Do Internet interventions for consumers cause more harm than good? A systematic review

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Abstract

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Objective To systematically review the effect of consumer use of online health information on decision-making, attitudes, knowledge, satisfaction and health outcomes and utilization.

Search strategy Electronic databases searched included the Cochrane Controlled Trials Register, MEDLINE, PREMEDLINE (to 14 March 2001), CINAHL, Australian Medical Index, Health and Society, National Institutes of Health Clinical Trials Database and CenterWatch.

Inclusion criteria All post-1995 comparative studies (including controlled studies, before and after studies, and interrupted time series analyses) of Internet users vs. non-Internet users and other communications mediums, and Internet characteristics such as e-mail vs. other communication mediums, were included. Outcomes included consumer decision-making, attitudes, knowledge, satisfaction and measurable changes in health status or health utilization.

Data extraction and synthesis One reviewer screened all papers then two reviewers independently assessed studies against the selection criteria and any discrepancies were resolved by discussion with a third reviewer. No attempt was made to combine the data for further statistical analysis.

Main results We identified 10 comparative studies. Studies evaluated the effectiveness of using the Internet to deliver a smoking cessation programme, cardiac and nutrition educational programmes, behavioural interventions for headache and weight loss, and pharmacy and augmentative services. All studies showed some positive effects on health outcomes, although the methodological quality of many studies was poor.

Conclusions Despite widespread consumer Internet use to obtain health-care information, there is almost a complete lack of evidence of any effects this may have on health outcomes.

Introduction

In November 2000 more than 400 million people around the world accessed the Internet.¹ The Internet is a communications medium that delivers information and services via text, graphics, sound and video. However, unlike other forms of communication the Internet is a global, open, public environment forum. The Internet also has multiple, discrete, characteristics such as the World Wide Web, e-mail, chat rooms and discussion lists.

The Internet provides consumers with access to a wealth of health information and services whereby consumers can now access the same online information as health-care providers. Consumers use the Internet-based information to shape treatment preferences and select health-care providers.^{2,3} Consumers seek online consultations, support, self-management and screening tools, and buy medicines online.⁴⁻⁷ Health-care services can now be delivered by virtual health-care providers, located anywhere in the world, to consumers who never have to leave home. Pragmatically the Internet is becoming much more than just a communications medium.

Consumer use of the Internet has the potential to benefit or harm consumers who use it to manage their health. The quality of information and services on the Internet is variable and not regulated.^{8,9} Legislation aimed at protecting consumers from fraudulent health-care claims and practices lacks the development of technology and is difficult to enforce due to the global and open nature of the Internet.¹⁰

In countries including Australia, Canada, Denmark, Finland, Iceland, Netherlands, Norway, Sweden and the United States of America (USA) more than 40% of the population is estimated to use the Internet.¹ Two USA studies conducted in 1999 and 2000 found that 31% (aged less than 60 years, $n = 1237$) and 27%

($n = 12751$) of all American adults, respectively, sought health information via the Internet.^{11,12} Furthermore, both studies determined that Internet use is associated with being younger, more affluent and better educated.

As Internet access increases and consumer demand for online health services and information grows there is an urgent need for information about whether this causes more harm than good. Our primary hypothesis is that consumer access to the extensive and variable quality of health information and services available via the Internet affects their decision-making, attitudes, knowledge, satisfaction and health outcomes and utilization. Our secondary hypothesis is that the discrete communication features of the Internet also affect these outcomes.

The materials for this systematic review are all the post-1995 comparative studies of consumer use of online health information and services. We examine Internet users vs. non-users, Internet users vs. other communication mediums and Internet users using discrete characteristics of the Internet. For example, we are interested in studies that compare consumers who use online smoking cessation programmes vs. face-to-face counselling and consumers who communicate with doctors via e-mail vs. the telephone.

