1 Information-seeking by general practitioners: an overview

Research is the process of going up alleys to see if they are blind
Marston Bates, 1967

ABSTRACT

General practitioners’ roles and related tasks undertaken in the course of daily practice prompt specific information needs, which in turn give rise to an information-seeking process. The environment in which this takes place is characterized by an information overload as a result of the information explosion of the last decades. In this introduction, we will first discuss the influence of the information explosion on tasks of general practitioners. Then we will discuss some aspects of information needs and information-seeking on the basis of the model of Leckie. Finally, we will describe some characteristics of the group of Dutch general practitioners who took part in our studies.

INFORMATION EXPLOSION

We experience the world around us as random, and we use information to reduce our sense of disorder so that we can cope with the randomness. However, in our society, and especially in the medical sciences, the rapidly increasing volume of information influences the way physicians seek information. It may be that the volume of medical literature has become unmanageable.1,2 We will look at the impact of this problem on retrieving and selecting literature; on the way doctors practise medicine, and on medical education.

To illustrate the size of the information explosion, we have measured the increase of information in three ways: the number of biomedical databases, the number of biomedical journals, and the number of articles on general practice indexed in Medline, the medical database most used by physicians. Figure 1 shows that the number of biomedical databases had increased from 433 in 1988 to 1154 in 1997, a growth of 267% in 10 years.3

The increase in the number of biomedical journal titles since 1870 has been exponential, with a doubling time averaging 19 years (figure 2).4 An estimated two million articles are published in the biomedical literature each year.5 For a physician to read everything of possible biomedical relevance, it would be necessary to read about 6,000 articles a day.6 Although the volume of medical information is increasing, the ratio of researchers and publications has not changed.7 In part, the information explosion can be attributed to more researchers who publish.
Fig. 1. Growth in the number of biomedical databases.³

![Graph showing growth in the number of biomedical databases from 1988 to 1996.]

Fig. 2. Growth in the number of biomedical journals.⁴

![Graph showing growth in the number of biomedical journals from 1860 to 2000.]

The third measure was the number of articles on general practice indexed in Medline. Medline is the most widely used biomedical database. It is produced by the U.S. National Library of Medicine (NLM). It indexes 3900 biomedical journals, and contains more than 6.8 million citations to the world’s journal literature. The increase of indexed articles was reflected in the mean weight of the printed Index Medicus, which corresponds with Medline. The mean weight of the Index Medicus remained steady at approximately two kg from 1879 to the mid-1940s, when it began to grow at an exponential rate. Between 1955 and 1978 its weight increased more than sevenfold.

Figure 3 shows that the number of articles indexed in Medline with the Medical Subject Headings "Family Practice" or "Physicians, Family" has doubled in 30 years.

Fig. 3. Growth in the number of articles indexed in Medline with the Medical Subject Headings "Physicians, Family" or "Family Practice". Search performed in December 1998 on Silverplatter, Winpsirs version 2.1

The information explosion also has an impact on retrieving and selecting the literature. Firstly, methods of information retrieval have changed enormously due to the emergence of sophisticated information technology. Whereas the printed Index Medicus was the preferred information source for retrieving information until around 1975, the electronic version Medline has now replaced it. In the early stage of this change Medline was made available by computer host organisations such as DIMDI, later Medline was distributed on CD-ROM, and during the nineties Medline became free available on the Internet.

