Professional's Information Link (PiL): A Web-Based Asynchronous Consultation Service

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Despite the massive growth of on-line information resources, many clinicians still prefer to obtain information from other clinicians, particularly those to whom they refer patients. Based on this notion and an information needs assessment, we developed the Professional's Information Link (PiL), a Web-based asynchronous consultation service to facilitate question answering between rural clinicians and an academic medical center. The system aims to provide answers to questions within two working days. It also includes patient handouts and continuing medical education resources. Our preliminary evaluation demonstrates modest but enthusiastic use of the system.

Medical informatics research has informed us a great deal on how clinicians use knowledge-based information. We know, for example, that clinicians have frequent information needs, on the order of two questions for every three patients seen, yet only pursue answers to one-third of them [1]. This same research shows us that the most common source they turn to for answers is other humans, most often a colleague or consultant in their referral chain. We also know that relative to overall information needs, computer-based knowledge resources are used modestly. Studies of usage show the average user seeks answers to clinical questions with on-line resources only a few times per month, even in the Internet era [2]. One likely reason for this is the time it takes to obtain an answer, which takes upwards of 30 minutes when using MEDLINE and journal literature [3]. It is likely that the move towards synoptic information resources, particularly those which adhere to principles of evidence-based medicine, may increase the usage of on-line knowledge resources [4, 5].

Another approach to providing knowledge-based information to clinicians might involve the development of technologies that recognize the value of person-to-person consultation and facilitate it. This approach is much less developed than the myriad of on-line information resources, especially when used in a clinician-to-clinician mode. There are a great deal of on-line patient-to-clinician consultation services. Probably the largest of these is NetWellness, which has over 17,000 answered questions in its database [6]. A query of "on-line medical consultations" to the Google search engine (last performed March 1, 2002) yields dozens of such services, with over half offered commercially.

One early clinician-to-clinician consultation service has been developed at the University of Iowa and uses predominantly email [7]. A different approach has been taken by Partners Medical System, which offers such consultations for a fee (econsults.partners.org). Some health systems use on-line clinician-to-clinician consultation but have not published about it (Methodist Medical Group in Indianapolis, Mark Overhage, personal communication; Kaiser-Permanente Northwest, Homer Chin, personal communication; The Cleveland Clinic, www.eclevelandclinic.org; eSMART, www.coh.uq.edu.au/coh/projects/telemedicine/esmart.html).

This paper describes the motivation, implementation, and preliminary evaluation of the Professional's Information Link (PiL) project. PiL was motivated by a combination of the unmet needs of a group of clinicians in rural Oregon and their desire for answers by specialists Oregon Health & Science University (OHSU) to their questions. These clinicians already had access to a telephone-based consultation service, the OHSU CONSULT service, which allows any licensed clinician in the state of Oregon to call a toll-free phone number and be connected to an OHSU specialist, but found it insufficient.

Needs Assessment

The impetus for PiL arose from an information needs assessment carried out with physicians in Medford, Oregon, a city in the southern part of the state with a population of approximately 80,000. As with many rural cities, Medford has uneven coverage of medical specialists, with care in a given area, e.g., pediatric infectious diseases, dependent upon as little as one

provider. In order to better understand the information needs and desires of Medford-area physicians, a survey was undertaken in late 1999. A convenience sample of 52 physicians were asked the questions listed in Table 1 during a face-to-face interview with a clinician who would become a member of the PiL project team (RM). The results of this survey, also shown in Table 1, indicated that these clinicians expressed a desire for the ability to interact with specialists from the state's only medical school, OHSU. They believed that the synchronous nature of the phone-based consultation service was too inconvenient and expressed a desire for a Web-based asynchronous approach. They also expressed a desire for access to patient handout materials and on-line continuing medical education (CME).

