

Interfacing Computers and the Internet With Your Allergy Practice

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Abstract

Computers and the internet have begun to play a prominent role in the medical profession and, in particular, the allergy specialty. Computer technology is being used more frequently for patient and physician education, asthma management in children and adults, including environmental control, generating patient databases for research and clinical practice and in marketing and e-commerce. This article will review how computers and the internet have begun to interface with the allergy subspecialty practice in these various areas.

Index Entries

Allergy; asthma; computers; internet; e-commerce; environmental control; patient education; physician education.

Introduction

Computers and more recently, the internet, have begun to play a prominent role in our society. A recent Harris Interactive Research Poll found that the use of the internet by adults has increased from 9% in 1995 to 69% (147 million) in 2003 (1). Over 93% of these users were below the age of 65 yr and 60% were university students. From this survey, it was determined

that internet users spend at least 9 h a week on the world wide web, of which 60% occurs at home and 31% at work (1).

It is not surprising that this burgeoning technology has rapidly permeated into the medical profession. Today, virtually all medical offices have computers for the purposes of electronic billing, appointment scheduling, and more recently for patient records. Many

physicians maintain personal computers in their offices that allow direct access to the internet and e-mail services. This has accelerated our ability to access medical information relevant to our specialty and to communicate with other colleagues more efficiently. Nonetheless, unless physicians have a special interest in computer technology, they are most likely under-utilizing these powerful resources to maximize informatic efficiency in their practice and personal lives.

This review highlights the use of computers and the internet to complement or enhance the practice of medicine. It focuses on future applications for:

1. patient education with special emphasis on methods for improving asthma management;
2. physician continuing medical education;
3. improving adjunctive aspects of asthma management such as environmental control;
4. generating patient data bases in clinical practice; and
5. marketing and e-commerce opportunities. This brief discussion is not intended to be all-inclusive, but rather to create greater awareness among allergists on how to use these powerful resources more creatively in their daily lives.

Patient Education

Several studies have been conducted to test the feasibility of using computerized support systems for utilizing clinical guidelines for asthma in the primary-care setting. The results of some of these studies have revealed significant technical problems in developing a system that can fully support the management of chronic complex diseases such as asthma (2). However, a variety of research techniques such as computer assisted instructions, prospective pre-test/posttest randomized intervention trials, and randomized controlled clinical trials conducted over the internet have been successful in demonstrating significant improvement in

asthma clinical outcomes (3–5). One such study used a computer-assisted instructional software successfully as part of a pediatric asthma self-management program (4). The Watch, Discover, Think and Act (WDTA) program is a theory-based self-motivating educational program designed for pediatric asthma self-management education. Pre- and posttest randomization trials have revealed that children using this program scored significantly higher on questions pertaining to asthma self-management strategies (4). Another study showed improvement in asthma clinical outcomes when a computerized algorithm of asthma guidelines was incorporated into the patient's office visit (5).

More recent studies have investigated the feasibility of using internet technology for patient education. One such program used an internet-based "store and forward" Video Home Telehealth System in an attempt to improve asthma outcomes in children (6). Pediatric asthma patients were provided home computers and internet access and monitored twice a week over the internet. Subjects were also seen in the outpatient clinic at 2, 6, 12, and 24 wk (6). One-half of the subjects received asthma education in person and the other half through an interactive website. Adherence was measured using therapeutic and diagnostic monitoring. Therapeutic monitoring included digital videos of patients using controller medications; diagnostic monitoring included asthma symptom diaries and videos of the participants using a peak flow meter. These videos were submitted electronically twice a week, using in-home telemonitoring and store and feed technology (6). Disease control of each child was further assessed by examining his or her quality of life, utilization of rescue therapy, unscheduled office visits, overall symptom control, and retention of asthma knowledge. This was a relatively small study with only 10 children participating (6). However, the results indicated that inhaler technique scores significantly improved using internet technology

with a concomitant rise in peak flow values. There was no change in quality of life reported by the patients but the caregivers of the "virtual education" group reported improvement in quality of life scores (6). Overall, there was also a reduction in asthma emergency room visits and hospitalizations as well as a reduction in use of rescue therapy among the "virtual education" group. There was high satisfaction using this home telemonitoring system. One obvious limitation in implementing this system widescale would be the requirement of owning a computer with internet access, which is often a problem, especially in lower socioeconomic populations (6).