A second consequence of the information explosion is that selecting the appropriate literature has become not only more complex but also more important because of the demands of evidence-based medicine. Among all the published articles one needs to find those research studies that are based on sound methodology.
Evidence-based medicine is an approach to clinical practice in which clinicians base their decisions and actions on appropriate evidence from health care research literature, as well as on their clinical expertise and the circumstances of the patient. Literature research needs to satisfy the same criteria as research in general, including validity, reproducibility and verifiability.\textsuperscript{11} This need for scientifically based literature searching became obvious in the development of the systematic review.\textsuperscript{12} Whereas a narrative review is based on the author’s authority, systematic reviews involve the application of scientific strategies, in ways that limit bias.\textsuperscript{13} For example, it is known that studies yielding statistically significant differences between groups are about two-and-half times more likely to be reported than those in which no such differences are found.\textsuperscript{14} To minimise publication bias, both published and unpublished studies need to be included in a systematic review, and the criteria for inclusion and exclusion must be accounted for.\textsuperscript{13} Other features that need to be included in a systematic review are a clearly stated question; the sources used and the search performed to detect relevant studies; the appraisal of studies; the synthesis of studies; and, usually, evidence-based inferences. Systematic reviews can help practitioners to keep abreast of the medical literature by summarizing large bodies of evidence and helping to explain differences among studies on the same question.\textsuperscript{13} The Cochrane Collaboration collects and writes systematic reviews, and publishes them in an electronic journal. This journal, the Cochrane Library, includes regularly updated full-text systematic reviews on the effects of health care with critical appraisal by experts.\textsuperscript{15}

The information explosion has its impact on the way doctors practise medicine. Owing to the information explosion, physicians find it hard to keep up to date with new developments.\textsuperscript{2} Many solutions have been proposed: computerization; effective instruction in use of information sources; greater library accessibility; a change in journal articles’ content and structure; development of guidelines based on sound research;\textsuperscript{16} and abstracts of critically appraised journal articles. Supporters of evidence-based medicine focus on evidence as a basis for patient care decisions.\textsuperscript{17-20} This evidence may be obtained from several sources, such as the patient’s history or examination, laboratory data, and the medical literature. Evidence-based medicine is based on five principles,\textsuperscript{21} namely: formulating the question; searching the literature for relevant information; selecting the articles; appraising the evidence for validity and usefulness; and, applying the evidence in everyday practice. Critically appraised articles are found in the journals Evidence-based Medicine and ACP Journal Club (together published as the electronic version Best Evidence\textsuperscript{22}), and in the Journal of Family Practice, named POEMS (Patient-Oriented Evidence that MatterS).\textsuperscript{23}

Finally, the information explosion has its impact on medical undergraduate and postgraduate education. The doubling time of the biomedical knowledge base is currently about 19 years,\textsuperscript{4} meaning that medical knowledge will increase fourfold during a professional life time. Consequently, medical students cannot learn everything they need for their professional career during their undergraduate days. In the next century, society will demand doctors with different competencies and skills. For example, doctors will be expected to cope efficiently with the information overload, to take advantage of new
technologies including information technology, and always to work as efficiently and effectively as possible. Modern insights into the nature of teaching and learning and the results from experiments with new instructional methods and approaches are now implemented in medical education to meet these demands. One popular instructional method is problem-based learning. It emphasizes studying in small groups in which the students define their own learning needs and how to fulfill them: learn how to learn, so that they will be able to keep up to date with new developments later in their career. Being able to search the literature quickly and effectively plays a central role in learning how to keep up to date. It will become evident that effective doctors are not those who "have most knowledge", but those with a sound core knowledge who can find out what they need to know quickly and effectively.24 Not only medical students need to develop literature searching skills, but practising doctors as well. Postgraduate medical training therefore needs to include library instruction with a focus on searching, selecting and appraising the medical literature.

INFORMATION NEEDS AND INFORMATION-SEEKING

In this environment with an overload of information, when general practitioners perceive information needs, they have to adopt some kind of information-seeking behaviour. Leckie has developed a model of information-seeking by professionals,25 and we will use this to discuss several components of information-seeking by general practitioners: work roles and associated tasks of general practitioners, characteristics of their information needs, and three factors affecting information-seeking - sources, awareness, and outcomes (figure 4).

