How do primary care physicians seek answers to clinical questions? A literature review ℞

By Herma C. H. Coumou, MD, PhD
hcoumou@xs4all.nl

AGIS Zorgverzekeringen and
Second Opinion Practice
Zaanstraat 137
1013 RW Amsterdam
The Netherlands

Frans J. Meijman, MD, PhD
fj.meijman@vumc.nl

Department of Metamedica/Medical Humanities
VU University Medical Centre
P.O. Box 7057
1007 MB Amsterdam
The Netherlands

Objectives: The authors investigated the extent to which changes occurred between 1992 and 2005 in the ways that primary care physicians seek answers to clinical problems. What search strategies are used? How much time is spent on them? How do primary care physicians evaluate various search activities and information sources? Can a clinical librarian be useful to a primary care physician?

Methods: Twenty-one original research papers and three literature reviews were examined. No systematic reviews were identified.

Results: Primary care physicians seek answers to only a limited number of questions about which they first consult colleagues and paper sources. This practice has basically not changed over the years despite the enormous increase in and better accessibility to electronic information sources. One of the major obstacles is the time it takes to search for information. Other difficulties primary care physicians experience are related to formulating an appropriate search question, finding an optimal search strategy, and interpreting the evidence found. Some studies have been done on the supporting role of a clinical librarian in general practice. However, the effects on professional behavior of the primary care physician and on patient outcome have not been studied. A small group of primary care physicians prefer this support to developing their own search skills.

Discussion: Primary care physicians have several options for finding quick answers: building a question-and-answer database, consulting filtered information sources, or using an intermediary such as a clinical librarian.

INTRODUCTION

Primary care physicians are not all knowing. Although familiar with about 400 diseases that are frequently encountered in general practice, they are not expected to have directly reproducible knowledge of rare diseases [1], specialist problems, or the quick succession of technological developments. Primary care physicians nevertheless want to keep up with clinical evidence for their benefit, their patients' benefit, and communication with their colleagues.

A review of the international literature in the period 1975 to 1992 showed that primary care physicians

℞ This article has been approved for the Medical Library Association's Independent Reading Program.

Table 1
Studies included in review

Author(s)	Ref. nr.	Method	Disciplines (N)	Country	Outcome measures
McColl et al. 1998	[20]	Questionnaire	PCPs (302)	UK	Attitude to evidence-based medicine (EBM)
Verhoeven et al. 1999	[22]	Questionnaire	PCPs (226)	Neth.	Information needs/use
Short 1999	[19]	Questionnaire	PCPs (131)	US	CD-ROM use
Wilson 1999	[25]	Questionnaire	PCPs (160), practice nurses (96)	UK	Internet: use, attitude
Kalsman et al. 2000	[18]	Questionnaire	PCPs/specialists (250)	US	Internet: use, obstacles
Barry et al. 2001	[27]	Questionnaire	PCPs (299)	US	Effect of summaries
Gorman 2001	[4]	Questionnaire	PCPs/specialists (486)	US	Information: needs
Williams et al. 2001	[21]	Questionnaire	PCPs (186)	Aus.	Internet: use, attitude
Wilson et al. 2001	[11]	Questionnaire	1,406 staff in primary care (502 PCPs)	UK	Internet: use, attitude
Cullen 2002	[24]	Questionnaire	PCPs (294)	N. Zeal.	Internet: use, skills
Magrabi et al. 2005	[13]	Questionnaire	PCPs (193)	Aus.	Quick Clinical, online system use
Ely et al. 1992	[16]	Observation	PCPs (30)	US	Information: needs
Ely et al. 1999	[7]	Observation	PCPs (103)	US	Analysis of questions
Gorman et al. 1994	[8]	Interview	PCPs/specialists (49)	US	Searches by clinical librarians
Gorman et al. 1995	[6]	Interview	PCPs/specialists (49)	US	Information seeking: reasons
Chambliss et al. 1996	[10]	Interview	PCPs (9)	US	Information seeking: time spent, cost
Barrie et al. 1997	[12]	Interview/observation	PCPs (27)	Aus.	Number of questions, answering rate
Verhoeven et al. 1997	[17]	Interview	PCP-researchers (8), psychologists (1), information-specialists (2)	Neth.	Method of searching literature
Ely et al. 2002	[26]	Qualitative study	PCPs (23), clinical librarians (2)	US	Obstacles to answering questions
Alper et al. 2001	[9]	Comparative study	PCPs (2)	US	Use of electronic databases
Verhoeven et al. 2000	[3]	Comparative study	PCPs (87), other professionals (16)	Neth.	Effectiveness of searching method
Smith 1996	[5]	Literature review	13 studies	UK	Information: needs, type
Westberg et al. 1999	[14]	Literature review	368 papers	US	Information: needs, source, obstacles
Dorsch 2000	[15]	Literature review	20 studies	US	Information: needs, source, obstacles, use

