

## Articles

# The Primary Care National electronic Library for Health (NeLH-PC): a pilot of information-centred knowledge management for primary care – [www.nelh-pc.nhs.uk](http://www.nelh-pc.nhs.uk)

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### ABSTRACT

**Introduction:** The NeLH-PC (Primary Care National electronic Library for Health) was created as part of the NHS information strategy. It is designed to deliver knowledge to primary care. The rationale for developing this library as a knowledge management tool and where it sits within the science of knowledge management are described.

**Method:** Focus groups were used to define the questions that arise in primary care that the NeLH-PC should be seeking to answer. The Primary Care Library is subject to a cyclical programme of continuous improvement.

**Results:** A site has been developed to meet users' needs and levels of expertise. NeLH-PC attracts from 500 000 to in excess of 800 000 hits per month.

**Conclusions:** NeLH-PC provides an exemplar of how a limited range of knowledge management tools is utilised. More investment is needed if a broader range of tools is to be provided. Greater integration is required with educationalists and other information and knowledge services if the library's full potential is to be realised.

**Keywords:** electronic library, evidence-based medicine, Internet portal, knowledge management, primary care

## Introduction

The National electronic Primary Care Library (NeLH-PC) is part of the National electronic Library for Health (NeLH) programme, created as part of the NHS information strategy.<sup>1,2</sup> This paper describes its design and development, with the aim of delivering knowledge and know-how to primary care.

The NeLH programme includes the creation of 'virtual branch libraries' for specific diseases and

professional groups, and the Primary Care Library (NeLH-PC) was the first and largest. The development of NeLH-PC has been reinforced within the information strategy's most recent update: 'Specialised websites – virtual branch libraries – will focus on mental health, cancer and primary care.'<sup>3</sup>

NeLH-PC aims to promote clinical governance, by making 'explicit knowledge' available to primary care in a digestible form, within the context of the busy primary care setting. This explicit knowledge is the evidence base. It should enable patients to be

appraised of the best management options. It is an exercise in knowledge management – enabling primary care professionals to find out what they need to know, whilst avoiding the pitfalls of information overload.<sup>4,5</sup> In line with NHS policy, the site is also directly accessible to patients over the Internet.

The public and NHS staff will be able to access information on local care services and how best to use them through nhs.uk, and evidence-based information and clinical guidelines through the National electronic Library for Health (NeLH).<sup>6</sup>

Clinicians need access to information. Delivering evidence to clinicians rapidly, 24 hours a day, is one of the key tenets of the NHS information strategy, and of critical importance to the NeLH programme.

In relation to the professional knowledge base, NHS professionals cannot possibly retain in their heads all current and emerging knowledge about the work they do. Health care is an international business and the knowledge base constantly changes and grows.<sup>2</sup>

The NeLH-PC is primarily targeted at NHS general practice; these practices are connected to the Internet via the NHS Intranet (NHSnet), which sets out to provide desktop web-browser access for all. Although physical connection of general practices to NHSnet is near universal, its use is still patchy, and many primary care professionals still lack basic Internet skills.<sup>7,8</sup> The design and development of NeLH-PC has been

aligned with NHS policy, whilst taking into account the skill levels and ICT (information and communications technology) available in primary care (see Figure 1).

## Background

This section explains about knowledge and its definition. It explains one of the most common epistemologies (theories of knowledge), where the terms ‘knowledge’ and ‘know-how’ sit within this epistemology, and how they have come to be used within the NeLH-PC.

## What is knowledge?

There are many theories of knowledge, or epistemologies. Most describe knowledge as something generated from a flow of information, and involving human thought. What differentiates knowledge from information is that knowledge has to incorporate commitment and belief that something is right or true. Plato’s classical definition of knowledge has stood the test of time: ‘Knowledge is “justified, true belief”’.

The screenshot shows the NeLH-PC home page with the following elements:

- Header:** NHS NeLH-PC logo on the left. Navigation tabs for NeLH, Local Library, Feedback, and Help. Below these are links for MY NeLH-PC and SITE MAP.
- Left Navigation Menu:** A vertical list of categories including References, Journals, Books, Therapeutics, Emergency, News and Business, Technology, Educ. & Research, and Papers.
- Search Bar:** A central 'EBM Search' box with a 'Go' button and a 'details' link below it.
- Content Section:** A section titled 'Abstracts of new papers' featuring a link to 'Synergism between allergens and viruses in patients with asthma: Use of ramipril for the prevention of stroke: Early evidence of ethnic differences in cardiovascular risk' and a 'More ...' link.
- Footer:** A row of small thumbnail images and a 'disclaimer | about' link.
- Additional UI Elements:** A 'Select a View' dropdown menu set to 'Home / Knowledge' and a 'Site Index' search box with a 'Go' button and a link to 'A to Z list'.

