Beyond relevance — characteristics of key papers for clinicians: an exploratory study in an academic setting*†

By MaryEllen Sievert, Ph.D.
Professor
School of Library and Informational Science

Emma Jean McKinin, M.A.
Assistant Professor (Retired)
School of Library and Informational Science

E. Diane Johnson, M.A.
Head, Information Services
J. Otto Lottes Health Sciences Library

John C. Reid, Ph.D.
Professor, College of Education,
Medical Informatics Group

Joyce A. Mitchell, Ph.D.
Associate Dean, School of Medicine;
Director, Medical Informatics Group;
Professor, Department of Child Health

University of Missouri–Columbia
Columbia, Missouri 65211

Objective: The purpose of this study was to determine what factors beyond relevance influence a clinician's decision to choose to read one journal article over another in satisfying an information need. **Design:** Seventeen health care providers were interviewed and then surveyed regarding the characteristics of key articles (those they would not want to miss). On a Likert scale, the clinicians graded forty-two characteristics for importance in the decision process. Relevance was assumed and not at issue. **Setting:** The study took place in an academic health sciences center. **Subjects:** The subjects were seventeen clinicians, all with patient care responsibilities. There were four internists, four surgeons, three family practitioners, three pediatricians, two psychiatrists, and one clinical psychologist. **Results:** Factors beyond relevance that most often influenced the decision process pertained to methodological rigor, authors and their institutional affiliations, document types, and population studied. **Conclusions:** Among the clinicians surveyed, factors beyond topicality influenced judgments as to what constitutes an important article. The emphasis respondents gave to certain attributes is echoed in other published work and highlights the need for more intensive investigation of these non-subject indicators as search parameters. Improved searching capabilities might well lead to a significant reduction in the clinician's information overload.

INTRODUCTION

For clinicians, the problem of information overload has become acute. The medical literature is said to be underutilized [1] and several studies have documented a significant time lag between publication of

* Supported by grant LM04605 from the National Library of Medicine. The views expressed are solely those of the authors.
† Address for correspondence and reprint requests: MaryEllen Sievert, Ph.D.; Professor, School of Library and Informational Science, 104 Stewart Hall, Columbia, Missouri 65211

an innovation in patient care and its adoption by practicing physicians [2–4]. One reason often given for this underuse is the difficulty in sifting information of importance from an overwhelming volume [5]. The search for the "key" article instead of the merely relevant one is an important quest for information specialists in all disciplines. Mechanisms for identifying key articles have been dubbed "quality filters" [6].

The urgent need to retrieve only the key or best information on a topic comes at a time when information systems have not yet attained the sophistication necessary even for retrieving only the *relevant*. Studies measuring the efficacy of retrieval systems have documented mean precision rates (the number of relevant items retrieved divided by the total number of items retrieved) of no more than 60%, even for trained searchers; for novices the rates are often much lower [7].

Even the idea of relevance is receiving much closer scrutiny. In a recent issue of the *Journal of the American Society for Information Science* devoted to the topic of "relevance research," Hersch suggested that two types of relevance, "topical" and "situational," need to be considered in evaluating medical information systems. Topical relevance refers to subject content and situational relevance to the "impact of the system on the user" [8]. Barry found that "situational factors other than the inherent topical content of documents influence the relevance judgment process . . ." These factors relate to elements such as authors, their affiliated institutions, and document types [9]."

In spite of the ambiguity regarding relevance, the pursuit of quality filters continues. The call for filters in information systems was first sounded in 1971 [10], and one article on quality filtering in medicine appeared in 1975 [11], but it was not until the mid-1980s that articles on quality filtering began to appear regularly in the medical literature. A flurry of articles on the identification of articles on randomized controlled trials [12–15] sparked a discussion that continues today.

Efforts to provide simple methods of extracting the important as opposed to the merely relevant journal articles are under way. Finding search parameters that go beyond subject content and point to the relative merit of documents is an important aspect of the quest for quality filters [16–17]. So far most of the attention has been focused on methods of identifying a specific type of article, the solidly based and rigorously executed research study [18–20]. Scant attention has been given to the definition of "high quality," which varies depending upon the background and purpose of the person requesting the article.

Physicians have been surveyed to determine specific information needs at various points in their practice day [21–23] and the information sources used to meet those needs [24–26]. Prior to the present study, only Florance had asked physicians how they distinguish relevant articles from irrelevant ones [27]: from the articles they viewed, the physicians were able to select the "best" item. However, the purpose of Florance's study was to learn about the physicians' cognitive strategies, and the collection of information on relevancy judgments was only incidental. Thus, no previous studies have asked specifically how health care professionals distinguish important articles from merely relevant ones in a generic sense.

