

# Knowledge Infrastructure Needed for Occupational Health<sup>a</sup>

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**Abstract:** Expertise on work and health topics is the foundation for the added value of occupational health (OH) professionals to the health of the working population. Professionals should therefore practice in accordance with high quality standards and latest evidence. As adequate knowledge management and a supportive knowledge infrastructure is needed, OH professionals can discuss opportunities to strengthen both. Occupational health services ought to offer ICT facilities, stimulate organizational conditions and human resource development to implement evidence-based practice. On national level a portal including a virtual library, tailor-made for occupational health, providing access to high quality websites, abstracts and full text articles and books, is a backbone for further developments. Expert groups on various topics can function as a top reference level for new or complicated questions and issues. As an example of an initiative to foster progress, the Dutch Knowledge Infra Structure program for OH professionals (2004–2006) is introduced. This program included efforts to develop the infrastructure itself and projects to develop concrete tools and instruments.

**Key words:** Occupational health, Knowledge infrastructure, Knowledge management, Evidence-based medicine, Experts, Library

## Added value of Occupational Health Professionals Depends on Knowledge

In order to guarantee good quality of care to companies and workers, occupational health (OH) professionals have to use state of the art knowledge in daily practice<sup>1–3</sup>). Fortunately, today companies and workers are getting more eager to know about working conditions, hazards in the workplace and health. A problem is the poor or limited facilities in many countries to support them. When good information is available e.g. through a high quality website or help desk, their questions can be answered and they can receive suggestions for solutions. In Canada the

“Occupational Safety and Health Answers” facility has been developed to inform the public and is widely used and highly appreciated by all involved parties (<http://www.ccohs.ca/oshanswers/>). Such practice reflects what we all want: workers and companies interested in occupational health issues and able to inform themselves and to resolve problems. But even when good facilities are available, workers and companies will search for professional support when they want to be sure that the information found is valid, up-to date and relevant for their own situation. Some cases are too complicated for self care and in other cases companies need exposure measurements. Concrete health care activities such as a diagnostic medical examination might be wanted by a worker, or a workers’ council might like to discuss with experts the need for a screening programme. Then OH professionals are needed with practical experience and

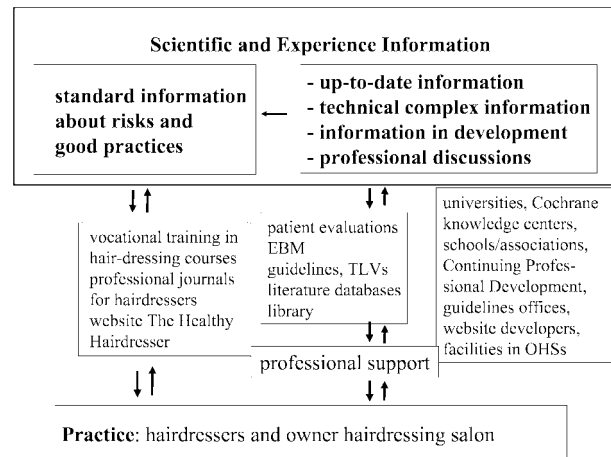
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able to transfer and interpret scientific knowledge.

For example, a hairdresser with current asthma complaints needs knowledge about risks at work and good practices. Fortunately, the owner of the salon is anxious as well and stimulates her to search for more information. She visits the Dutch website “The healthy hairdresser” (<http://www.healthyhairdresser.nl/>), after she has learned in vocational training about potential risks in the workplace and about the existence of the website. On this website she finds ‘standard information’ such as tips about prevention and rehabilitation on occupational contact dermatitis, and a warning for the risk of occupational asthma in general terms. Now she knows there might be a serious problem and she feels the need to have professional support to diagnose if there is an occupational disease indeed. Measurements have to be done and proven adequate solutions have to be suggested, discussed, implemented and evaluated. To be able to deliver a high quality professional advice and care, OH professionals use up-to-date information from professional guidelines or websites, scientific literature databases, articles and reviews and other original sources. In figure 1 the two current main ways of knowledge (information) dissemination toward the shop floor are presented in a scheme: ‘standard’ information without professional interference, and ‘up-to-date technical complex information’ where professional support is needed.

