

# Promoting GP use of the Internet for evidence based practice: evaluation of an educational program

Debbie Zaks, Peter Schattner, Britt Klein Department of General Practice School of Primary Health Care Monash University

#### Abstract

**Objectives:** To evaluate the impact and acceptability of a training program on effective internet use for general practitioners (GPs).

**Methods**: The training program entitled Chaos to Clarity was developed and piloted in 2005 and was designed to improve GP use of the internet for the purposes of gathering valid and clinically useful medical information. It involved a single session of 45-60 minutes conducted at the GP's practice, and covered information management skills, search skills, structuring clinical questions, navigating through a selection of reputable clinical databases, and case studies.

Thirty three GPs were recruited via three divisions of general practice in Melbourne following invitations via telephone calls, emails and newsletter advertisements. Three project officers were trained in delivering the program which was evaluated quantitatively through pre- and post-program surveys. Qualitative evaluation was also undertaken using semi-structured telephone interviews with 10 GPs and face-to-face interviews with the project officers.

**Results:** Significant pre- to post-program differences were found for GPs' knowledge about preappraised evidence-based medicine resources, frequency of use of the internet for clinical purposes, search skills and confidence, and perceived competence in using clinical databases. Favourable attitudes towards using of the internet to obtain clinical information were also reported by GPs.

Qualitative data indicated that GPs were more likely to put the training into practice outside consultation times (rather than during consultation) as clinical searches take too long and can detract from doctor/patient rapport. GPs reported that they mainly use the internet to access patient education information, and to perform occasional quick searches for unfamiliar medications or illnesses.

**Conclusions**: Training in efficient use of the internet can increase GP knowledge, skill and interest in using the internet to find evidence-based clinical information.

#### Keywords: Internet, continuing professional development, evidence based medicine

### 1. Introduction

The uptake of evidence based medicine (EBM) in general practice has been relatively slow in Australia [1]. This is despite encouragement of general practitioners (GPs) from within the medical profession, as well as the Australian Government, to use the best available evidence to guide clinical decision making [2]. It is generally accepted that the quality of healthcare in general practice would be enhanced by increasing the uptake of 'best available evidence' [3]. The 'classical' EBM approach stipulates that doctors should set aside time to critically appraise the research literature, including systematic reviews, and formulate their own conclusions regarding the most empirically supported, valid and relevant approach to treatment [4]. However, this process appears to be too difficult to put into effect in the time-pressured practice of day-to-day medicine [5, 6].

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Slawson and Shaughnessy proposed a shift from 'classical' EBM to promoting a patient-centered, 'information mastery' approach [7]. This new focus involves teaching GPs to formulate searchable questions, use internet resources and information filters, and navigate to pre-appraised information relevant to specific patients in a timeefficient manner at the point of care. In support of this approach, a survey among GPs found that the only practical way for doctors to answer clinical questions was to rely on pre-appraised information [8].

This 'information mastery' approach underpins internet databases such as the Cochrane Library which includes studies that have been pre-appraised by expert 'knowledge synthesizers'. It has been suggested that such resources highlight a difference between 'doers' of EBM (those who undertake critical appraisal) and 'users' of EBM (those who rely on pre-appraised literature) [9, 10]. However, in a survey of 311 Australian GPs, 22% were aware of the Cochrane Library but only 4% of GPs had ever used it [11]. This finding suggests that GPs may need some training in using internet clinical databases in order to become 'users' ofEBM.

The internet can also help keep GPs up to date with new findings. Traditional approaches to continuing medical education (e.g. attendance at educational meetings) are based on the assumption that something learned now can be applied in practice in the future (so-called 'just in case' learning). An alternative approach, which is facilitated by the use of the internet, is to solve clinical queries as they arise in practice, possibly while the patient is still present. This on-the-job method has been called 'just in time' learning [7]. Given that doctors typically generate around 45 questions about patient care every week [12], the ability to spend a few minutes rapidly obtaining pre-appraised EBM information is now considered a more relevant skill for GPs to learn than the development of critical appraisal skills [13-15].