This paper, which contains some answers to that question, reports on one aspect of a larger study of quality filters for the medical journal literature. The overall goal of the work is to arrive at search strategies that will serve as filters in the full-text databases and to compare the results with those of similar strategies designed for bibliographic counterparts. Interviews and follow-up surveys were conducted as a first step in arriving at definitions of quality, which could then be fashioned into search techniques as part of a larger project.

METHODS

Seventeen health care professionals in five clinical specialties serve as co-investigators for the MEDLINE/Full Text Research Project [28]: four internists, four surgeons, three pediatricians, three family practitioners, two psychiatrists, and one clinical psychologist. Representatives of these specialties were chosen because most of the journals in the full-text medical databases fall into these areas.

Each of these clinicians was interviewed by two information specialists and all interviews were taped. At the beginning of the interview one of the information specialists defined what was meant by "key." A relevant article addressed the topic requested; a key article both addressed the topic requested and appeared so important that the clinician would not want to miss it. To ensure that all interviews covered the same factors, the interviewers worked from a printed schedule. The interviews, however, were not highly structured and the clinicians were allowed to develop their thoughts according to their own patterns. The interviewers were responsible for ensuring that all the items on the schedule were covered, regardless of the order.

Prior to the interview, each participant received a letter, a copy of a search request, and a print-out of citations generated in response. The first question asked in the interview was, "When you look at a list of citations, how do you judge what is a key paper, that is, a paper you would not want to miss in reviewing the topic?" This general question was posed at the beginning of the interview to elicit unprompted comments about the decision process. After the

participant had listed characteristics, the interviewers suggested other characteristics gleaned from the literature on quality filtering, earlier discussions with physicians, and in some cases from earlier interviews.

Using the tapes and the interviewers' notes, a team member created a composite of all of the interviews. This composite was used to develop a survey, a list of forty-two characteristics, which were sent for evaluation to the same clinicians who had been interviewed. (A copy of the survey may be obtained from the authors.)

For the survey, participants were told they had received a bibliography of 200 citations and abstracts of relevant articles, so relevance was not at issue. Respondents were asked to judge the degree to which each characteristic on the list might influence their decision to read a particular article by using an 8-point scale: -1, negative; 0, not important; 1, least important; 2, of little importance; 3, somewhat important; 4, important; 5, very important; 6, most important.

RESULTS

Interviews

The most obvious point revealed by the interviews was the importance placed by the clinicians on the *relevance* of the paper. The interviewers did not ask about relevance because they were seeking to differentiate between articles that were merely relevant and those which were key. However, the clinicians seemed unprepared to begin with the assumption that they were only discussing distinctions among relevant items.

The characteristics presented by participants at the beginning of the interviews were of special interest because their mention was unprompted. The first person interviewed responded to the opening question by stating that his own level of knowledge about a topic greatly influenced what he was likely to regard as key. When other participants were questioned on this point, most agreed with his statement.

Five clinicians said the purpose of the search influenced their decision as to what was key. In discussing the relationship between purpose of the search and characteristics that defined the key article, many indicated that the characteristics seldom varied but that some became more important for certain purposes than others. For example, review articles or articles containing tables and graphs became more important, and more likely to be key, when preparing for teaching than when searching for information on some aspect of patient care.

SURVEYS

One of the most striking aspects of the results was the variability of the responses, both in the interviews and to the survey. Two physicians (a surgeon and an internist) seemed to feel that there were few, if any, features besides the topicality of the information need that influenced their decisions about which articles were key. These clinicians rated very few characteristics at the high end of the scale on the survey. However, others named characteristics such as the institution where the study took place or the presence of a leading authority as an author as important features. In spite of these differences, some agreement emerged. Table 1 lists the forty-two characteristics on the survey with the mean, standard deviation, maximum, and minimum responses for each.

Of most interest are those characteristics that received high, low, or widely varying responses. The characteristic "valid study design" received the highest mean score and was tied for the lowest standard deviation, meaning it was ranked consistently as important. Of the seventeen clinicians, three ranked it as the most important feature, nine ranked it as very important, four ranked it as important, and one ranked it as somewhat important. The clinicians recognized that not all methodologies were applicable to all studies. For example, there are few, if any, randomized controlled trials in genetics. Accordingly, the phrase "valid design" was used to categorize studies, whether or not they were recognized as having a specific methodology, that had qualities the clinicians viewed as valid. The participants said as much in the interviews. Whatever they perceived as the most rigorous method for their specialty, the clinicians were interested in studies with what they considered valid designs.