This scheme and expectations might be clear, but when OH professionals have to rely on the state of the art knowledge, how and where will they find all relevant knowledge? This issue is not a simple one, as occupational health includes the care for all kind of industrial branches and occupations, representing a wide variety of risks: ergonomic, chemical, physical like noise and radiation, biological like viruses, mental and organizational. This is the reason why occupational health involves a large number of professional disciplines. Moreover, people differ in capacities and susceptibilities including the impact of genetic predispositions and relevant medical conditions such as chronic diseases and the use of potent prescribed drugs or supportive medical devices such as implantable cardioverter defibrillators (ICDs). Consequently, many different medical disciplines might be involved as well. Another aspect is the actuality of the sources as the half lifetime of most knowledge is limited to four or five years<sup>4</sup>). This all implies high demands on the availability and quality of up-to-date knowledge and information<sup>5</sup>). As access to various sources of knowledge is not everywhere available, this has to be organized. To support OH professionals in their task to transfer knowledge to the workplace they need not only access



**Fig. 1. Two ways of knowledge (information) dissemination, ‘standard information’ without professional interference, and ‘up-to-date technical complex information’ where professional support is needed.**

The practice of a hairdresser is chosen as an illustration.

to international scientific journals and books. In daily practice we see an essential contribution of national journals, reports, websites, conferences and courses that give access to international publications on (occupational) health issues. National media offer added value presenting and discussing various opinions of practitioners, experts, unions and employers’ federations. Often results of original studies have to be reviewed, appraised, combined and translated in new knowledge products useful for practice, such as practice guidelines and threshold limit values.

In the Netherlands it turned out however that this variety of knowledge was not easily accessible for most of the professionals.

First of all, professionals have to know how to recognize and develop knowledge questions and how to perform a search in literature. A recent survey study has shown that occupational physicians have little questions in their daily practice when asked for. We have titled these questions ‘manifest’ questions. During observations in daily practice and subsequent discussions about cases however, they presented many knowledge questions which we have titled ‘latent questions’<sup>6</sup>). Next, when answering these questions they rely primarily on advice from colleagues, whereas these advices were found to differ substantially from the best evidence from the literature<sup>7</sup>). We concluded that the search motivation of occupational physicians has to improve substantially.

Secondly, in the Netherlands and in most other countries there is no clear overview of the places where state of the

art professional knowledge can be found. It is hard to find the right sources providing high quality knowledge. Most of the time OH professionals tend to stick to sources they already know, which leave them with some blind spots for other relevant sources<sup>8)</sup>. To complicate this all even more, many professionals suffer from information overload, especially since the introduction of the internet, caused by many, often low quality, sources and a poor organisation of the infrastructure<sup>9)</sup>.

When OH professionals are aware of their knowledge questions and know where to find answers, there is the question of who has to pay for access to literature databases that are not for free such as PsycINFO, and how to get the full text journal article when these are not for free. It is not only practical matters that can hinder. Many professionals are lacking in search skills to find relevant literature in databases and skills how to assess the quality of the publications found. The ways to find implicit knowledge are relevant as well, e.g. how-to-do advises that are not (yet) written down. In a next step you can share the search effort or knowledge found with colleagues and clients. Unfortunately, in Dutch occupational health services (OHS) sharing questions and knowledge is not common practice everywhere. Finally, there is the question of how to evaluate knowledge which is applied. We would like to know if the employee or manager has received the benefits of evidence-based advices or care. The application of knowledge in everyday practice can be advanced e.g. by feedback in peer group meetings.

### **Knowledge Infrastructure on Various Levels**

To support professionals a good knowledge infrastructure is needed. Knowledge infrastructure can be regarded as the sum of all sources and means which is available to find relevant new knowledge for problems at hand. A good knowledge infrastructure requires adequate technical facilities e.g. Information Technology (IT) and a (virtual) library; appropriate organizational conditions such as incentives on sharing knowledge; and human resource development of professionals e.g. to learn search strategies for practice<sup>10)</sup>. We will describe facilities on local, national and international level that can be developed or improved.

At a local level a technical infrastructure is needed such as IT and internet access at the workplaces of all professionals. OHSs can support professionals to manage knowledge properly by creating opportunities and incentives for exploring, sharing and applying knowledge that can benefit employees and companies. They can foster interdisciplinary

co-operation, organize appropriate contracts with a firm, provide enough time and practical facilities.

On a national level, relevant actors are professional organizations, national institutes, universities, employer's confederations, trade unions, and the government. A technical infrastructure can include a virtual library; a national network of expert groups on various topics; internet-based access to quality-appraised relevant sources; facilities to develop guidelines and threshold limit values; knowledge transfer media such as national professional journals; education and training courses to develop skills to find, share and apply knowledge. There is a need to develop easy-to-apply search strategies and practical tools such as search filters.

International facilities include e.g. the Cochrane Occupational Health Field in Finland (<http://www.cohf.fi/>), the Canadian Centre for Occupational Health and Safety (CCOHS), ILO and network organizations such as the WHO collaborating centers in occupational health. WHO has published the Technical Report "A practical guide for the use of research information to improve the quality of occupational health practice for occupational & public health professionals" in 2006<sup>11)</sup>. Furthermore, International Commission on Occupational Health (ICOH) scientific committees and meetings offer good opportunities for sharing knowledge.