A qualitative study based on clinical questions formulated by 103 United States physicians revealed the following major obstacles to answering clinical questions: time to find information, finding an optimal search strategy, finding reputable sources of information, uncertainty as to whether all relevant information has been found, and inadequate synthesis of evidence into a clinically pragmatic approach [16]. The difficulties reported by GPs in formulating clear clinical questions have led to the adoption of a patient, intervention, comparison, and outcome (PICO) model of structuring questions.

The use of computers in Australian general practice has increased from 31% in 1997 to 95% in 2002-2003. These trends are consistent with overseas experience [17-18]. Henderson, Britt, and Miller concluded from their survey of 1319 Australian GPs that that further opportunities for the uptake of the new technology in general practice remain [18]. The proportion of Australian GPs with access to the internet has increased from 47% to approximately 70% with approximately half consistently reporting using it to find medical or clinical information [19, 20]. However, this proliferation of internet access does not necessarily reflect a corressponding increase in GPs' skills in rapidly navigating the internet for specific clinical information. Cullen found that internet search skills of GPs in New Zealand were elementary, and when full text articles were not available, the GPs surveyed would rely on the abstracts alone [21]. Cullen concluded that practitioners urgently require training on how to use the internet to look for evidence-based information. Similarly, a recent UK-based study among primary care practitioners identified lack of training as the main barrier to using the internet and online biomedical databases [22].

More recently, practical internet training programs that teach GPs to formulate searchable questions based on specific patients, use search operators and EBM filters, and navigate through pre-selected EBM internet sites have been developed. Nicholson and Shieh piloted such a program with 36 internal medicine residents at Stanford University Medical Centre [5]. They found the 'training effect' of the program on a variety of EBM skills to be fairly strong. Residents further described performing clinical searches, using prefiltered EBM internet sites such as the Cochrane Library, during patient care. The authors stated that access to prefiltered clinical internet sites was essential to the efficient practice of EBM.

The internet training program titled *Chaos to Clarity* was designed by the second author to teach GPs how to use a limited number of the internet's medical databases and websites to augment evidence based practice. Training in this setting means that GPs should acquire knowledge, skills, and competencies as a result of the teaching program. They should develop practical skills and knowledge that they can apply to their work and which is consistent with their broader professional development.

In a pilot study conducted 18 months previously, 23 GPs participated in a one hour *Chaos to Clarity* training session on how to use the internet to search for evidence-based clinical information. Given previous research indicating the practical difficulties involved in delivering internet training to GPs in a group-based format [23], the training occurred at the individual level at each GP's practice.

This study aimed to provide a more comprehensive evaluation of the impact, usability and acceptability of the *Chaos to Clarity* internet training program with GPs in three divisions of general practice in Melbourne, Australia. It was conducted in 2006.

# 2. Method

### 2.1. Participants

#### 2.1.1 Divisions of General Practice

Three divisions of general practice were chosen for their convenient location to the study centre in south east Melbourne. The GP membership profiles of the three divisions do not differ significantly. One of the three (Monash Division) had previously piloted the *Chaos to Clarity* program with several GPs with its current information management project officer. Of the two other divisions, Southcity GP Services had a dedicated information management project officer. The Central Bayside Division had a project officer who was responsible for a chronic disease management program and had more limited experience in supporting information management in general practice. The role of the project officers was limited to providing a one-off training session without further followup.

#### 2.1.2 GPs

GPs were recruited from the three divisions of general practice by the three division-based project officers. Recruitment procedures included telephone calls, emails, and advertisements in division newsletters. Only GPs who had internet access at work were eligible to participate. Once approximately 10 GPs per division expressed interest in participating, further recruitment ended. This number of GPs was based on the practical consideration of the time available to conduct individualised training.

#### 2.2. Measures

A quantitative approach was used to measure change as a result of the training and a qualitative approach was used to gain a greater understanding of the more complex issues involved in the uptake of new internet searching practices. The interviews were semi-structured and were conducted by the first author. Key interview themes explored were GPs' attitudes and beliefs to the use of the internet in clinical practice, and also to the training program.