Methods

Inclusion criteria

We include all comparative studies of consumers using the Internet to access healthcare information and services. We included controlled studies, before and after studies, and interrupted time series analyses of Internet users vs. non-Internet users, Internet vs. other communication mediums and specific Internet characteristics such as e-mail vs. other communication mediums. Outcomes of interest included consumer decision-making, attitudes, knowledge,

satisfaction and measurable changes in health status or health utilization.

Exclusion criteria

Non-Internet computer-based consumer information systems, e.g. information kiosks, Intranets and CD-ROMs, were excluded. Whilst these might be good quality resources, their access is restricted and evaluating their use does not inform us about the risks and benefits of public access to the variable quality of information and services on the Internet. A suitable analogy is that studying the effects of access to a library is not the same as studying the effects of access to four specifically chosen books. We did not consider studies of Internet use by health professionals because we perceive them to have skills and training that enable them to interpret the quality of health information in a manner different to the general public. Studies pre-1995 have been excluded because at that time the Internet was not widely used by the general public. In 1995 there were less than 10 million computers with registered Internet service provider addresses, compared with more than 100 million at the end of the year 2000.¹³ The World Wide Web was developed in 1991 and the first commercial search engines only became available in 1995.¹⁴

Identification of studies

Studies were identified from the Cochrane Controlled Trials Register (Cochrane Library Issue 1, 2001) and MEDLINE (1966, December, week 4, 2000), PREMEDLINE (14 March 2001), CINAHL (February 2001), Australian Medical Index (February 2001), Health and Society (January 2001) and the National Institutes of Health Clinical Trials Database (14 March 2001) available at <http://www.clinicaltrials.gov> and CenterWatch Clinical Trials Listing Services (14 March 2001) available at <http://www.centerwatch.com/patient/trials.html>.

The MEDLINE search terms included Internet, online, World Wide Web, web, e-mail

or e-mail: or electronic mail, mail list, discussion list, chat room and newsgroup (tw). These terms were combined with study terms including evaluation studies, intervention studies, cohort studies, controlled studies or study, comparative study, before and after study, clinical trial and pilot projects (tw). The combined results were restricted to years 1995 to 14 March 2001. Searching was not restricted by language. The terms Internet, online, World Wide Web and web were limited to (ti) to reduce the number of citations from approximately 2500 to 597. The strategy designed for MEDLINE was adapted and used to search all other databases. Copies of the searches are available on request. All searches were conducted in March 2001.

Study selection and data extraction

Citations retrieved by the searches were downloaded via bibliographic software (EndNote 4.0) to form a single library from which duplicates were removed. The first reviewer screened each citation for possible inclusion according to the selection criteria and only those studies that did not meet the selection criteria were discarded. Full texts of the remaining citations were sought and independently appraised by two of us (TB and SM). Discrepancies were resolved by discussion with CS.

Ethics approval

The Standing Committee on Ethics in Research Involving Humans at Monash University granted ethics approval for this project and survey questions.

Statistical analysis

We intended to assess the relative contribution of included studies to describe the current state of knowledge and to generate hypotheses for future research using a random effects model, but the nature of the studies did not allow data pooling or further statistical analysis.^{15,16}

Description of studies

Our search identified 599 citations from which we identified 10 comparative studies.^{17–26} We also identified 44 descriptive studies (Appendix 1) and two case reports.^{27,28} The majority of citations were excluded because they were concerned with ‘webs’ of a non-Internet nature or non-consumers. Although it was not our intention to identify descriptive studies as part of this review we have included a list of such studies for interest, as they may be the precursors to future comparative studies. We also identified two further comparative studies; the first is in progress and will conclude in the later half of 2001,²⁹ whilst the second study’s results were reported in a press release but not in the medical literature.³⁰

Results

All proposed outcomes and reported results of comparative studies are shown in Table 1.

Takahashi demonstrated that the Internet is a medium in which effective smoking cessation intervention can be delivered. They reported that 52% of smokers and 43% of heavy smokers had quit 12 months after enrolling in an online smoking cessation programme. This programme was not limited to a restricted sample size and was accessible to all members of the public able to access the Internet in a convenient and timely manner.