### **The Dutch Knowledge Infra Structure (KIS) Programme**

OH professionals in each country can start initiatives to strengthen the local and national infrastructure. Recent Dutch initiatives are hereafter presented as an illustration. In the Netherlands we started in 2004 and 2005 ten projects as parts of the Knowledge Infra Structure (KIS) programme with support of the Dutch Ministry of Labor. The aim was to discuss and develop the infrastructure itself and to deliver search tools and assessment instruments to improve the knowledge infrastructure substantially.

The projects on tools and instruments included different concrete subjects and are partly published elsewhere or are still ongoing and will be published. A number of projects was dealing with search strategies and is published already<sup>12-15)</sup>. One project evaluated AGREE (Appraisal of Guidelines for REsearch and Evaluation) as a quality assessment system for practice guidelines<sup>16)</sup>. Projects evaluating the effectiveness of an EBM course supplemented by peer group case discussions are still ongoing. For practical use an Electronic lesson on EBM for occupational health practice was developed and a mid-level EBM course was

developed and evaluated. Furthermore, we started five Cochrane systematic reviews relevant for occupational health which will be published. In 2006 an invitational conference on knowledge infrastructure facilities within OHSs has been organized and an international workshop on economic outcomes of occupational health interventions. Results of a Delphi study on the last subject will be published<sup>17</sup>.

In this paper we will describe in further detail the results from one comprehensive project which concentrated on the discussion and development of the knowledge infrastructure itself, as this project formed the core of the KIS programme. The issue was the situation in our country, and in many other countries, that OH professionals were not able to find knowledge or information easily while at the same time employees, companies and health care in general made rapid progress in information searching and finding. Evidence-based medicine/health strategies were learned to increasing numbers of OH professionals, but could not easily be brought into practice as the facilities were lacking. Internet offered to professionals numerous sources but mostly of poor or unclear quality. The situation could be characterized as chaotic and potentially even threatening the quality of occupational health care itself. The question was to increase insight in the essentials of a knowledge infrastructure and, if possible, to start initiatives for improvement.

In this project, first it was necessary to order the different concepts, elements and current initiatives as we had no overview and no insight in essential elements, relationships, quality aspects and effectiveness. Literature, consultations and an invitational conference have led to the distinction of four key elements or functions in the infrastructure needed to provide knowledge to OH professionals: (1) scientific research and development, (2) support of knowledge transfer by development of instruments for practice and through e.g. national journals, (3) education and training, and (4) a leading national OH portal including a virtual library (Fig. 2).

Within the infrastructure we singled out scientific research and development including applied research, as an important element producing new knowledge and scientific instruments basic for new developments in practice. Evaluation research can reflect quality and effectiveness of occupational health practice. As another element we distinguished the development of a set of instruments for practice. Examples are: threshold limit values e.g. for vibration and chemical exposure, practice guidelines e.g. to treat nervous exhaustion (adjustment disorders) for occupational physicians and psychologists, measurement protocols e.g. for biological exposure and work pressure, criteria documents e.g. how to diagnose work-related upper extremity musculoskeletal

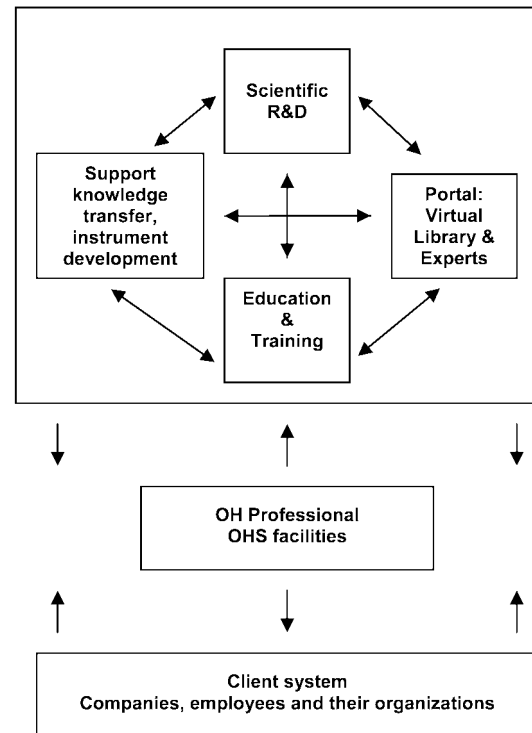


Fig. 2. The four key elements in the infrastructure needed to provide knowledge to OH professionals to improve working conditions and health of the client system and to benefit employees and companies.

disorders. The set of instruments is essential to facilitate not only professionals' practice, but also to organize control measures and quality assurance on the shop floor. To support transfer of knowledge, other current and important initiatives have to be mentioned as national journals and conferences, regional meetings of professionals, various website initiatives including forum functions to exchange knowledge.