Design

This survey led to the design plan for a system providing the following functionality:

- Question-answering by specialists
- Patient handouts
- On-line CME

The central feature of PiL is to provide answers to questions that arise during care, especially on topics where local expertise is not readily available. Questions are forwarded to OHSU, where the aim is to provide an answer within two business days. The "asynchronous" (i.e., non-real-time) nature of PiL makes it more convenient both for busy rural clinicians and OHSU specialists. In addition, communications between both groups are facilitated by an "informationist" [8], a medical information specialist who forwards incoming questions to appropriate specialists, assists them in finding additional resources to augment answers, keeps them cognizant of the desired turnaround time, and returns them all to the individual who answered the question. An on-line repository of questions and answers is being captured (and will soon be made available for direct on-line searching to the users of the system). Figure 1 depicts the flow of information in the question-answering portion of the system.

PiL is also an alternative to the OHSU CONSULT real-time phone-based consultation service. As noted in the needs assessment (and elsewhere in the state anecdotally), the problem with these real-time consultations is that they require both the clinician asking the question and one answering it to disrupt their workflow to wait for a specialist to be paged and connected to the line. The needs assessment showed that while Medford-area physicians valued and used this service, they did so infrequently due to its synchronous nature. They also desired to have follow-up information provided to corroborate and expand upon what the consultant has recommended.

Another problem with OHSU CONSULT is that specialists have little incentive to provide more than basic answers over the phone. They certainly do not have the time to find articles or Web pages to reinforce their answers. With a growing desire on the part of academic medical centers for physicians to be clinically productive, the amount of uncompensated time they can provide for such services is small. PiL is therefore a novel approach to harnessing the expertise of these specialists to answer questions with minimal imposition on their time.

Additional goals for PiL include the provision of patient handouts and CME. The patient handouts in PiL are available through OHSU's license of materials from a commercial publisher. Clinicians can print the handouts for their patients with their own names at the top. A CME pilot project within PiL will be launched in mid-2002 using many of the same technologies employed in OHSU's medical informatics distance learning program [9].

Another goal of PIL is to determine how to provide these services in a financially-sustainable model. A major challenge for all of telemedicine has been developing funding models that sustain projects beyond their usually grant-based seed funding. A particular challenge has been how to reimburse specialists for the time and effort they put in relative to the market worth of their services [10]. From the project's inception, the specialists have been paid, to the best of our ability to estimate it, appropriately for their clinical time. An important part of further research will be to determine how to deliver these sorts of services in an economically-tenable manner.