Figure 1 NeLH-PC home page [www.nelh-pc.nhs.uk](http://www.nelh-pc.nhs.uk)

## Types of knowledge – explicit and tacit

Knowledge is often described as being of two types, ‘explicit’ and ‘tacit’.<sup>9</sup> Explicit knowledge can be codified and recorded in a structured way in journals and books. Evidence-based medicine (EBM) is a highly formalised form of explicit knowledge. Explicit knowledge is the easier part of the concept to understand.

Tacit knowledge is subdivided into our mental models of the world and a technical element. Both the mental model and technical element components of tacit knowledge have relevance within general practice. The mental models include our paradigms, perspectives and schemata. Understanding the paradigm within which a judgement is framed, or an individual’s perspective, is something that is done all the time within clinical practice when patients’ ideas and expectations are explored.<sup>10</sup> A ‘schema’ is a mental model, and clinicians use these all the time – for example, a patient with atrial fibrillation that needs to have some form of antithrombus treatment. PRODIGY (Prescribing RatiOnally with Decision support In General practice study) takes such a schema and writes a specific guideline for that clinical situation.<sup>11</sup>

The NeLH programme focuses on the technical element of tacit knowledge. This is a different but complementary approach to PRODIGY. The technical element of tacit knowledge is the more concrete know-how, crafts and skills. The NeLH project is trying to capture and make available to primary care the tacit knowledge of how to get things done.

## Terminology used within the NeLH programme – knowledge and know-how

The NeLH programme uses a simplified terminology (set out in Table 1); only the terms ‘knowledge’ and ‘know-how’ are used.<sup>12</sup> Knowledge is applied to explicit knowledge – principally when it is applied to that highly formalised type that clinicians are very familiar with and know as EBM. Know-how is applied to the technical element of tacit knowledge – ‘how to do it’. Often this will be about how to apply the EBM that forms the knowledge base.

In summary, within the NeLH programme, where the term ‘knowledge’ is applied, users should expect to find mainly EBM; where ‘know-how’ is displayed, expect to see how to do it, or the parameters within which the EBM is to be applied.

## Knowledge management

As with knowledge, there are many different definitions. Wyatt sees it as about recognising the importance of knowledge and getting it used.<sup>4</sup> The NeLH programme goes beyond this in trying to encourage it to become a core activity.<sup>12</sup> Access to, and ultimately use of, the NeLH-PC is as ubiquitous as that of the *British National Formulary* within the consulting room. Prerequisites for its use are technical resources to

**Table 1** Epistemology of knowledge

| Epistemology of knowledge<br><i>after Takeuchi &amp; Nonaka</i> <sup>9</sup>  | Medical examples  | Epistemology<br><i>for NeLH-PC</i>  |  |
|---|---|---|--|
| Type of knowledge and its characteristics   |   |   |  |
| <b>Explicit</b>   | Formalised  | <b>Knowledge</b>  |  |
| <ul style="list-style-type: none"> <li>• Rationality</li> <li>• Sequential               <ul style="list-style-type: none"> <li>– there and then</li> </ul> </li> <li>• Digital knowledge               <ul style="list-style-type: none"> <li>– theory and reductionist research</li> </ul> </li> </ul>  | Evidence-based medicine <sup>4,13</sup><br><br>Clinical audit   | = Evidence-based medicine   |  |
| <b>Tacit</b>  | Mental models/<br>cognitive   | <b>Know-how</b>   |  |
| <ul style="list-style-type: none"> <li>• Experience               <ul style="list-style-type: none"> <li>– ‘body of knowledge about’</li> </ul> </li> <li>• Simultaneous               <ul style="list-style-type: none"> <li>– here and now</li> </ul> </li> <li>• Analogue               <ul style="list-style-type: none"> <li>– learnt from practice</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Perspectives</li> <li>• Paradigms</li> <li>• Schemata</li> </ul> Technical element | = Implementation of evidence-based medicine<br><i>or</i><br>Frameworks within which EBM must be applied                         |  |
|   | <ul style="list-style-type: none"> <li>• Know-how</li> <li>• Crafts</li> <li>• Skills</li> </ul>                            | Schema used in PRODIGY <sup>11</sup><br><br>Implementation of national service frameworks<br><br><i>How to get things done!</i> |  |