Another recent study sought to determine whether health outcomes in children with asthma could be improved through the use of an internet-enabled interactive multimedia asthma education program (7). This larger asthma study randomized 228 children to either control or intervention groups. Children in both groups received traditional patient education based on the National Asthma Education and Prevention Program, whereas intervention group participants also received self-management education using an interactive multimedia program designed for asthma control and tracking (7). Several standardized survey instruments were used to assess the benefits of this approach, including the Pediatric Asthma Care Knowledge Survey and the Pediatric Asthma Caregiver's Quality of Life Questionnaire. In addition, asthma symptom history, spirometry, and health services utilization data was collected at the initial visit, 3 mo and 12 mo of the study (7). The interactive multimedia program for asthma control and tracking demonstrated a significant increase in both the child and caregivers' knowledge of asthma, an increase in the number of asthma-symptom-free days and a decrease in the number of emergency room visits for asthma (7). The intervention group was also able to reduce daily dose requirements for inhaled corticosteroids by the end of the study. It was further

shown that improved asthma knowledge significantly correlated with fewer unscheduled office physician visits and use of rescue therapy. The authors concluded that this type of supplemental interactive multimedia education could significantly improve asthma knowledge and reduce the burden of childhood asthma (7).

Computers with an interface allowing patients to complete a validated questionnaire have been used in large primary-care settings to calculate an "asthma score" randomly among patients and have been successful in both identifying children with asthma and their level of disease severity (8). Other investigators have successfully used computer-assisted telephone interview techniques to monitor patient asthma quality of life, medication compliance, and automated natural language processing techniques for extracting information from clinical records and identifying patients who would benefit from additional asthma education (9,10).

Many patients use the internet as a resource for education about asthma and other allergic diseases before or after seeing their allergist. A study conducted to assess the quality and contents of asthma education currently on the internet reviewed 145 websites on the four most widely used search engines (11). Each site was evaluated based on accessibility by readability, language, download time, and actual content. This analysis revealed that asthma information sites are extremely variable in quality and content and that most of these sites failed to meet the information needs of patients (11). For the allergist, this analysis emphasizes the importance of directing their patients to credible and reliable websites for supplemental educational information.

Many scientifically based non-profit professional organizations (www.AAAAI.org and www.ACAAI.org) and for-profit companies have tailored online patient allergy education information which can be safely recommended to patients by allergists and posted on their own practice websites. Companies have begun

to promote computerized educational video clips delivered by well-known allergists about allergic diseases that can be viewed by patients while they are in the office (<http://www.LCDmd.com>). Other websites have provided a personalized online service allowing patients to directly ask questions to a board-certified allergist (<http://www.stopallergy.com>—"Ask an Allergist"). All of these modalities are very useful at fulfilling unmet gaps in patient education. However, further research is needed to determine whether these tools help to improve clinical outcomes over time and are more effective than the educational approaches currently utilized by allergists in their offices. Ideally, interactive web-based studies that employ behavioral modification techniques need to be designed to demonstrate whether the benefits of these different approaches warrant the cost of implementation on a large scale. Based on the current literature, it appears that internet interactive multimedia programs for home and office education hold significant promise for the future and should be pursued.

Physician Education

Physicians have the daunting task of keeping abreast of an ever-expanding body of medical literature. Each year, there are thousands of new articles published on asthma in hundreds of journals and books (12). Because of the rapid advances in medicine, most physicians are not able to fully benefit from information that could best guide their medical decision analysis. As early as 1997, internet technology had just begun to permeate into libraries of medical institutions, primarily because of lack of funding and decisive policy on what the future of computerization would mean to the medical field (13). However, recent surveys among postgraduate students indicate that the internet is the best resource for research information, support for evidence-based medicine, and continuing education (13).

