Evidence Based Library and Information Practice

Article

Developing the Role of a Health Information Professional in a Clinical Research Setting

Helen M. Seeley
Research Associate
Dept. of Academic Neurosurgery
University of Cambridge
Cambridge, United Kingdom
Email: hms35@medschl.cam.ac.uk

Christine Urquhart
Senior Lecturer
University of Wales
Aberystwyth, United Kingdom
Email: cju@aber.ac.uk

Peter Hutchinson
Honorary Consultant Neurosurgeon
Dept. of Academic Neurosurgery
University of Cambridge
Cambridge, United Kingdom
Email: pjah2@cam.ac.uk

John Pickard
Professor of Neurosurgery
Dept. of Academic Neurosurgery
University of Cambridge
Cambridge, United Kingdom
Email: jdp1000@medschl.cam.ac.uk

Received: 19 Jan. 2010 **Accepted:** 8 May 2010

Abstract

Objective - This paper examines the role of a health information professional in a large multidisciplinary project to improve services for head injury.

Methods - An action research approach was taken, with the information professional acting as co-ordinator. Change management processes were guided by theory and evidence. The health information professional was responsible for an ongoing literature review on knowledge management (clinical and political issues), data collection and analysis (from patient records), collating and comparing data (to help develop standards), and devising appropriate dissemination strategies.

Results - Important elements of the health information management role proved to be 1) co-ordination; 2) setting up mechanisms for collaborative learning through information sharing; and 3) using the theoretical frameworks (identified from the literature review) to help guide implementation. The role that emerged here has some similarities to the informationist role that stresses domain knowledge, continuous learning and working in context (embedding). This project also emphasised the importance of co-ordination, and the ability to work across traditional library information analysis (research literature discovery and appraisal) and information analysis of patient data sets (the information management role).

Conclusion - Experience with this project indicates that health information professionals will need to be prepared to work with patient record data and synthesis of that data, design systems to co-ordinate patient data collection, as well as critically appraise external evidence.

Introduction

The role of the Health Information Professional (HIP) is shaped and expanded by the current healthcare environment and system. Their unique set of skills is increasingly being used as the need for evidence based healthcare increases (Gray, 2001). There are several types of health information management role and delineations of role boundaries may vary from country to country. In North America, the "informationist" role (Davidoff, Rankin, & Oliver, 2000) has developed. The term informationist, popularized in the late 1980s (Debons, Home, & Cronenweth, 1988; Oswitch, 1990), was used by Davidoff & Florance (2000) to describe a new health profession which encompasses a wide diversity of roles and a wide variety of attributes and skills in a variety of healthcare settings. Responsiblities of the informationist encompasses the socio-economic, cultural, scientific, and technical information systems. Scholars emphasised that this new informationist should be an integral part of a group with specialized expertise that can contribute vitally to clinical situations rather than information 'servers' in an auxiliary capacity. The Medical Library Association (MLA) explored the concept resulting in a national implementation strategy, including renaming the role Information Specialist in Context (ISIC) as a broader more inclusive term emphasising the importance of working within context (Homan & McGowan, 2002; Shipman, 2007).

This shift required existing HIPs to market their services to health professionals (Lewis, Urquhart & Rolinson, 1998). However, and health librarians have been surprised to find a gap between what they offer and users' expectations and impressions of services offered by "information specialists" (Publicover et al. 2006). Health professionals often seem unaware of the new roles health librarians are fulfilling in work with multidisciplinary teams for the production of evidence bulletins (Mann, Sander & Weightman, 2006), or in clinical librarian roles. (Beverley, Booth & Bath, 2003; Harrison & Sergeant, 2004; Urquhart et al. 2007; Wagner & Byrd, 204; Winning & Beverley, 2003).

Bailey & Rudman (2004) argued for the HIP to have knowledge and skills to lead in the design, process and implementation of collaborative research projects. Beverley, Booth, and Bath (2003) identified 11 roles when tracing the evolvement of the information specialist, the most recent being primary researcher. Bury, Lindsey, and Roberts (2006) also noted a change in focus from teaching by librarians to the concept of the HIP as a learning facilitator in the literature.

Conclusions from the literature are that HIPs need to respond to changes, build on the past and re-engineer themselves to meet the information-intensive demands of healthcare of the future. One major problem seems to be credibility in knowledge transfer among members of a healthcare team (Jacobson & Goering, 2006), and another is the need for specialist educational programmes for some informationist careers (Oliver et al., 2008).

In the United Kingdom, according to the National Health Service (NHS) careers website, individuals in information management "are responsible for the retrieval, analysis, interpretation and presentation of health data and information, to a high standard." The health librarian role has been subsumed into knowledge management; HIPs support health professionals and managers in their education, training, and practice, by locating, retrieving and organizing the necessary evidence from a vast array of resources, as well as training professionals in critical appraisal. In the UK, therefore, a general distinction is made between those information professionals who deal with the processing and analysis of local patient data (information managers), and those who seek evidence from elsewhere for local application (knowledge managers).