The second characteristic about which there was little disagreement (the item tied for the lowest standard deviation) was "a large population." All clinicians ranked this characteristic between important and very important. Seven ranked it as very important, six ranked it as somewhat important, and four ranked it as important. Such agreement is noteworthy given the differing specialties represented by the clinicians and the generally wide variation among their responses. This result suggests that most clinicians outside the survey group would find this characteristic important.

A valid design and a large population were the only two items on the survey that all respondents ranked as important or higher. These responses were confirmed by what the health care professionals said during the interviews.

The characteristic receiving the second highest mean score (4.7) was the "randomized controlled trial." Four clinicians ranked this characteristic as the most important while another seven ranked it as very important. Only two ranked it as less than important and the remaining four ranked it as important. In interviews, clinicians in surgery and genetics noted

Table 1
Descriptive statistics for characteristics listed on survey

Characteristic	Mean	Standard deviation	Maximum*	Minimum†
Study has a valid design	4.8	0.8	6	3
Randomized controlled trial	4.7	1.1	6	2
Prospective study	4.5	1.1	6	2
Author well-known on topic	4.3	1.3	6	2
Large population in study	4.2	0.8	5	3
Journal refereed	4.2	1.5	6	0
Practice guideline	4.2	1.6	6	1
Long-term follow-up	4.1	1.3	6	2
Article contains detailed diagnosis and treatment	4.1	1.6	6	1
Review article	4	1.5	6	1
Journal prestigious in all of medicine	3.9	1.2	5	0
Journal prestigious in specialty	3.8	1.3	5	0
Consensus statement	3.6	1.4	6	1
Prestigious institution	3.6	1.5	6	1
Study population is same age	3.5	1.7	6	1
Meta-analysis	3.4	1.3	6	1
Multi-institutional study	3.2	1.5	5	1
Study population is same gender	3.2	1.8	6	1
Study supported by a national agency	2.9	1.4	5	0
Article is practice-based	2.9	1.4	5	0
Author from same specialty	2.6	1.5	6	0
Study conducted in U.S.	2.5	1.8	5	0
Retrospective study	2.2	1.5	4	−1
Editorial	2.2	1.7	6	0
Article contains tables, graphs, etc.	2.1	1.4	4	0
Study conducted with out-patient population	2.1	1.7	5	0
Study reports negative results	2	1.8	5	−1
Article prompted later letters	1.9	1.5	4	−1
Study conducted in Canada	1.9	1.7	5	0
Basic science study	1.9	2.1	5	−1
Study conducted with in-patient population	1.8	1.5	4	0
Study conducted at a single institution	1.7	0.9	3	0
Study conducted in Western Europe	1.6	1.5	5	−1
Study conducted in a public institution	1.2	1.5	4	0
Study conducted in a private institution	1.2	1.5	4	0
Case report	1.1	1.1	3	−1
Study supported by a drug company	1	1.5	3	−1
Study conducted in Third World	1	1.6	4	−1
An animal study	0.9	1.7	3	−1
Journal from nursing, allied health, or dentistry	0.8	1.7	3	−1
Author from nursing, allied health, or dentistry	0.7	1.6	3	−1
Letter	0.4	1.5	3	−1

* Maximum indicates the highest ranking given by any of the respondents.
† Minimum indicates the lowest ranking given by any of the respondents.

that there were few such studies in their areas, but that when they appeared, the physicians viewed them as important.

The characteristic ranked third in mean score is also part of what one of the clinicians called "the holy trio" (randomized, prospective, and multicenter studies) in the interview. The characteristic "prospective study" had a mean score of 4.5 and the same standard deviation (1.1) as the randomized controlled trial. Nine of the clinicians ranked it as very important or most important (three as most important and six as very important), and only one ranked it as being of little importance. "Multicenter studies" appeared to be less important to these clinicians. The mean score was 3.2 and no one ranked it as most important. In the interviews, these characteristics—randomized, prospective, and multicenter—were repeated almost as a litany, but the written responses suggested that the multicenter study was the least important of the three to these clinicians.

At the other end of the scale were characteristics that could be considered negative influences on article selection. For three of the characteristics, the rating chosen most often was −1 (the lowest). Articles from nursing, dentistry, or allied health journals, animal studies, and letters were all rated by more than half of the clinicians as negative on the scale. Authors from nursing, dentistry, or allied health and articles from the third world also received many negative rankings.