Evidence based decision medicine (EBDM) is a process that requires using the best avail-

able medical evidence to guide health care decisions. If used uniformly by Allergists and other medical specialties, it is hypothesized that EBDM will lead to better patient outcomes. In addition, EBDM could provide clinicians, their patients, educators, researchers, funding agencies, and other interested health care parties a common basis on which to interact (12). However, there are potential dangers of EBDM such as manipulation of the fundamental process of research studies designed to generate unbiased data (12).

Furthermore, once evidence-based information is produced, it can easily be misconstrued or used inappropriately by ignoring other types of potentially relevant information in order to advance the objectives of the sponsoring individual or party (12). Over the last several years, most medical specialties, including allergy, have emphasized the importance of evidence-based decision making (EBDM). This has been highlighted by the development of practice guidelines by the Joint Task Force on Practice Parameters, a joint committee appointed and supported by the American Academy of Allergy, Asthma and Immunology (AAAAI) and the American College of Allergy, Asthma and Immunology (ACAAI) (<http://www.jcaai.org/Param/index.html>).

Finally, computerized clinical decision support systems based on clinical asthma guidelines have been tested using internal medicine residents to determine if they were more effective than traditional educational approaches. Residents using computerized decision support systems scored significantly better compared to residents using paper-based guidelines (92% vs 84%; $p < 0.002$) (14).

There are many barriers to the dissemination of evidence-based documents such as practice parameters. Some of these include lack of awareness by clinicians that such guidelines exist, lack of time or motivation by physicians to read and incorporate them into their practices, inadequate skills or resources to access this information, and limited ability by clinicians to

Table 1
Internet Resources That Assist Evidence-Based Decision Making

1. Evidence-based medicine: How to practice and teach EBD (<http://www.cebm.utoronto.ca/>)
2. PubMed Central (<http://www.pubmedcentral.nih.gov/>)
3. Respiratory Medicine Journals. MedNets. (<http://www.mednets.com/>)
4. MedBioWorld (<http://www.sciencekomm.at/med/journals/pulmonary.html>)
5. BioMedCentral (www.biomedcentral.com/)
6. The Cochrane Collaboration (<http://www.cochrane.org/>)
7. National Guideline Clearinghouse (<http://www.guidelines.gov>)
8. Joint Task Force Practice Parameters (<http://www.jcaai.org/Param/index.html>)
9. Medscape Allergy CME (<http://www.medscape.com/cmecenterdirectory/allergy>)

appraise the validity and relevance of research information upon which these guidelines are based.

It is plausible to suggest that the use of computers and the internet can rapidly overcome many of these barriers. Table 1 lists several readily available internet resources useful for the practice of EBDM as they allow clinicians rapid access to medical journals and continuing medical education. Computers and the internet will also help to increase the general public's health literacy about EBDM and permit health care decision makers to readily exchange information leading to standardization of medicine throughout the world. However, for this to have a successful effect, it will be necessary to generate more complex solutions that can overcome the barriers currently hindering our ever-expanding health care system and overcome patient and physician misperceptions of asthma disease management (12).

Environmental Education and Control

Recent evaluation of top-ranked managed care organizations in the United States indicates that there is still a significant deficiency with the integration of environmental avoidance measures with their asthma clinical prevention programs (15). This is largely due to the high costs of sending trained nurse practitioners or case workers into the homes of asthmatics to see how they live. The authors of this study have recommended alternative forms of

communication such as web-based case management and information systems (15).

The National Heart, Lung, Blood Institute and the Joint Task Force guidelines both strongly emphasize the importance of environmental control in the home and workplace as part of the comprehensive management of asthma and rhinitis. There are many web-based sources for environmental control education sponsored by nonprofit organizations or developed by companies selling environmental control products. However, effective environmental control requires more than advising patients to buy bedding encasements or air cleaners. In fact, recent unpublished data indicates a lack of correlation with owning an air cleaner and/or a dehumidifier and indoor allergen exposure. This suggests that behavioral modification-based educational principles must be applied to demonstrate the real-life benefits of environmental control which have been previously demonstrated in controlled clinical trials (16).