Fig. 4. Leckie’s model of the information-seeking of professionals.25
Work roles and tasks
General practitioners have several roles and related tasks from which their information needs originate: service provider, learner, researcher, educator, and administrator/manager. General practitioners spend the majority of their time in the role of direct service provider. The tasks associated with patient care create their greatest needs for information - information mainly on treatment and diagnosis. The general practitioner also has a role of learner or student, within which the specific tasks are professional reading, or attending conferences and meetings to stay abreast with new developments in health care. In continuing medical education, Welsh general practitioners considered that the most valuable educational activities occurred within the practice, the most valued being contacts with partners. Tasks associated with the role of researcher involve writing publications and speaking at conferences. The role of researcher needs the use of many and complex information sources, including electronic sources. Tasks associated with the educator role include planning and curriculum development. In this role the general practitioner needs information to teach medical students and general practice trainees. Finally, the general practitioner must also be an administrator and manager of his own practice.

Characteristics of information needs
The characteristics of the information needs of general practitioners are mainly determined by work roles and tasks.
We define information needs as the recognition of the existence of uncertainties. These uncertainties are not arbitrary, but relevant to practical decisions. The variables that influence the information needs of general practitioners include individual demographics (age, career stage, geographic location), context of the situation that prompts the information need, frequency of need, predictability (expected or unexpected) and complexity. The perceived information needs of general practitioners give rise to information-seeking behaviour. Connelly distinguished two forms of information-seeking: information-seeking behaviour which fulfilled an immediate need, and knowledge-gathering behaviour which added to the practice knowledge base for future use (continuing medical education). In addition to immediate needs and future needs, some researchers make a distinction between levels of perception. In this view, information demands (or, wants) were articulated, conscious needs, and unrecognized needs were needs that might not be expressed as grammatical questions, or even not be verbalised at all. In chapter 3 and 4 we discuss general practitioners’ recognized needs, including pursued and satisfied needs.
General practitioners use five types of information for patient care: patient data, population statistics, medical knowledge, logistic information, and social influences. Patient data refers to information about a specific person, and includes items of a patient’s history, observations from physical examination, and results of diagnostic testing. Population statistics refer to aggregated data about populations of patients, such as prevalence. Medical knowledge refers to general information known about health and disease, the body of scientific knowledge of medicine. This is the medical literature, generalised by scientists, consisting of the primary, secondary and tertiary literature. Primary literature is defined as the original reports of scientific findings; secondary literature as the bibliographic indexes to the primary literature; and tertiary literature as the summaries and elaborations of the primary literature.
literature as the vast summary of the primary literature, from review articles to textbooks and, more recently, hypertexts and practice guidelines. Logistic information refers to local knowledge about how to get the job done, often specific to a practice setting or payment mechanism. An example of this type of information is the following question: "Which forms must be completed to obtain a needed service?". Finally, social influences refers to knowledge about the expectations and beliefs of others, especially colleagues.

The main type of information being considered in our studies published in this thesis is medical knowledge. It may exist as original research and systematic overviews in the medical literature. It may consist of the classic descriptions of disease pathophysiology, diagnosis, and treatment found in standard textbooks. It may take the form of informal experience accumulated by practitioners.

**Sources of information**
The first factor that affects information-seeking is the information sources used by the general practitioner. Those used widely by general practitioners are human based information sources i.e. personal communication, and private books. Electronic information sources were used little. Problems with using electronic sources on the World Wide Web in primary care are a lack of time and an efficient use of a new vocabulary. It seems important that users need to be involved in the development of new electronic information systems.

**Awareness of information**
The second factor is the awareness of information. Direct or indirect knowledge of various information sources and perceptions about the process, or about the information retrieved, play a crucial role in the overall information-seeking process. Familiarity, timeliness, cost, quality and relevance of the information are also considered as factors influencing information-seeking.

**Outcomes**
The third factor is the outcomes of the information-seeking. Outcomes are the results of the information-seeking process. The optimal result is that the information need is met. If the need is not satisfied, further information-seeking is required, and through feedback the definition of the information need may be sharpened or changed. It is also possible that an outcome from one task associated with a particular role may quite unexpectedly benefit the professional in another role.