#### 2.2.1 GP questionnaire

The questionnaire was designed to assess changes in GPs' skills (e.g., "I have the ability to translate a clinical problem into a search term for using the internet"), perceived competency in using clinical databases and sites (i.e., SUMSearch, PubMed, The Cochrane Library, and the National Guidelines Clearinghouse), knowledge of databases and search strategies (e.g., "SUMSearch is a search engine which 'trawls through' a number of evidence based databases" – true or false?), attitudes and self-reported internet searching behaviours (e.g., "How often would you conduct a search for clinical information on the internet during a consultation?"), confidence in using the internet, and perceived usefulness of various clinical databases.

The pre- and post-questionnaires were the same with the exception of four questions in the post-questionnaire that assessed GPs' views on whether the training was enjoyable, practical, clear and easy to follow, and whether it led to an increased use of the internet to find clinical information. The pre-training questionnaires were mailed out and completed one week before each GP's session; the posttraining ones were completed four weeks after the session. The questionnaires were coded so that each GP's responses could be matched pre- to post-intervention.

#### 2.2.2 GP interviews

A convenience sample of 10 GPs participated in 15 - 20 minute telephone interviews four weeks after the training. The first author conducted the interviews and covered the following topics: 1) perceived changes in knowledge, attitudes and beliefs about searching techniques and relevant internet sites; 2) self-reported changes in the use of the internet in day-to-day practice; 3) confidence ratings of this method in searching for evidence; 4) beliefs about the impact on the doctor-patient relationship; 5) perceptions on changes in knowledge, attitudes and stated practices on 'safe' usage of the internet (safe refers to the application of valid and relevant information); 6) attitudes and beliefs about the training program itself; and 7) suggested improvements to the program and need for further support and/or training.

#### 2.2.3 Project officer interviews

The Divisional project officers, who delivered the training, participated in face-to-face semi-structured interviews with the first author one week after completing the training to obtain feedback about the feasibility and perceived usefulness of the training program.

### 2.3. Design

# 2.3.1 'Chaos to Clarity' – an internet training program

The Chaos to Clarity program takes approximately one hour to complete and consists of the following components: introduction to several useful web-based clinical databases and sites, instructions in using the PICO model to formulate clinical questions, discussion of search operators, filters and other search strategies, hands-on searches based on prepared clinical case studies, discussion of applying internet information to specific patients and using the internet at the point of care. Whilst the concept of EBM was discussed, the emphasis of the training was on 'information mastery', that is, mastery in discovering efficient ways of finding reliable, preappraised clinical information using the internet. Each GP received a training manual which contained all the information covered in the program. A 'favourites' list of 50 clinical sites was uploaded to the GPs' computer, and the first five (the large databases and search engines) were demonstrated within the training session.

### 2.3.2 Training the trainers

The second author instructed the three Divisions of General Practice project officers in the use of the program before they commenced training the GPs in their division. The project officers practised the use of the recommended list of clinical websites until all three project officers felt competent in teaching *Chaos to Clarity*.

#### 2.4. Procedure

The 33 GPs who expressed interest in training were contacted by the project officers and appointments were made for a one hour training session at the practice. The project officer used a presentation program (Microsoft PowerPoint) to teach internet searching, and then engaged with the GP to conduct 'live' searches on previously selected cases. The main websites used were SUMSearch, PubMed, The Cochrane Library, and the National Guidelines Clearinghouse. There was sufficient time for general discussion. The GPs were given the Chaos to Clarity training manual for subsequent reference, and the 50 clinical websites were loaded into their 'favourites' folder on their practice computers.

#### 2.5. Data analysis

Thirteen Wilcoxon [23] signed rank tests, which are non-parametric tests for paired data (with Bonferroni adjustments for multiple testing, yielding an alpha = .004), were conducted to investigate the significance of pre-topost changes in questionnaire items pertaining to:

- 1) frequency of use of internet clinical resources
- 2) attitudes to using internet resources, and
- 3) perceived competence in searching clinical websites.

The Wilcoxon singed rank test for paired samples does not assume that the 'population' is normally distributed; it simply assumes that the paired differences follow the same (symmetric) distribution. In addition, changes in GPs' knowledge of clinical databases were explored by inspecting the preto post-training frequencies of correct responses to true/false questions (which are shown in Table 4).