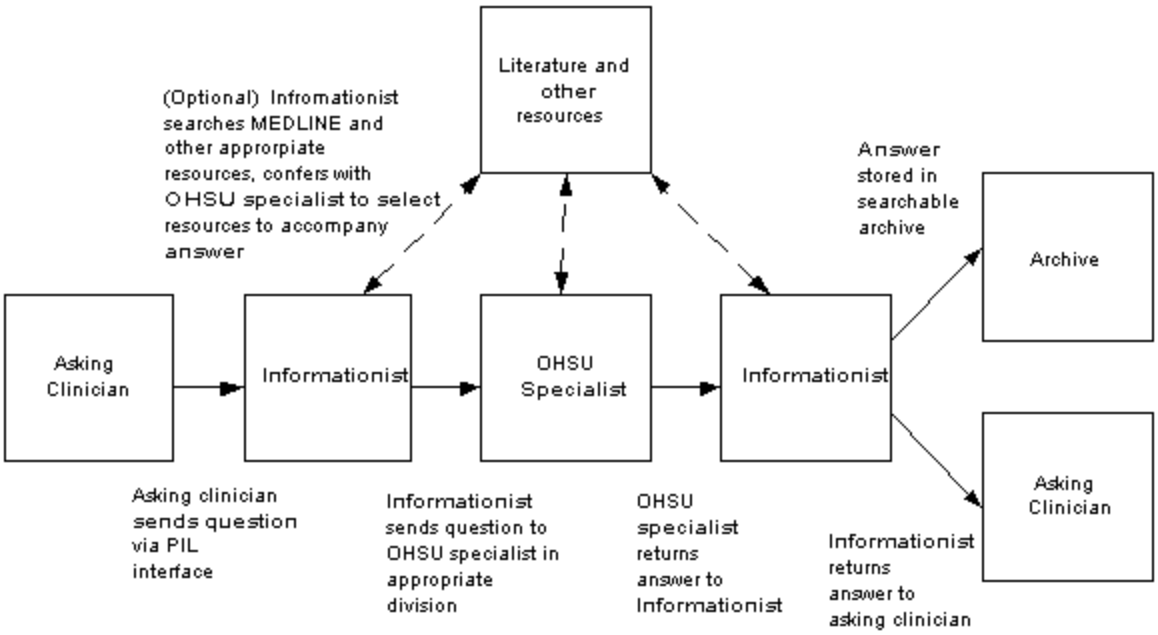
Implementation

The PiL system is accessed by users from a secure Web page. After a user successfully logs in, a new browser window opens that provides access to all the capabilities of PiL. The initial screen allows the user to compose a question and direct it to the appropriate specialist. The user can then branch to other pages, one of which allows display of all of the "active" questions, which consist of all questions that have been either submitted or returned but not yet viewed.

Table 1 - Information needs assessment of 52 clinicians from Medford, Oregon.

Question	Answers
What type of practice do you have?	Group - 38 (84%) Solo - 7 (16%)
What specialty?	Internal Medicine - 20 (38%) Pediatrics - 9 (17%) Family Medicine - 6 (11%) Obstetrics/Gynecology - 4 (8%) Other - 13 (25%)
Have you referred patients to OHSU within the last year?	Yes - 49 (98%) No - 1 (2%)
Have you utilized the OHSU CONSULT service?	Yes - 27 (53%) No - 24 (47%)
Do you use the Internet in your medical practice?	Yes - 33 (63%) No - 19 (37%)
Would you use an Internet service that was designed to give you feedback on your medical questions and information needs within 24-48 hours?	Yes - 42 (86%) No - 7 (14%)
What resources would be most helpful with your or your patients' educational needs? (Could choose more than one.)	Patient Handouts - 25 (52%) Grand Rounds - 21 (44%) Other Conferences - 12 (25%) None - 12 (25%) Other Information - 9 (19%) Practice Guidelines - 5 (10%)

Figure 1 - Information flow in PiL.



Another page provides a display of "all" questions which he or she has ever asked. Figure 2 shows this view. Other pages provide access to patient handouts, CME, and help in using the system. All screens in PiL display the user's name as well as navigation tabs along the left side and the top of the screen. The left-side tabs provide access to the specific functions of PiL, which are currently the question-and-answer, patient handouts, and CME opportunities. The top tabs provide access to information about PiL.

Due to the limited funding for PiL, the initial system has been restricted to four clinical specialties: adult infectious diseases and endocrinology and pediatric infectious diseases and endocrinology. Each of these specialty groups submits a "call schedule" to the informationist, who forwards questions to the appropriate individual and follows up with them to insure the two-day turnaround time is met.

As noted above, we have been archiving questions and will add a searching capability over all the questions asked by all users. When the answer is viewed by the clinician, he or she is asked to provide brief feedback as to whether the question was answered, whether it was helpful in care of the patient, and any other comments. The user is also given the option of asking a follow-up question.

Initial Usage

A total of 31 clinicians were given access to PiL during July-August, 2001. By the end of December, 2001, a total of 13 questions had been asked by seven different clinicians. One question had two follow-up questions (not counted in the total of 13). The questions were distributed almost exactly evenly, with four questions asked of adult endocrinology and three each of adult infectious disease, pediatric endocrinology, and pediatric infectious disease. The short feedback form completed by the clinicians on the answer page has yielded all positive comments. Further analysis on the details of the questions is planned. We also hope to determine why the majority of clinicians have not yet used PiL. An example question is shown in Figure 3.

Future Plans

Initial use of PiL has been enthusiastic but modest. We are now focusing on ways to increase usage. One approach will be to expand the system to all of the internal medicine and pediatrics subspecialties. We hypothesize that a broader range of content coverage will lead clinicians to use the system more often. We also plan to survey users directly for their feedback to elicit suggestions on how to better meet their needs. Finally, we are investigating the economic aspects of the system, with a particular focus on how to make this service into a financially-sustainable aspect of the health care delivery system.