enable access to the knowledge, availability of the resource itself, and support for those learning to use it. Project Connect has supplied the necessary infrastructure; the NeLH-PC provides the resource itself; and the training needed to really make best use of these resources rests currently with local initiatives.<sup>7</sup>

## Method

The theoretical framework of the library was established by the NeLH Project Team, which met regularly between June 1988 and 1999. Within these meetings the aim of the Primary Care Library was established, and its objectives and scope defined.

Focus groups to define primary care information needs were carried out from May to September 1999.<sup>14</sup> Eighty-eight professionals, including 38 general practitioners and 21 nurses, attended these meetings. From these, a user specification and a development programme were initiated.

A cycle of formative evaluation has been introduced. This contains a number of elements.

- 1 Usage rates of different parts of the library are monitored.
- 2 Response to requests from user feedback. These can take a number of forms: requests for new links to be established with the library (this is done via the form at [www.nelh-pc.nhs.uk/Feedback.htm](http://www.nelh-pc.nhs.uk/Feedback.htm)), comments about sites from users or their owners, and finally via users being able to comment whether the 'meta-evidence' search engine answered their intended question.
- 3 A member of the NeLH-PC team visits practices to assess the library's usability. Users and potential users of the library are asked to frame three questions that arose in their normal work. They are then asked to use the library to answer them. Questions asked are then grouped into three categories: those questions the user could answer unaided, those that an expert can answer with the NeLH-PC, and those that cannot be answered.
- 4 The results of these exercises are fed back to the development team.

## Results

The aim of the NeLH-PC was defined as providing online access to the knowledge and know-how to support clinical governance. Its scope was to be the

knowledge and know-how requirements of the whole of primary care.

### Phase I – NeLH-PC user requirement

The key questions that define user requirements are set out in Box 1. Potential users wanted speed, text (not video or images), few mouse clicks, a search engine linked to guidelines and summaries of the evidence. They also wanted to know what information sources such as Cochrane contained, and their usefulness.

### Phase II – library specification and development

- A simple to navigate structure has been created, separating knowledge, know-how and people into different 'views' reached via a drop-down menu.
- An indexing system, using the Dublin Core specification, can be accessed adjacent to each of the libraries' contents, or searched or browsed via a 'site index' search at the bottom left of the home page.<sup>15</sup> Sites are rated for their usefulness.
- An 'EBM-search' engine searches in three tiers. Type in a search term (such as 'stroke') and guidelines and secondary review articles are accessed initially. The third tier is the PubMed Medline clinical queries interface.<sup>16</sup>
- 'My-NeLH-PC' allows a user's favourite resources to be drawn together on a single screen. This is a first step to allow personalisation of knowledge management.
- Signposts to recent publications are provided on the home page. These are pointers toward papers worthy of attention in this week's primary care press.
- Feedback can be given on rating scales, results of searches, abstracts, and new sites submitted.

### Phase III – continuous improvement

The NeLH-PC aims to respond to the requests of users and site owners. Unless there is a need to display urgent material, the NeLH-PC feedback is collected and studied, and changes made every three to four months rather than piecemeal. Items submitted are appraised for their evidence base, where appropriate, usefulness to primary care, and the quality of the interface. The overwhelming majority of sites submitted are accepted into NeLH-PC. Those rejected are in the following categories: sites predominantly marketing or selling, sites where there are no indications of quality of the content, sites not relevant to primary care.

## Box 1 Key questions that arise in primary care

### Therapeutics

- 1 What is the correct dosage regime of the drug for the patient with me?
- 2 I want to commence this patient on a particular class of drug (e.g. statin for hypercholesterolaemia). Which one is the best to use?
- 3 A patient on multiple therapy complains of a problem, could it be due to one of their drugs or be an interaction?