PCPs = primary care physicians.

searched for clinical information predominantly through personal contacts with colleagues, followed by reading of books and journals. Seldom did they consult electronic databases [2]. To what extent have primary care physicians changed their methods of searching for information since the direct availability of online medical journals and bibliographic databases through the Internet?

The authors reviewed the recent literature on the subject to answer the following questions:
1. How do primary care physicians seek clinical information?
2. Which strategies and sources do they use?
3. How time consuming are these?
4. How do primary care physicians evaluate their strategies and information sources?
5. Can a clinical librarian take over (part of) this task from a primary care physician?

METHODS

We systematically searched the following sources: MEDLINE/Pubmed, Embase, Web of Science, Cochrane database, and the Dutch medical journals *Huisarts en Wetenschap* and *Nederlands Tijdschrift voor Geneeskunde*. Moreover, we used the ''snowball'' method: going through references of papers already included. This search was done in April 2005. We used the following inclusion criteria: original research reports and (systematic and nonsystematic) literature reviews that discussed the searching behavior of primary care physicians in English or Dutch and were published after 1992.

The search strategy using Medical Subject Headings (MeSH) and free-text words was: (family doctor OR family physician OR family practice OR family practitioner OR family medicine OR general physician OR general practice OR general practitioner OR primary care OR primary health care OR rural physician OR rural practice OR health professional OR health care provider) AND (literature OR medical literature OR literature search OR information need OR information seeking OR health information OR databases OR electronic databases OR internet OR information retrieval OR bibliographic retrieval OR decision making).

RESULTS

We did not find any systematic reviews. We found research studies using questionnaires, observation, and interviews (18); qualitative (1) and comparative (2) studies; and reviews (3). The included studies are shown in Table 1. More than half of the studies were from the United States (13). Others were from the United Kingdom (4), The Netherlands (3), Australia (3), and New Zealand (1).

Most studies involved primary care physicians working in nonacademic settings. Seven studies also included medical specialists and other health professionals (such as practice nurses, psychologists, information specialists) working in primary care. In two of these studies, the results concerning primary care physicians were not reported separately [3, 4].

The number of participating primary care physicians varied from 2 to 1,000. The response rates varied from 45% to 100%.

Information-seeking behavior of primary care physicians

The wide variation of average number of questions generated by primary care physicians per consultation

(0.07–1.85) depended on the work setting (rural versus city, small or solo practice versus large practice), the definition of a question, and the methods used (self report, interview, observation) [5].

The percentage of questions that actually led to information seeking also varied. Three US studies with primary care physicians reported percentages of 30% [6], 36% [7], and 57% [4], respectively. Independent predictors of information-seeking behavior seemed to be (1) the urgency of a patient problem and (2) the expectation that a clear answer existed. Two phases of information seeking could be distinguished: whether information is sought at all depends on the expected benefits, and the method of seeking seems influenced by the expected costs of various search strategies [6].

Three US studies showed that a substantial number of primary care physicians' questions could be answered by consulting electronic databases [8–10], that in 56% of the cases they evaluated the answer as relevant, and that in 46% of the cases the answer was judged to be clear cut [8]. When the information sources "colleagues" and "textbooks" were included as well, the percentages of satisfactory answers rose to the range of 70% [11] to 80% [6, 7, 12].

A recent Australian study reported that, in 73% of queries, primary care physicians were able to find clinically useful information *during their routine work,* using the online evidence system "Quick Clinical," specifically designed around their needs. Eighty-three percent of these clinicians were convinced of the potential of Quick Clinical to improve patient care, and one in four users reported direct experience of improvement in care [13]. The true effect is unknown as is the effect of not knowing the answer to a clinical question. Studies convincingly reported difficulties with access to information in general practice [14, 15].