### 3. Results

Of the 33 GPs, 28 (85%) of these returned both the pre- and post-training questionnaires. Almost 80% of the respondents were male. The average time that the GPs had been working in general practice was 22.7 years (S.D. 7.8). Most GPs held partner or associate positions (67.9%), followed by assistantships (32.1%). Most GPs reported working more than 6 sessions per week (78.6%) and the most common age range was 40-59 years (71.4%).

As shown in Table 1, there were significant pre- to post-training increases in the use of SUMSearch, PubMed and the Cochrane Library. However there were no significant increases in the frequency with which GPs actually searched for clinical information on the internet during or outside consultations. Follow-up telephone interview responses were consistent with these results. GPs reported that: Database searching takes too long during a consultation; You would need longer consultation times to do clinical searches and this is uncomfortable as patients are paying for the consultation; Clinical research detracts from doctor/patient rapport; The need to do clinical research during a consultation only occasionally arises in terms of finding out about unfamiliar medication or unknown illness.

Table 2 shows that there were significant pre- to post-training increases in GP self-reported confidence and competence in search skills and knowledge of clinical sites. GPs reported that: *Now I am aware that there are actual strategies and techniques for* 

Questionnaire Item*	Pre- training	Post- training	z value (N=28)	p
	mean (sd)	mean (sd)	(11 20)	
How often would you conduct a search for clinical information on the Internet during a consultation?	2.07 (0.5)	2.18 (1.0)	42	.590
How often would you conduct a search for clinical information on the internet outside of a consultation?	2.54 (1.1)	2.96 (0.9)	-1.74	.090
How often do you currently use SUMSearch?	1.07 (0.3)	1.93 (0.9)	-3.82	.000
How often do you currently use PubMed?	1.29 (0.5)	2.07 (0.9)	-3.33	.001
How often do you currently use The Cochrane Library?	1.50 (0.6)	2.14 (0.7)	-3.50	.000

Table 1: Frequency of Use of Internet Clinical Resources .

\* Items were rated using the following scale: 1 = never to 5 = several times a day.

Questionnaire Item*	Pre- training mean (sd)	Post- training mean (sd)	z value (N = 28)	p
I feel confident in my ability to use the internet as a source of clinical information	3.32 (1.2)	2.07 (0.8)	-3.89	.000
I can efficiently search the internet to obtain clinical information during a consultation	3.89 (1.2)	2.89 (1.0)	-3.64	.000
I have the ability to translate a clinical problem into search terms for using the internet	3.46 (1.2)	2.29 (0.8)	-3.61	.000
I am satisfied that I know a sufficient number of internet sites to obtain clinical information	3.71 (1.2)	2.00 (0.8)	-4.36	.000

Table 2: Attitudes to Using Internet Resources

\* Items were rated using the following scale: 1 = strongly agree to 5 = strongly disagree.

effective Internet searching, where before the training I had no idea of things like search filters, limits and the PICO format. Feedback from the interviews reflected these findings. GPs unanimously reported that their awareness of useful sites increased. Just adding the list of well-reputed clinical sites into my 'favourites' has vastly improved my awareness of useful online resources. Furthermore, GPs' confidence in the quality of internet information increased. Knowing that I have free and easy access to a variety of pre-screened clinical sites has improved my confidence in the trustworthiness of the information I pull off the Internet.

There were significant increases from pre- to post-training in the extent to which GPs reported feeling competent to use SUMSearch, PubMed, Cochrane Library and the National Clearinghouse guidelines (see Table 3).

The number of correct responses increased for all knowledge-based questions, from 53 correct before training to 139 correct after (Table 4). The majority of GPs reported that the training was practical, enjoyable and easy to follow, and led to increased use of the internet to search for clinical information (Table 5).