The outcome of the information-seeking is the end point of using an information source, but not the end of using the information. In evidence-based medicine, physicians with clinical information needs are advised to evaluate high-quality original research critically in order to practise evidence-based medicine. The Evidence-based Medicine Working Group developed "User guides to the medical literature" published as a series in the Journal of the American Medical Association of which the first appeared in November 1993. Some researchers have underlined the need for critically appraising the literature, but recognised that this is unrealistic for busy clinicians. The following alternatives have been proposed: using guidelines emphasizing Patient-Oriented Evidence that MatterS (POEMS); making a balance between the message
and the design of the study; reading abstracts of critically appraised journal articles; using the READER method for critical reading; and developing a medical database with answers of self-perceived information needs and reference citations supporting the answers. Within evidence-based medicine, the information seeker has reached his or her goal only after having critically appraised the selected literature, applied the information in practice, and evaluated the process of information-seeking.

GENERAL PRACTITIONERS

The results of our studies were influenced by the type of subjects we examined. Our study deals with Dutch general practitioners and their information needs. Their information needs are influenced by the general practitioner’s role in the Dutch health care system. We will explain this first, then describe the libraries available for general practitioners.

Different terms for general practitioner are in use. In the Netherlands the Dutch word for a general practitioner is "huisarts", this is literally translated "home physician". In the United Kingdom the titles are family doctor, or, general practitioner (GP). In the United States the common terms are family physician, and primary care physician, which includes family physicians, general internists, gynecologists, and pediatricians. The specialized physician can be translated as medical specialist (The Netherlands), consultant (UK), and specialist (USA).

Dutch general practitioners are federated with the Royal Dutch Medical Association (KNMG) as the National Association of General Practitioners (LHV). The scientific institution is the Dutch College of General Practitioners (NHG).

The Dutch health care system, including the general practitioner, has several characteristics. General practitioners and medical specialists are two different groups of professionals. They work in primary health care in the community, whereas medical specialists work in secondary health care, mostly in hospitals. In contrast to the situation in the USA, Dutch general practitioners never work in hospitals, and specialists almost never work in primary care. In the Dutch health care system, the general practitioner acts as a gatekeeper. The general practitioner’s role is crucial for an effective and affordable health care system. Recourse to health care is high unless there is a financial barrier.

Second, the Dutch general practitioner provides continuity of care by caring for patients of all ages, and deals with all kind of problems, severe or mild, acute or chronic and in any phase. In addition, the general practitioner (or his locum, or, substitute) is available 24-hours a day.

Third, the Dutch general practitioner cares for a population that is clearly defined by registration. As a result, the general practitioner provides long-term care, not seldom lifelong.

Finally, many Dutch general practitioners work in solo practices (in 1996: 49%) or in duo or group practices (31%). Only 9% of the Dutch general practitioners work in health care centers (personal communication from the Netherlands Institute for Research of Health Care, Utrecht, the Netherlands, March 1996).

For their information needs Dutch general practitioners may turn to their private libraries. Next, most local hospitals to which general practitioners refer patients, also
have medical libraries, most of them managed by professional librarians. More specialized are the libraries of University Departments of General Practice, sometimes incorporated within the Medical Centre’s library or University Library. These libraries are not often close to the general practitioners’ offices, and this will be a barrier for use. Nationally, the Netherlands Institute for Research of Health Care (NIVEL) in Utrecht, provides medical information on demand for general practitioners from their own book and journal collection and bibliographic databases. The Royal Netherlands Academy of Arts and Sciences (KNAW) in Amsterdam owns the largest medical journal library in the Netherlands, and provides journal articles to general practitioners.

In conclusion, the model of Leckie of the information-seeking of professionals is an appropriate frame to explain the information-seeking by general practitioners. It was intended to capture the complexity of the information-seeking activities of professionals, including general practitioners. General practitioners are gatekeepers within Dutch health care, and they are expected to manage a wide range of medical problems. The computerization of 93% of the Dutch general practitioners, and the Dutch general practitioners’ characteristics may influence their information needs and information-seeking.

REFERENCES


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