Information seeking by primary care physicians

During the last thirteen years, primary care physicians still telephoned colleagues and consulted textbooks when they needed information [4, 6, 11, 12, 16, 17].

The availability of a computer and access to the Internet in general practice varied across countries [11, 18–21]. In 1996, 93% of Dutch primary care physicians used a computer in their practice but seldom for information-seeking purposes [22]. A questionnaire study revealed that, in 2000, whereas 75% of Dutch primary care physicians had Internet access, only 37% of them also had access in their practice. Emailing with colleagues was most popular, followed by seeking medical information for general professional purposes [23].

In 2002, 48% of primary care physicians in New Zealand report using the Internet to look for clinical information. MEDLINE was their most frequently accessed source [24].

Time consumed by information seeking

A primary care physician is concerned and curious but also busy and pragmatic [6]. One of the salient difficulties primary care physicians consistently reported through the years was the amount of time spent seeking for information [2, 5, 14, 15, 20, 25, 26]. Observation in 1999 showed that US primary care physicians spent on average less than two minutes on a search activity by consulting colleagues or paper information [7]. Another group of US primary care physicians reported in 2001 spending an average of twelve minutes per search, using on average mainly two sources, paper and colleagues. They used electronic sources and library facilities much less often [4].

Primary care physicians' evaluation of retrieved information

Apart from the time factor, primary care physicians also encountered other difficulties when seeking information: a lot of irrelevant material, difficulty finding correct search terms, inefficient indexes in books and journals, and badly organized journal volumes in their own practice [2]. On the basis of 1,101 clinical questions generated by 103 US primary care physicians, a taxonomy was developed of 59 obstacles found when answering questions with evidence. The obstacles were organized according to the 5 necessary steps in asking and answering clinical questions: acknowledge a gap in information, formulate a question, seek relevant information, formulate an answer, and apply the answer to patient care. Six obstacles seemed prominent: (1) the extraordinary amount of time necessary to find information; (2) reformulation of the original question, which often is vague and could be interpreted in multiple ways; (3) discovery of an optimal search strategy; (4) lack of a good source of information; (5) uncertainty as to whether all relevant information has been found; and (6) inadequate synthesis of many pieces of evidence into a clinically useful approach [26].

In 2001, US primary care physicians were presented with three different types of case summaries: a summary with and one without structure and Patient Oriented Evidence that Matters (POEM). The study showed that a change in decision making did not depend on the format of the information but on the validity of the information concerning a clinical problem [27].

Seventy percent of a group of primary care physicians from the United Kingdom expressed the need to be trained in the use of electronic databases in 2001 [11, 25].

Outsourcing of information seeking

While present-day electronic databases are well able to give the answer to questions from primary care, they are often not fast enough to provide specific answers to questions from daily practice. The average amount of time primary care physicians spent online when finding an adequate answer varied from 2.4 to 6.5 minutes [9].

Involving a clinical librarian is one possibility to overcome primary care physicians' lack of time and

skills. Clinical librarians were first used in the early 1970s with the purpose of improving patient care on the basis of finding specific patient-related information in the medical literature. In the last few years, the development of more user-friendly sources has transformed the role of clinical librarians from a supportive one into a proactive one. Under the authority of the doctor, they read and filter information, leading to a synthesized, written summary, relevant for a particular case.

In the United Kingdom in 1997, the ATTRACK project started as a service to primary care physicians, who, after phrasing a clinical question, receive an evidence-based summary within six hours. The service was evaluated by forty participating primary care physicians as useful (31%) to very useful (69%). All primary care physicians experienced the service as fast to very fast and would use it again in the future. The questions forwarded were mainly therapeutic ones (64%); more than half of the doctors said the information provided did change their practice. This result was possibly related to the information being asked at the moment it was needed. The study also showed that primary care physicians preferred to receive evidence-based summaries rather than undertake a search themselves [28].

A similar service was offered to a group of thirty-one Australian primary care physicians and was evaluated in 1998. Nine of them forwarded forty-five clearly defined clinical questions regarding twenty patients. They received an answer within one to twelve days. They were also provided with the citations on which the answer was based, a description of the validity of the evidence, and the possible clinical application, as well as an indication on a four-point scale of the strength of the evidence. The primary care physicians evaluated the answers as clear, readable, and received in time. The given information was said to have changed clinical practice in four of twenty cases. Only four primary care physicians read all of the supplementary articles [29].