In follow-up interviews, GPs made several suggestions in response to the question 'Where to from here?' Some GPs reported that *A follow-up session* would be beneficial in order to consolidate learning and workshop problems and difficulties. Others stated that *A follow-up session would be useful* but it's not necessary. What I really

Clinical sites*	Pre-	Post-	Z value	Р
	training	training		
	mean (sd)	mean (sd)	(N)	
SUMSearch	4.75 (1.2)	2.44 (0.7)	-4.45 (27)	.000
PubMed	4.41 (0.9)	2.30 (0.8)	-4.29 (26)	.000
The Cochrane Library	3.71 (1.4)	2.22 (0.8)	-3.67 (27)	.000
National Guidelines Clearinghouse	4.71 (1.2)	2.51 (0.8)	-4.39 (27)	.000

Table 3: Perceived competence in searching clinical sites

\* Items were rated using the following scale: 1 = very competent to 5 = either never heard of website or never used website

Knowledge-based items	PRE % (N = 28)	POST % (N = 25)
PubMed is a database of journals in competition with Medline	7%	48%
Cochrane Library is mainly concerned with evidence about the effectiveness of treatments	50%	80%
SUMSearch is a search engine which 'trawls through' a number of evidence based databases	18%	92%
National Guidelines Clearinghouse only covers clinical practice guidelines written and used in the USA	4%	8%
PICO stands for 'Patient', 'Intervention', 'Comparator', 'Outcome'	18%	80%
Clinical practice guidelines exclude expert opinion and are only based on evidence	46%	60%
The PICO model can be used to formulate clinical questions	14%	76%
MeSH is a database of journals, similar to Medline	7%	32%
The words AND and OR are examples of Boolean operators	46%	80%

Table 4: Frequency of correct responses to questions assessing knowledge of clinical databases

need to do now is practise using the sites so I become efficient with them. One GP suggested that It may be helpful to have a group-based session with other GPs as a follow-up to the training session to share helpful strategies and sites and workshop difficulties.

# 3.1. Post-training interviews with project officers

The project officers all concurred that the program was simple, well-targeted and straightforward, with the caveat that ultimately the usefulness depends on a GP's willingness to practise using the sites and search tech-

niques. There was some doubt about the level of behaviour change that can be achieved as a result of a single training session. Project officers were also dubious that GPs would use the internet during a consultation, so the usefulness of the program would be mainly for seeking clinical information after the patient encounter. Reasons for this include limited consultation times, the need to maintain patient rapport, and a lack of patients that really challenge a GP's knowledge base. One officer suggested that the program could be improved by delivering the training sessions in a group format, where GPs can "feed off each other" in

recommending useful clinical internet sites, as well as sharing tips for searching the internet efficiently and productively.

The project officers felt that the GPs particularly liked learning the PICO format, practising searches using case studies, receiving a list of clinical sites to add to their 'favourites', and the table at the back of the training manual which summarised useful sites. Project officers stated that GPs who opt for training are already favourably disposed to regarding the internet as a useful clinical resource, so the training sessions can leave out discussion on why using the internet is benefi-

Questionnaire Item	% agree (N = 28)
Will do more internet searches in the next few months	88%
Training lead to increased use of internet for clinical information	84%
Training program was clear and easy to follow	92%
Training program was practical	88%
Training program was enjoyable	88%

Table 5: Post-training assessment

cial; the 45 - 60 minutes is better used in practising search strategies and familiarising GPs with sites.

Project officers did not all agree on which sites GPs found most useful. For example, one project officer stated: GPs seemed to opt for limiting themselves to one meta-search engine, and therefore SUMsearch appeared to be the site most favourable to GPs. Another stated: SUMsearch should be the last site mentioned or not at all because the interface is very poor – it is not user friendly or intuitive, and there is not much freely available full-text information.

### 4. Discussion

The results of this study suggest that the goals of the training program were achieved. All GPs found the training worthwhile, and the material covered was applicable to their work. There were significant pre-to post-training increases in the following: frequency of GP exploration of clinical web sites, knowledge of how to navigate several clinical sites, self-perceived competence in using the internet, confidence in the reliability of several clinical databases, and confidence in efficiently searching for relevant clinical information. As Stewart noted, "Becoming familiar with a few clinically relevant and freely available medical resources on the World Wide Web may enhance a physician's efforts to provide evidenced-based care on a daily basis" [25].