Cellio, Winzelberg and Winett examined the effect of delivering education via the Internet on the eating habits, body image or physical activity of young women and all three studies found positive outcomes in the Internet intervention group. Scherrer-Bannermann also examined the effect of delivering education via the Internet, comparing Web-based and printed patient education manuals for consumers on cardiac surgery waiting lists. They reported that the Internet-based intervention provided increased social support, decreased social anxiety and improved attitudes towards surgery.

Tate compared the use of a 6 month weight loss Internet-based education programme and beha-

viour therapy intervention, comprising e-mail-facilitated weekly lessons, support and bulletin board, with an Internet-based education programme only. They showed that the additional Internet-based resources did improve the numbers of people achieving weight loss goals and mean weight loss 6 months post-intervention.

The quality of the remaining four studies was poor. MacKinnon showed that e-mail is a useful adjunct for some people with disabilities when using an augmentative communication service. Wagner compared the structural and cost outcomes of online and traditional USA pharmacies and showed that online pharmacies have higher consumer costs due to handling and delivery charges but more comprehensive consumer medicines information. However, the small sample sizes in the MacKinnon and Wagner studies do not allow robust conclusions to be drawn. Jones compared Internet users vs. outpatients seeking Viagra repeats; however, the control group of inner-city outpatients is likely to have lower health, social and educational status than Internet users. Furthermore, consumers who experienced an adverse event are unlikely to request a repeat prescription. Strom conducted a controlled trial for self-help treatment of recurrent headache for consumers randomized to an Internet-based intervention or waiting list but 56% of participants dropped out of the study. Overall the results of these four studies are not reliable.

Discussion

The strongest finding to emerge from this systematic review is the lack of rigorous research regarding the effects of consumer Internet use on health outcomes. Given the widespread use of the Internet and the claims that are frequently made about its benefits as a tool for communicating health information and empowering consumers in health-care decision-making, this lack of research evidence is disturbing.

Firstly, this lack of research may be due to the provision of consumer Internet health-care services being a recent and evolving phenomenon. Secondly, just as the Internet-based

Table 1 Characteristics of included studies

Author	Study design & number of participants	Comparison groups	Intervention	Outcome	Absolute change	Relative change	Quality
Celio 2000	Controlled trial (n = 76)	Internet (n = 24) vs. classroom (n = 15) vs. no intervention (n = 19) for young women at a US private university	Education programme for reducing risk factors for eating disorders	At 6 months: relative effect sizes and absolute mean differences for: Body image score Bulimia Drive for thinness Weight/shape concerns Eating concerns Restraint Social support	Net vs. no intervention 17.1 points 1.9 points 7.9 points 0.9 points 0.6 points 1.0 point NS (net and classroom)	Classroom vs. no intervention NS NS NS NS NS NS NS	Drop-out rate in classroom group (40% was higher than the Internet group) 30% 3% 19% 14% -8% 34%
Jones 2000	Retrospective quantitative analysis of patient records (n = 346)	Patients from an online health clinic (n = 310) vs. a USA inner-city hospital clinic (n = 36)	Seeking repeat requests for Viagra	Sex life satisfaction Patient complaints	Not reported Nil reported		Recruitment bias and poor choice of control group
MacKinnon 1995	Randomised controlled trial (n = 16)	E-mail (n = 7) vs. normal service (n = 9)	Clinical and technical assistance to physically disabled persons from an augmentative communication service	Mean service Number of contacts to clinicians and staff over 6-month period	0.2 points 36 contacts	4% 500%	Small sample size Randomization method not stated
Scherrer-Bannerman 2000	Controlled trial (n = 72)	Patients with Internet access vs. no Internet access, waiting for cardiac surgery in Vancouver	Website vs. written manual	Social support Anxiety Lifestyle changes Attitude to surgery	Not reported	Not reported	Bias. Internet group provided training Numbers of participants in each group not reported Convenience sample – only those with Internet access

Table 1 (Continued)