### '4Rs' – referrals, requests, reports and results: when to make and how to interpret

- 1 When do I refer for a condition?
- 2 When should I do a test?
- 3 What does this report mean (e.g. 'a touch of atelectasis' on a chest X-ray report)?
- 4 What do I do about a slightly abnormal result, especially when the laboratory report says 'maybe adjusted for age'?

### Directory information

- 1 I am the nurse lead in my PCO (primary care organisation). How do I contact others?
- 2 Which consultant would be the best to refer to for a given clinical condition?

### Health improvement/PCO population health

- 1 I am the clinical governance lead for my organisation. I was previously involved in clinical audit and I never achieved sustained improvement. Can you provide new tools to replace the old ones?
- 2 I need methodologies to implement the new NSFs (national service frameworks). I know the evidence – but where is the implementation strategy?
- 3 Every PCO throughout the country is reinventing the wheel within their health improvement plans; can you provide access to these to enable me to benchmark my data?

### Access to online librarian/knowledge officer

- 1 I have tried to find information about a particular topic using this search strategy and failed, please help?
- 2 I have found the following title that I think meets my information needs, please find it for me or suggest an alternative?

## Usage

NeLH-PC is used most during UK office hours. Late morning and the afternoon are the busiest times and Tuesday to Thursday the most popular days. The site is used most by '.nhs.uk' email addresses. NHSnet users make on average 27 requests per visit, those on the Internet 3.7. Internet usage is growing faster than that on NHSnet. The monthly usage rate of NeLH-PC since September 2001 has been between 500 000 and 850 000 hits per month. Over 1000 websites have links to NeLH-PC.

## Discussion

The NeLH-PC has gone online and achieved usage figures in excess of those anticipated by its developers – however, no target figures for use were set. The hours of usage and the source URLs suggest that this is primarily use by UK health professionals.

Focus groups were used because of perceived pressure of time at that stage in the programme's development; they enabled a large number of primary care clinicians' views to be obtained in a short time. Constructing a user requirement from focus groups has been effective. Their output was compatible with previous work; there were additional questions relating to the new primary care organisations.<sup>17</sup> Other methods, particularly piloting and evaluating trial versions in the workplace were considered, but discounted largely because of pressures of time and resources.

The formative evaluation consists of responding to users' preferences and comments, coupled with an attempt to capture the questions that arise in primary care, and seeing if NeLH-PC can answer them. The latter process was arrived at as the project wanted to use a method that its single knowledge officer could use on a week-by-week basis as the library evolved. This approach has resulted in contact with (a small number of) real users. The nature of doctors' questioning has already been reported.<sup>18</sup> It is subject to both selection and recall bias: users may select

questions that they think NeLH-PC can or can't answer; and they might have difficulty recalling precisely the questions that arose in consultation.

Even if this limitation did not exist, further research is needed to compare the effectiveness of NeLH-PC to answer clinical questions compared with other approaches that have been tried.<sup>19</sup> It is important to learn whether a web-based interface can come close to answering the questions of its users – or if a librarian/informaticist/knowledge officer is required as an intermediary. The skills of the knowledge and information officers within the NHS Library Service could be mobilised to meet at least part of this need, however, to date there are only limited examples of this approach being taken.<sup>20,21</sup> Leaving the NHS Library Service outside the NHS Information Authority creates an unnatural divide between librarians (who are increasingly the information and knowledge managers for primary care), the NeLH programme, and the Primary Care Library that lies within.

The principal limitations on the technical development of the Primary Care Library project have been due to insufficient funding and lack of provision of training about the resource. More funding would allow the development of additional knowledge management tools. These would include:

- discussion fora to promote understanding of and how to implement the evidence base
- a repository for original material
- incorporation of components of the library into primary care organisations' Intranets.

These additional tools to enable knowledge management would be prioritised ahead of additional external resources.

There is still an enormous skills gap in primary care, with many primary care professionals unable to use the resources already provided. More tools to help them with use of existing knowledge assets are needed ahead of additional information sources.

## Conclusions

Without investment in knowledge management, as found in the private sector, the NeLH-PC may remain an inadequately resourced backwater, merely scratching the surface of information needs. Its tiny team can be contrasted with Access Health, the American medical call centre, which invests heavily in creating algorithms that have codified the symptoms of over 500 illnesses.<sup>22</sup> NeLH-PC shows what it is possible to deliver with limited resources. It is a first step in 'information-centric' knowledge

management. It provides exemplars, rather than a comprehensive range, of information management tools.

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