To accomplish this task, a very thorough home and work environmental history that elicits specific environmental characteristics in conjunction with a health assessment is necessary. Unfortunately, history alone has not been shown to be a sensitive method for identifying environmental exposures (16). Preferably, a walk through of the home or workplace is recommended for identifying the sources and magnitude of allergen and/or irritant exposures. Unfortunately, this can prove costly and very time consuming for the physician, patient,

and/or employer. It is not surprising that patient compliance with environmental control avoidance measures is generally poor. Studies indicate that only 10–30% of allergic patients implement environmental interventions (16). Given the importance of reducing exposure to asthma triggers, a greater effort by physicians and allied health personnel is necessary to improve patient compliance with avoidance measures.

Educating patients about the relationship between allergens and asthma is the first step for improving compliance (16). It is first necessary to increase the awareness of patients, employers, and physicians about importance of indoor air quality and allergen exposure (16). This could be accomplished in part by providing patients with an affordable and simple means to analyze levels of indoor allergens in their home. This information could in turn be used by the physician to make an evidence-based management plan encompassing avoidance measures with pharmacological and/or immunotherapy tailored to the individual patient's needs (16). Affordable dust sampling would allow both the physician and patient to monitor the effectiveness of environmental control measures in reducing and maintaining low indoor allergen levels over time (16). This innovative approach toward environmental assessment and monitoring can be done very inexpensively through the internet and information can be readily shared between the patient and his or her physician (16).

Patient Databases for Clinical Research

Industry-sponsored clinical research trials and physician-initiated clinical research projects are an important component of many allergy practices. Currently, most physicians' offices have a database that is centered primarily around their electronic billing system which unfortunately provides limited demographic information about the patient population of

interest. Most clinical practices have not efficiently "mined" their patient databases. Personal computers make it possible for clinical practices to develop databases that can capture specific populations within a practice without the need to conduct time-consuming chart reviews. The internet can also be used to more efficiently distribute surveys of patients in compliance with HIPPA regulations in order to obtain specific information on a variety of topics relevant to research and patient care.

Making the transition to electronic from hard copy records in clinical practice is a challenge that most physicians have yet to meet because of concerns about cost and computer malfunctioning that can result in unexpected downtime, thereby affecting the normal flow of clinical practice. However, many hospitals and universities have successfully made this transition which has been relatively well accepted by house staff and physicians.

Medical Practice Marketing and E-Commerce

One of the simplest uses of the internet in the allergist's office has been the development a web-page to advertise the practice. Companies offered this service *gratis* to allergy practices as a way of establishing a direct pipeline to the allergist. These websites have been used to provide patient information, as conduits for soliciting marketing surveys on behalf of pharmaceutical companies and to sell product to patients who access their allergist's website. This commercial approach of offering a free service to capitalize on physician referrals was not as effective as hoped, primarily because physicians and their patients failed to use these sites to their full capacities. Other possible reasons why personalized physician websites have not been successful for selling products to patients could have been due to the physician's overall indifference in promoting environmental control measures, the discomfort patients had with ordering products over the internet

and their lack of access to the internet. In fact, many consumers continue to use the internet as a source for gathering information about a particular product but then make their purchase in a retail store.

E-medicine is now starting to have practical applications in health care, specifically in hospital operations and practice patterns. However, these E-medicine services such as prescription writing, lab testing, patient monitoring, and disease-specific diagnosis and treatment, are still fragmented. Nevertheless, it is only a matter of time before these E-medicine health services will become interconnected resulting in large and profitable internet service businesses (17).

Conclusions

It is evident that the internet has the potential of becoming an integral part of the allergist's practice. The internet readily provides access to information that never would have been available just 10 yr ago. Its practical use in evidence-based decision-making, patient and physician education appears imminent. The greatest barrier will be the allergist's willingness to change practice behavior in order to incorporate this emerging technology. More likely, the expectation is that whenever anything new is introduced to the medical profession, a third of physicians will immediately adapt it into their practice, a third will await the experience

of the first third and the final third will await the experience of the first two-thirds. If this trend holds true, the accretion of internet-based medicine is still well beyond the horizon.

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