Unfortunately, not all primary care physicians are able to contact a clinical librarian in their own neighborhood. A UK study reported 53% of 718 primary care physicians had access to a librarian who did searches on request [11]. A small group of Dutch primary care physician-researchers preferred a help desk (by telephone, mail, or appointment) to answer questions adequately [22].

In Gorman's study, a search by a clinical librarian cost on average $27.37 per question, with an average search time of 45 minutes, resulting in retrieval of 2 to 4 suitable articles in more than half of the cases [8]. Another study also showed that involving clinical librarians took time and was costly: a MEDLINE search took 5 to 60 minutes with an average of 20 minutes for primary care physicians (not including the time needed to evaluate the found literature), and a search in 2 to 4 textbooks took 2 to 12 minutes. According to the primary care physicians, half of their questions (54%) were answered completely or nearly so. Seventy-

one percent of the answers were found in MEDLINE, 20% in textbooks, and 9% in a combination of sources. The cost was $27.50 per question. All 9 participating primary care physicians were prepared to pay for the service. Half of them expected to use the service at least twice a month [10].

In the United Kingdom, the use of a similar service (a primary care physician trained in evidence-based medicine) was less than expected. Only 22% of the primary care physicians to whom the service was offered used it. Without the service, one-third of the questions generated by the primary care physicians would not have been answered [30].

DISCUSSION

Primary care physicians only try to answer a limited number of their clinical questions, and, when they do, they first consult colleagues and paper sources. This practice has not really changed through the years, despite the greater availability of and better access to electronic sources of information. One of the main difficulties primary care physicians report when looking for electronic information is the amount of time it takes. The same barrier is identified for using computerized decision support systems [31] and computerized guidelines [32]. In spite of all, it has been shown that answers can be found to a substantial number of clinical questions from primary care. Primary care physicians also experience difficulties with formulating a good search question, finding an optimal search strategy, and interpreting found evidence.

Clinical librarians take on a more proactive role, where, under the authority of the primary care physician, they read and filter information and create structured syntheses. Some primary care physicians would rather receive these evidence-based summaries than develop search skills themselves. However, not every primary care physician has this service available, and, in some cases, when available, usage levels are somewhat disappointing.

One limitation of the included studies and thus of this review is that the expected positive effects of searching the literature for clinical questions is mainly based on self-reports. No empirical reports are available that show that consultation of literature leads to a lasting change in professional behavior for primary care physicians or to better patient care. The lack of this information is a serious problem, because primary care physicians increasingly have to take into account clinical effectiveness, cost-effectiveness, and value of interventions for their patients.

They also have to cope with patients who themselves more often look for medical information on the Internet and ask the primary care physician to help interpret this information [33]. An important way to accommodate these conflicting demands is to answer clinical questions adequately [34].

What can be done when a substantial portion of the answers do exist but are not sought? Although the information needs of the primary care physician consti-

tute more than specific clinical information—support, confirmation, or approval—we limit ourselves here to clinical information. Busy primary care physicians are described as overloaded with information and often unable to answer their patients' questions. Doctors seem well aware of this gap in their knowledge, but acquiring the information takes time and hinders the patient flow. The obvious practical advantage of ''opinion-based medicine,'' however, blocks professional growth and probably has a negative effect on patient care [35].

The big problem is to get adequate answers fast. By adequate, we mean valid, convincing, and relevant to primary care. Can this problem be solved? Three possibilities seem available.

"The stamp collection"

Many authors recommend formulating short and to-the-point questions, in other words, according to the Patient–Intervention–Comparison–Outcome (PICO) model [36]. Others, however, want primary care physicians to *ask what they want to know* rather than adapt their questions to the available evidence. A step in the right direction would be to systematically register clinical questions and organize these in a database. The Family Practice Inquiries Network <http://www.fpin.org> is an example. Instead of blindly adding to an already overwhelming amount of information, information needs should be documented [35].

Arguments against such a ''stamp collection'' are that they would probably be used only by a small number of doctors and that the application of a question *to any particular* patient would still be limited.

"The expert"

Another possibility for a primary care physician to obtain fast, valid, and relevant information is to consult filtered (electronic) information sources, where the included original studies and reviews have been subjected to explicitly formulated methodological criteria. Examples are ACP Journal Club <http://www.acponline.org/journals/acpjc/jcmenu.htm>, PIER: The Physicians' Information and Education Resource <http://pier.acponline.org>, and Cochrane Library <http://www.update-software.com/publications/cochrane/>.