LIMITATIONS

This study was exploratory and the sample was small. It seems likely that all, or at least most, of the characteristics likely to influence clinicians' choice between key and relevant items have been identified. It is not clear, however, based on this small sample, whether other clinicians would rank the characteristics the same way. A survey of a larger, random sample might be valuable to clarify the rankings.

Given the size of the sample, it was not possible to determine whether the purpose of the search would change the ranking of characteristics significantly. From the interviews it was clear that, while respondents cited many of the same characteristics as important, the ranking of these characteristics might change with the purpose of the search. A survey of a larger sample also might clarify these differences.

In the survey, the authors asked the clinicians to rank each characteristic independently. In the interviews, the clinicians indicated that they often saw characteristics occurring together, as in the "holy trio" (randomized, prospective, and multicenter). A study that examined the characteristics in relation to one another could reveal which, if any, other combinations of characteristics influenced clinicians.

No attempt was made to query the clinicians about the date of publication. The authors assumed that in clinical medicine, the timeliness of an article was important.

DISCUSSION

While the population for this study was small, it was also diverse. The participants varied in department, rank, specialty, and gender. In spite of these variations, some agreement did emerge. Barry indicated that, in eliciting the factors that determined relevance, a level of redundancy was reached with the ninth respondent; that is, no new factors were listed after the first nine persons were interviewed. The authors of the present study also felt that redundancy was reached early in the interviews. It is likely, therefore, that if the clinicians surveyed were typical, then the characteristics of interest to clinicians have been identified. The characteristics identified as important are similar to those that Florance found clinicians using to judge relevance [29]. A larger, random sample would be needed to ensure that these clinicians were representative of the larger population.

Without being asked, the health professionals in this study stated that topicality was the most important factor in deciding what to read. This emphasis on topicality suggests that the pursuit of topical features is still an important first step in finding information for clinicians; quality filters should be used after all the topical aspects of an information need have been addressed.

However, clinicians also use a number of additional parameters in deciding which articles to pursue. Further research is needed to learn if clinicians really do choose articles with the characteristics they have described as important for key articles. As database designers and searchers seek ways to lighten the burden of information overload for health care providers, it may be time to consider the role of these non-subject parameters in more depth. Additional research may be in order to determine which characteristics are most useful to the greatest number of users. Once identified, characteristics not already incorporated into databases as searchable elements might be given that status, and their availability publicized or built into searching software.

Findings from this study indicate that the attention given to the identification of studies of methodological rigor is not misplaced. Many of the characteristics cited by clinicians are related to the quality of study design, and several have been included as searchable elements in electronic databases. Both health professionals who do their own searching and search intermediaries are being urged to use them [30–31].

A number of the characteristics included in the survey, however, are not available as elements for searching. Table 2 indicates the availability of the forty-two features in the MEDLINE database. For instance, MEDLINE does not identify refereed journals, but this capability currently is incorporated into another health-related database, Cumulative Index to Nursing and Allied Health Literature. Determining peer review policies in medical journals is not a simple matter. To provide a reliable, searchable marker for refereed status, a database designer would require clear statements of peer review policies from all journals. For some journals, even among those included in MEDLINE, such statements are not available [32].

The identification of articles that provide details about patient management is a much knottier problem. The literature indicates that respondents in the present study are not alone in recognizing the need to identify such articles. Wilczynski et al. [33] assessed means of identifying research studies dealing with clinical aspects of disorders, and McKibbon suggested methods for retrieving such items for different types of studies [34–35]. Slawson outlined methods for distinguishing between "patient-oriented evidence that matters" and disease-oriented evidence [36]. Ironically, articles that are primarily about clinical problems, regardless of their overall quality, are seldom easy to identify in medical databases. Although National Library of Medicine indexers use many clinical terms—etiology, therapy, drug therapy, diagnosis—as subheadings, those terms are often applied so liberally that it remains difficult to recognize articles in

