.w3.org/TR/rdf-syntax-grammar/>. [Last accessed on 2023 Aug 27].
49. Özsü MT. A survey of RDF data management systems. *Front Comput Sci* 2016;10:418-32.
50. Manola F, Miller E, McBride B. RDF primer. W3C recommendation. 2004;10:6.
51. Bergman M. Advantages and Myths of RDF. *AI3*, April. 2009.
52. Nurseitov N, Paulson M, Reynolds R, Izurieta C. Comparison of JSON and XML data interchange formats: A case study. *Caine* 2009;9:157-62.
53. Cabot J. WordPress: A content management system to democratize publishing. *IEEE Software* 2018;35:89-92.
54. Patel SK, Rathod V, Prajapati JB. Performance analysis of content management systems-Joomla, Drupal and Wordpress. *Int J Comput Appl* 2011;21:39-43.