Objections to this approach are the high aggregation level of research outcomes, the limited relationship of these outcomes to the specific problems of specific individuals, and the interpretation of margins of uncertainty.

"The supporter"

The third possibility is mediation by a clinical librarian or similar service, which means that the labor intensive part of searching is taken over by a primary care supporter who functions proactively and reads, filters, and synthesizes. The information, however, is *asked* by primary care physicians at the moment and in the way they want it. The support of a clinical librarian could partly be given by a query tool like *ask*MEDLINE

<http://askMedline.nlm.nih.gov>, which shows a promising efficiency [37].

Because searching the literature might be faster, cheaper, and sometimes more useful than other procedures such as a blood test or scan, it has been advocated that medical insurances cover this type of ''procedure'' [38].

REFERENCES

1. HOFMANS-OKKES IM, MEYBOOM-DE JONG B, LAMBERTS H, VAN WEEL C. Chronisch zieken met zeldzame ziekten in de huisartspraktijk. NCCZ-reeks Zorg, opvang en begeleiding van chronisch zieken. Zoetermeer, 1994.

2. VERHOEVEN AA, BOERMA EJ, MEYBOOM-DE JONG B. Het gebruik van informatiebronnen door GPs. een literatuuroverzicht. Huisarts Wet 1996;39:12–5.

3. VERHOEVEN AA, BOERMA EJ, MEYBOOM-DE JONG B. Which literature retrieval method is most effective for GPs? Fam Pract 2000;17(1):30–5.

4. GORMAN PN. Information needs in primary care: a survey of rural and nonrural primary care physicians. Medinfo 2001;10(pt.1):338–42.

5. SMITH R. What clinical information do doctors need? BMJ 1996 Oct 26;313(7064):1062–8.

6. GORMAN PN, HELFAND M. Information seeking in primary care: how physicians choose which clinical questions to pursue and which to leave unanswered. Med Decis Making 1995 Apr–Jun;15(2):113–9.

7. ELY JW, OSHEROFF JA, EBELL MH, BERGUS GR, LEVY BT, CHAMBLISS ML, EVANS ER. Analysis of questions asked by family doctors regarding patient care. BMJ 1999 Aug 7; 319(7206):358–61.

8. GORMAN PN, ASH J, WYKOFF L. Can primary care physicians' questions be answered using the medical journal literature? Bull Med Libr Assoc 1994 Apr;82(2):140–6.

9. ALPER BS, STEVERMER JJ, WHITE DS, EWIGMANN BG. Answering family physicians' clinical questions using electronic medical databases. J Fam Pract 2001 Nov;50(1):960–5.

10. CHAMBLISS ML, CONLEY J. Answering clinical questions. J Fam Pract 1996 Aug;43(2):140–4.

11. WILSON P, DROOGAN J, GLANVILLE J, WATT I, HARDMAN G. Access to the evidence base from general practice: a survey of general practice staff in Northern and Yorkshire region. Quality in Health Care 2001 Jun;10(2):83–6.

12. BARRIE AR, WARD AM. Questioning behaviour in general practice: a pragmatic study. BMJ 1997 Dec 6;315(7121): 1512–5.

13. MAGRABI F, COIERA EW, WESTBROOK JI, GOSLING S, VICKLAND V. General practitioners' use of online evidence during consultations. Int J Med Inform 2005 Jan;74(1):1–12.

14. WESTBERG EE, MILLER RA. The basis for using the Internet to support the information needs of primary care. J Am Med Inform Assoc 1999 Jan–Feb;6(1):6–25.

15. DORSCH JL. Information needs of rural health professionals: a review of the literature. Bull Med Lib Assoc 2000 Oct;88(4):346–54.

16. ELY JW, BURCH RJ, VINSON DC. The information needs of family physicians: case-specific clinical questions. J Fam Pract 1992 Sep;35(3):265–69.

17. VERHOEVEN AA, BOERMA EJ, MEYBOOM-DE JONG B. Management of bibliographic information by Dutch researchers in general practice. Fam Pract 1997 Feb;14(1):69–72.