Table 2
Availability on MEDLINE of survey characteristics*

Article characteristic	Search availability
Study has a valid design	No
Randomized controlled trial	Publication type and MeSH term for random allocation
Prospective study	There is a MeSH term for this feature
Author well-known on topic	No
Large population in study	Not on MEDLINE (EMBASE indicates those studies with a population of fifty or more)
Journal refereed	Not on MEDLINE (CINAHL notes this feature)
Practice guideline	Publication type
Long-term follow-up	MEDLINE indicates a follow-up study but does not indicate the length of the follow-up
Article contains detailed diagnosis and treatment	The subheadings are so liberally applied that they do not really distinguish those with detailed diagnosis and treatment (Section 19.1)
Review article	Publication type
Journal prestigious in all of medicine	Possibly the *Abridged Index Medicus* journals could be used for this purpose
Journal prestigious in the specialty	No
Consensus statement	Publication type
Prestigious institution	No
Study population is same age as clinician	Check tags indicate age groups but are used so frequently they do not always function to distinguish the primary population (Section 18.5)
Meta-analysis	Publication type
Multi-institutional study	Publication type
Study population is same gender	Check tags indicate gender but are used so frequently they do not always function to distinguish the primary population (Section 18.5)
Study supported by a national agency	MEDLINE has check tags to indicate support from the U.S. government
Article is practice-based	No
Author from same specialty	No
Study conducted in U.S.	Geographic terms are available but are not always assigned in MEDLINE
Retrospective study	MeSH term for this feature
Editorial	Publication type
Article contains tables, graphs, etc.	Not on MEDLINE (indicated on CINAHL or Health Periodicals Database)
Study conducted with out-patient population	The MeSH term is not always applied
Study reports negative results	No
Article prompted later letters	The existence of comments on MEDLINE could be used as an indicator of this feature
Study conducted in Canada	Geographic terms are available but are not always assigned in MEDLINE (Section 36.1–36.5)
Basic science study	No
Study conducted with in-patient population	The MeSH term is not always applied
Study conducted at a single institution	No
Study conducted in Western Europe	Geographic terms are available but are not always assigned in MEDLINE
Study conducted in a public institution	No
Study conducted in a private institution	No
Case report	Check tag
Study supported by a drug company	The tag SUPPORT, NON-U.S. GOV'T includes drug company sponsorship but many other kinds of support also
Study conducted in Third World	Geographic terms are available but are not always assigned in MEDLINE
An animal study	Check tag
Journal from nursing, allied health, or dentistry	The subfiles in MEDLINE could be used to eliminate these journals
Author from nursing, allied health, or dentistry	No
Letter	Publication type

* Comments on the applicability of certain features are the opinions of the authors. The number in parentheses indicates the section of the *MEDLARS Indexing Manual*† where the topic is discussed.
† *MEDLARS Indexing Manual.* Bethesda, MD: National Library of Medicine.

the MEDLINE files that emphasize patient management.

In most medical databases, the size, age, and gender of the primary population discussed in the article cannot be determined easily. Like the clinical subheadings, age and gender indexing terms in the MEDLINE file are applied so liberally that identification of the primary population is often difficult. Such an indexing approach is required to accommodate occasions when comprehensive retrieval is necessary, but it becomes a deterrent in the identification of studies of specific populations. Only one database, EMBASE, allows searchers to identify studies with fifty or more subjects. This information is often included as a separate section in structured abstracts. Perhaps searchers could take advantage of this fact in searching for articles when age, gender, or study size is important.

Except on an individual basis, it is difficult to see how author or institutional prestige could be used in quality filters by searchers. However, the health care professionals in the present project clearly were influenced by these factors; many mentioned them as influential without prompting. They indicated that this information needs to be visible when a citation is presented to clinicians. Authors, of course, appear in all viewing and printing formats in medical databases. Institutional affiliation may or may not be visible.

It also may be useful to identify characteristics of the least important articles—those least likely to be regarded as key. Several of the characteristics with very low ratings might be considered as candidates for exclusion, particularly when the volume of literature is high and the application of positive filters not productive. Arriving at high-quality articles by a process of elimination seems a dubious approach, at best. However, it would be one way of reducing information overload. Means for identifying and thus eliminating case reports, letters, editorials, and specific journals exist in most medical databases. How-

ever, identifying basic science studies or work supported by a pharmaceutical company might prove more difficult. Additional research on characteristics most likely to be used for exclusion could be useful, but it is not as vital as improving positive attributes.

Regardless of the basic structure of a medical journal database (that is, whether it is designed for traditional Boolean searching or for non-Boolean algorithms and ranked output), research on these non-subject indicators could provide valuable information for system designers.

CONCLUSIONS

Among the clinicians surveyed, topicality was the most important feature of an article, but factors beyond topicality clearly influenced judgments as to what constituted an important article. It also appeared that some factors became more or less important according to the expected use for the information retrieved. That is, some characteristics became more important when an article was to be used for teaching rather than for patient care. The importance given to certain attributes is echoed in other published work and highlights the need for more intensive investigation of non-subject indicators used as search parameters. Improved searching capabilities might help to reduce significantly the clinician's information overload.

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