Author	Study design & number of participants	Comparison groups	Intervention	Outcome	Absolute change	Relative change	Quality
Strom 2000	Controlled trial (<i>n</i> = 102)	E-mail; internet (<i>n</i> = 20) and no intervention (<i>n</i> = 25) for chronic headache sufferers in Sweden	Applied relaxation and problem solving in the treatment of recurrent headache	Mean difference for: Headache Index improvement Frequency (days/week) Peak intensity	0.5 points NS NS	50%	assigned to intervention group and all others to control group Drop-out rate 56%
Takahashi 1999	Before and after study (<i>n</i> = 102)	Japanese smokers	Web page info Daily e-mail E-mail support	Smoking cessation > 30 per day < 30 per day	53 53	52% 43%	
Tate 2001	Randomized controlled trial (<i>n</i> = 91)	Internet behaviour therapy (<i>n</i> = 33) vs. Internet education (<i>n</i> = 32) in healthy, overweight US hospital employees	Weekly e-mail lessons, monitoring tool, individual feedback, and bulletin board	At 6 months Mean body weight loss Mean decreased waist circumference Achievement of 5% body weight loss	2.5 kg 3.3 cm 15 people	71% of patients had complete data 3% 3% 23%	
Wagner 2001	Comparative survey (<i>n</i> = 8)	Internet (<i>n</i> = 4) vs. traditional US pharmacy services (<i>n</i> = 4)	Supply of medication and information from pharmacies	Costs Delivery times Response times to questions Quality of information provided	NS NS NS NS		Small sample size
Winzelberg 2000	Randomized controlled trial (<i>n</i> = 60)	Internet (<i>n</i> = 24) vs. no intervention (<i>n</i> = 20) in young women at a public US university	Education programme for reducing risk factors for eating disorders	Mean difference at 3 months (high risk participants): Body image score Bulimia Drive for thinness Weight concerns Shape concerns	22 (20) points 3.1 (4) points 5.3 (4.8) points 1.6 (0.8) points 0.8 (0.6) points	73% of participants had complete data Method of randomization not stated Compliance with programme 64%	

Table 1 (Continued)

Author	Study design & number of participants	Comparison groups	Intervention	Outcome	Absolute change	Relative change	Quality
Winett 1999	Controlled trial (n = 180)	Internet and classroom (n = 103) vs. classroom (n = 77) in a poor US high school	Five educational modules for school health classes	Regular meals Fruits and vegetables Breads and cereals Regular sodas High fat snacks High fat dairy Fast food (calories)** Fast food fat (g)** Aerobic exercise (days/week)	0.3 points 1.1 points 1.0 point 0.4 points NS NS 261 14.2 0.8	F = 14.09 F = 15.11 F = 18.53 F = 5.25 r = 3.28 r = 4.28 F = 4.27	Not randomized or blinded due to logistical restraints Internet access was not always reliable

NS = not statistically significant ($P > 0.05$). ** $n = 39$.

services themselves are evolving, new research methodologies may be required to identify and track users prospectively in order to obtain health outcome measurements.

From the studies we did identify, there was some evidence that Internet-based materials may provide consumers with necessary information and support in a timely manner to achieve positive health outcomes. Although the overall effectiveness of the Internet on health service utilization outcomes was not clear, the results indicate that the Internet may impact on the overall cost effectiveness of health service provision and workflow practices.

Conclusion

We need to know how and why consumers use the Internet for health-care information and services, what subsequent actions they take, and how this affects their behaviour and health status. As increasing numbers of people use the Internet the public health benefits and risks of online health-care should be examined by measuring changes in health status, health service utilization, costs, decision-making models and consumer satisfaction. Indicators such as the number of adverse events, amount of quality online health information, number of licensed online health-care providers and the implementation of online practice standards may also be used to evaluate the effectiveness of the Internet as a health-care intervention in its own right.

At present, there is almost no evidence regarding the effect of consumer Internet use on health outcomes. Well-designed controlled studies, instead of anecdotes and opinions, about the risks and benefits of using the Internet are urgently needed.

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Appendix 1

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