We regarded education and training as a third important element of the infrastructure, since the professional vocational training and continuous professional development should be based on the latest findings and insights. Modern developments are in-company support and facilities offered by educational institutes to occupational health services, large companies and industrial branch organizations. As a last essential element we differentiated a national portal for OH professionals including a high quality virtual library where the latest knowledge can be found easily and efficiently using modern search strategies and tools. We added the availability of top experts and experts groups within this facility as they can support professionals in answering complex or new questions.

Finally, the whole infrastructure has the purpose to support OH professionals in practice and the occupational health

services, and in a fact to improve working conditions and health on the shop floor, to support government policies and to benefit employees and companies.

A number of institutes or actors can be distinguished within each of the different 'elements' such as universities, national institutes, education and training institutes, professional associations, practice guideline developers, national journals, website initiatives and many others. It is important to notice that creative and mutual interconnections are essential for the total infrastructure to function well. For example, universities should cooperate with professionals in practice because they need each other in order to determine the effectiveness of already existing occupational health interventions, but also to generate new research projects based on new knowledge questions arising from the field. Many institutes or actors are presented in more than one element of the infrastructure such as both guideline development and education about the guideline to increase effectiveness. For the same reason we see increasing alliances between actors.

Discussing the state of the art in the Netherlands we discovered both weak and strong points within each of the elements, and in the interrelationships between institutes and actors. Interestingly, it was often difficult to discover who was responsible or who might be held responsible for what. Sometimes competing interests hindered creative and productive relationships between institutes and actors, but also many examples were found where good collaboration was realized e.g. in the development of guidelines for occupational physicians.

After this first phase of conceptualization and exploration we had the task to strive for concrete improvements. Within the infrastructure we noticed a large gap between existing knowledge sources and the poor access for OH practitioners. Adequate bridging initiatives were lacking or only covering a part of the problem. The contrast with the current facilities present at universities was striking. Therefore we decided to concentrate efforts within the program on the realization of a national portal for OH professionals with the main aim to support OH professionals in finding and sharing existing knowledge. To elaborate and realize this facility we used an invitational conference, interviews and a program steering committee of stakeholders and users. Following the discussions we decided to include in the portal various functions such as (1) a virtual library and (2) an overview of high quality websites and other sources and (3) a representation of top expert groups.

Professional associations of most relevant OH disciplines agreed with the plans and stated that they took responsibility for the realization. Individual OH professionals were

enthusiastic and universities and other institutes were committed. A mock-up of the portal has been constructed and has been used to foster commitments. A "requirements analysis" has been completed. The first content will exist of the most relevant high quality websites for various topics useful for OH professionals. These websites will be selected and the quality will be judged by multidisciplinary working groups of dedicated OH professionals recruited by the professional associations. Financial constraints are the last barrier before the portal can start in reality.

In a next phase we plan to integrate a virtual library in the portal. In collaboration with universities we explore contracts with providers of relevant literature databases and publishers of relevant scientific journals. In this intended virtual (digital) library we want to realize direct access to (1) a number of most relevant international literature databases, (2) international journals for scientific articles and reviews, and e-handbooks (all full text) (3) national professional journals (4) authorized practice guidelines, (measurement) protocols, threshold limit values and criteria documents, and (5) a good thesaurus and well-designed search strategies, search tools and literature quality assessment tools.

As noticed, we plan to include in the portal a representation of various existing and new high quality expert panels on specific topics, to share and develop knowledge and to offer all professionals actual, relevant and high quality knowledge. Examples are existing facilities such as the website on mental health at work where the website editors act as an expert group (<http://www.mentalhealthandwork.com>), 'infectious diseases and work' and 'hearing and work' (both expert groups will produce a website in 2006), effects of work on reproduction (expert group exists but still without a website), and others. In addition we strive to include in the portal usual statistics and reference data, information on legislation, a discussion Forum, addresses, links to websites of high quality institutes, and information material for employees and companies. In the future, the portal as a part of the professional occupational health infrastructure has to be connected with facilities for employees, companies, branches of industry and government.

## Conclusions

The added value of OH professionals to the health of the working population is their professionalism and level of expertise on work and health topics. The right knowledge on the just moment and on the just place is crucial. An adequate knowledge infrastructure can facilitate

professionals, because the variety of relevant topics is large, actuality is essential and available specialized knowledge is mostly not easily accessible.

Occupational health services have a task to facilitate professionals offering information and communication technology (ICT) facilities such as good access to various knowledge sources. Management has to stimulate organizational conditions and human resource development to support and secure that professionals work evidence-based. Professionals can organize regular meetings to discuss daily practice, to maintain evidence-based quality and to prevent that many colleagues are lagging behind.

On a national level facilities are important such as a well-designed virtual library for occupational health, and a network of expert groups. As guidelines and threshold limit values are necessary as knowledge products, intermediating between original scientific studies and professional practice, facilities for development and updating are needed.

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