18. KALSMAN MW, ACOSTA DA. Use of the Internet as a medical resource by rural physicians. J Am Board Fam Pract 2000 Sep–Oct;13(5):349–52.

19. SHORT MW. CD-ROM use by rural physicians. Bull Med Libr Assoc 1999 Apr;87(2):206–10.

20. MCCOLL A, SMITH H, WHITE P, FIELD J. General practitioner's perceptions of the route to evidence based medicine: a questionnaire survey. BMJ 1998 Jan;316(7128):361–5.

21. WILLIAMS PA, MAJ SP. Is the Internet an integral part of general practice in Australia? Medinfo 2001;10(pt.1):394–8.

22. VERHOEVEN AA, VAN NOORT CP, BOSVELD HEP, BOERMA EJ, MEYBOOM-DE JONG B. Information use and needs: a survey among Dutch general practitioners. In: Information-seeking by general practitioners. Groningen, Netherlands: Van Denderen BV, 1999.

23. COX D. Uitslag enquête LHV en NHG. huisartsen surfen thuis! Huisarts Wet 2000;43:408–9.

24. CULLEN RJ. In search of evidence: family practitioners' use of the Internet for clinical information. J Med Libr Assoc 2002 Oct;90(4):370–9.

25. WILSON SM. Impact of the Internet on primary care staff in Glasgow. J Med Internet Res 1999 Oct–Dec;1(2):E7.

26. ELY JW, OSHEROFF A, EBELL MH, CHAMBLISS ML, VINSON DC, STEVERMER JJ, PIFOR EA. Obstacles to answering doctors' questions about patient care with evidence: qualitative study. BMJ 2002 Mar 23;324(7339):710–3.

27. BARRY HC, EBELL MH, SHAUGHNESSY AF, SLAWSON DC, NIETZKE F. Family physicians' use of medical abstracts to guide decision making: style or substance? J Am Board Fam Pract 2001 Nov–Dec;14(6):437–42.

28. BRASSEY J, ELWYN G, PRICE C, KINNERSLEY P. Just in time information for clinicians: a questionnaire evaluation of the ATTRACT project. BMJ 2001 Mar 3;322(7285):529–30.

29. HAYWARD JA, WEARNE SM, MIDDLETON PF, SILAGY CA, WELLER DP, DOUST JA. Providing evidence-based answers to clinical questions. a pilot information service for general practitioners. Med J Aust 1999 Nov 15;171(10):547–50.

30. SWINGLEHURST DA, PIERCE M, FULLER JC. A clinical informaticist to support primary care decision making. Qual Health Care 2001 Dec;10(4):245–9.

31. SHORT D, FRISCHER M, BASHFORD J. Barriers to the adoption of computerized decision support systems in general practice consultations: a qualitative study of GPs' perspectives. Int J Med Inform 2004 May;73(4):357–62.

32. BUTZLAFF M, VOLLMAR HC, FLOER B, KONECZNY N, ISFORT J, LANGE S. Learning with computerized guidelines in general practice?: a randomized controlled trial. Fam Pract 2004 Apr;21(2):183–8.

33. DIAZ JA, GRIFFITH RA, NG JJ, REINERT SE, FRIEDMANN PD, MOULTON AW. Patients' use of the Internet for medical information. J Gen Intern Med 2002 Mar;17(3):180–5.

34. DOWIE J. 'Evidence-based', 'cost-effective' and 'preference-driven' medicine: decision analysis based medical decision making is the pre-requisite. J Health Serv Res Policy 1996 Apr;1(2):104–13.

35. ELY JW. Why can't we answer our questions? J Fam Pract 2001 Nov;50(1):974–5.

36. GUYATT G, DRUMMOND R. The Evidence-Based Medicine Working Group users' guides to the medical literature: a manual for evidence-based clinical practice. Chicago, IL: AMA Press, 2002.

37. FONTELO P, LIU F, ACKERMAN M. AskMEDLINE: a free-text, natural language query tool for MEDLINE/PubMed. BMC Medical Informatics and Decision Making [serial online]. 2005;5:5. [cited 22 Sep 2005]. <http://www.biomedcentral.com/content/pdf/1472-6947-5-5.pdf>.

38. KLEMENZ B, MCSHERRY D, GRUNDKE V. Clinical problem solving by computer. J R Coll Physicians Lond 1997 Jan–Feb;31(1):32–6.