It appears that the GPs did not simply try to guess the answers to the true/false knowledge questions but considered their answers carefully. As a result, many answers were incorrectly chosen before the training program. Almost without exception, the responses reveal an important increase in correct choices after the intervention. The one question (on the National Guideline Clearinghouse) which remained poorly answered suggests that this topic was inadequately explained during the training session.

Whilst the project officers expressed some uncertainty about whether actual behaviour change will ensue from a single training session, 88% of GPs reported that they will do more internet searches within the next few months following the training. Follow-up telephone interviews with several GPs indicated that, since the training session, they had increased their use of the internet for clinical queries. However, most GPs stated that they wished they had more time to practise using the sites.

There was no significant change following the training in GPs' reported use of the internet during patient consultations. Most GPs felt that clinical searches take too much time. Concerns were also expressed about searching having an adverse effect on doctor/ patient rapport. Some GPs believed that many of the clinical databases and websites that were demonstrated were more useful for research purposes than everyday clinical practice; a view which has found support in other studies of information skills training.23 Nevertheless, the majority of GPs indicated that they thought it was highly beneficial to obtain patient-centred information from the internet during consultations.

Some caution must be applied in generalising the findings from this study as it was based on a self-selected group of GPs and utilised a single group pre-post test design with short term follow-up. However, others have found evaluation of teaching methods to be difficult, whether that be problem based learning or various forms of delivery styles such as small group learning versus the more traditional approaches such as lectures [26-28]. The Chaos to Clarity program is based on what is currently believed to be most effective: an interactive learning style based on what is most relevant to the participants [29, 30].

A single group evaluation design runs the risk of several biases, including not being able to distinguish between changes that simply occur over time compared with those that are due to the intervention itself. Unfortunately, it is not easy to convince GPs that they could be randomised to a control arm of a theoretically well design experimental study; it is hard enough to recruit GPs to a thoroughly developed professional development program. Similar pragmatism was shown in other areas such as in developing reasonably brief questionnaires with simple questions, some of which only required true/false answers. Questionnaires which could have probed more deeply, for example, to indicate which components of the training program were more effective, might not have yielded such a good response rate.

However, it would appear reasonable to conclude that in spite of some methodological shortcomings, the almost uniformly positive results in this study do strongly suggest a training effect, at least in the short term. Further, the program did highlight some of the practical difficulties GPs face in trying to implement new knowledge and skills, with time constraints being one of the major hurdles.

Some (around a quarter) of the GPs were involved in the pilot study 18 months previously. Although this could have 'contaminated' the results, it seems unlikely as the recent study showed that the majority acquired new knowledge and skills after the intervention. Presumably this is on top of whatever had been learnt previously by a sample of the group.

GPs and project officers provided various suggestions for how to improve the program. These included having a follow-up session to allow GPs to work through any difficulties they were having with particular websites and search techniques, and delivering the training session in a group format to allow GPs to share personal experiences with useful sites and lessons learned. Such a format and informal discussion might also help GPs gain confidence in incorporating internet use into the consultation process without impairing the doctor/patient relationship.

Finally, the program suggests that Australian divisions of general practice are able to deliver internet training to GPs. Whether many divisions will chose to adopt this role is uncertain in the absence of specific government funding or encouragement. Other strategies of improving practitioner internet search skills could include introducing training in the GP registrar program, or importantly, at the undergraduate level. The profession as a whole has still not adequately addressed the issue of training in information management in general practice. Improving GP skills in the use of the internet for clinical purposes is a part of this challenge.

## Acknowledgments

The project was funded by the Royal Australian College of General Practitioners as a part of its GP Informatics Scholarship program. The authors wish to thank the three participating divisions, the project officers and the GPs who participated in the training program and its evaluation.

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## Correspondence

Associate Professor Peter Schattner Department of General Practice School of Primary Health Care Faculty of Medicine, Nursing and Health Sciences Monash University Building 1, 270 Ferntree Gully Rd Notting Hill Vic 3168 Australia Peter.Schattner@med.monash.edu.au Phone: +61 3 8575 2252