Acknowledgements

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Figure 2 - PiL user interface with list of questions.

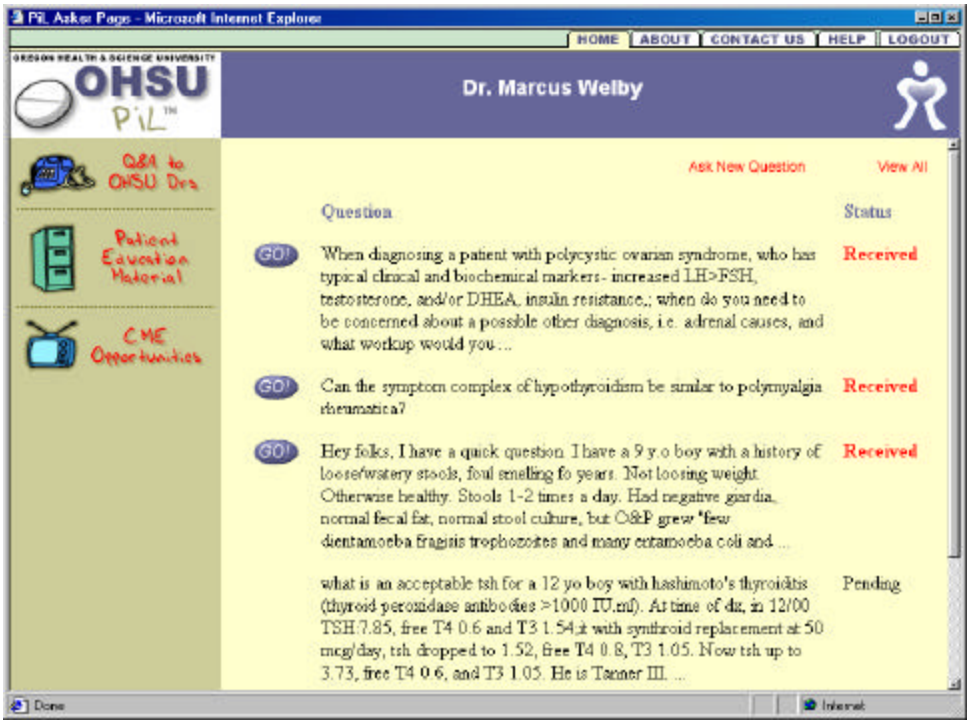

Figure 3 - PiL question.

Question:
Can the symptom complex of hypothyroidism be similar to polymyalgia rheumatica?
Response:
Yes, indeed it can be very similar.
The age range of affected individuals is similar. Hypothyroidism can present with a wide spectrum of musculoskeletal complaints. Very common in hypothyroidism are muscle stiffness, pain and cramps as well as the "universal" but nonspecific complaint of fatigue. Less common is a true myopathy with weakness, often with an increased muscle mass and myoedema. This is similar to the complaints of PMR of muscle stiffness, pain, and weakness, which also often has systemic complaints of fatigue and malaise and sometimes weight loss (rare in hypothyroidism). Other complaints of hypothyroidism: constipation, menometorrhagia, dry, brittle hair, skin and nails are not reported in PMR.
The laboratory also has similar findings, with anemia common in both diseases; CK is usually normal in PMR and can be normal or markedly elevated in hypothyroidism. The hallmark laboratory in PMR is an elevated sedimentation rate; I can find no reference for ESR in hypothyroidism. However, an elevation in TSH in hypothyroidism should make the diagnostic dilemma clear.
Two other endocrine diseases with similar presentations are vitamin D deficiency and primary hyperparathyroidism, both often with muscle pain, aching, stiffness and weakness. The incidence of vitamin D deficiency is vastly underestimated and so a 25-hydroxy vitamin D level is on my list of "screening tests" for the patient with otherwise unexplained muscle aches and fatigue.