Such distinctions may not always be helpful for the health service or the HIPs involved. The aim of this paper is to describe and examine the role of a HIP (the first author, HS) in a multidisciplinary longitudinal research project aimed at improving the care of head-injured patients in the East of England region, UK. The project was collaborative, involving university researchers, a large and renowned teaching hospital, other local hospitals, primary care providers, and other agencies such as voluntary support groups.

Setting

The Eastern Head Injury Group (EHIG) is a collaborative research partnership set up in 2000 as a response to recommendations in Royal College of Surgeons of England (RCSE), the Society of British Neurosurgeons (SBNS) reports, and the House of Commons' 3rd Report (2000). This EHIG study used a collaborative action research approach to identify and address deficiencies in regional service provision for head injured patients. The aim was to develop a framework for regional service across tertiary, secondary, primary care and social care. Head injured patients have diverse and complex needs, which require a co-ordinated service response from a wide range of specialties, disciplines, and organizations. For those commissioning services (a responsibility of Primary Care Trusts, PCTs) or delivering services, making changes to service provision requires an understanding of the relationships between different parts of the system, and how changes in one part can affect many other parts of the system. Therefore, a whole systems approach was necessary. Figure 1 shows the scope and process of the research study.

The EHIG began as a Working Group, but as the project progressed through phases, it developed into a partnership of academic researchers, managers, and commissioners to enable every aspect of service change to be addressed (Figure 2). This research partnership acted as a steering group, providing strong leadership in strategic planning of the study, meeting regularly as part of the action research cycles of planning, action, and review or reflection, and was seen as essential to successful implementation.

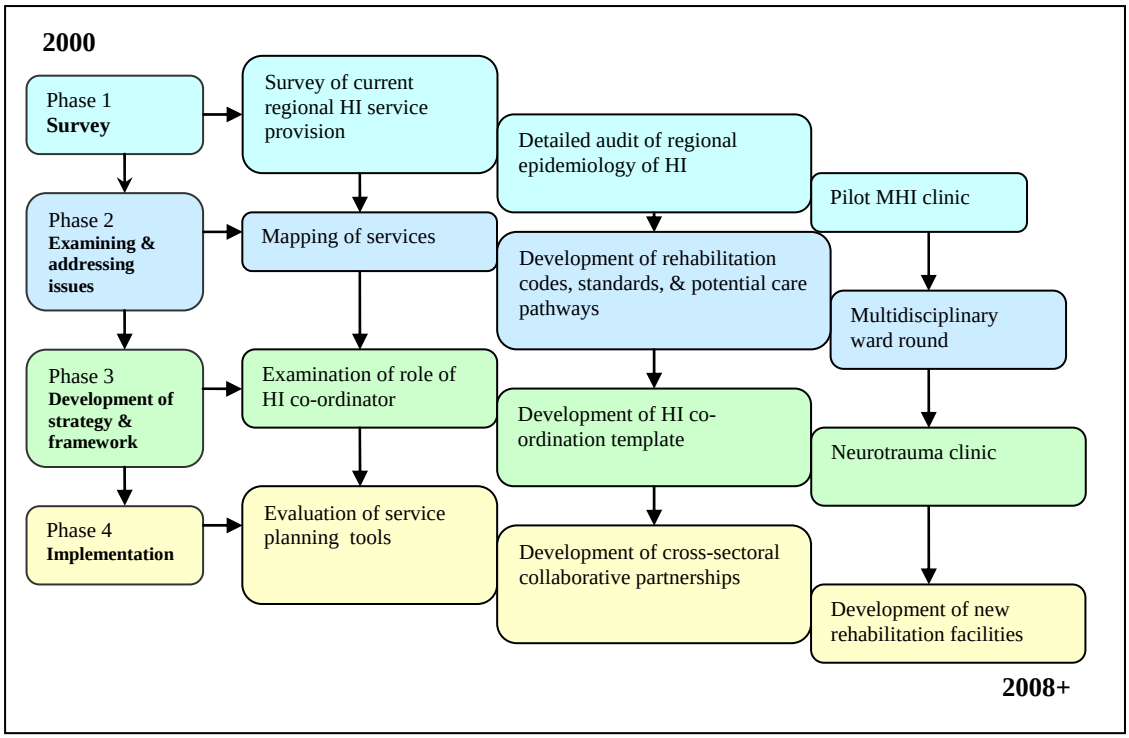

Fig. 1. The EHIG Study Action Research Cycles Showing Developmental Process

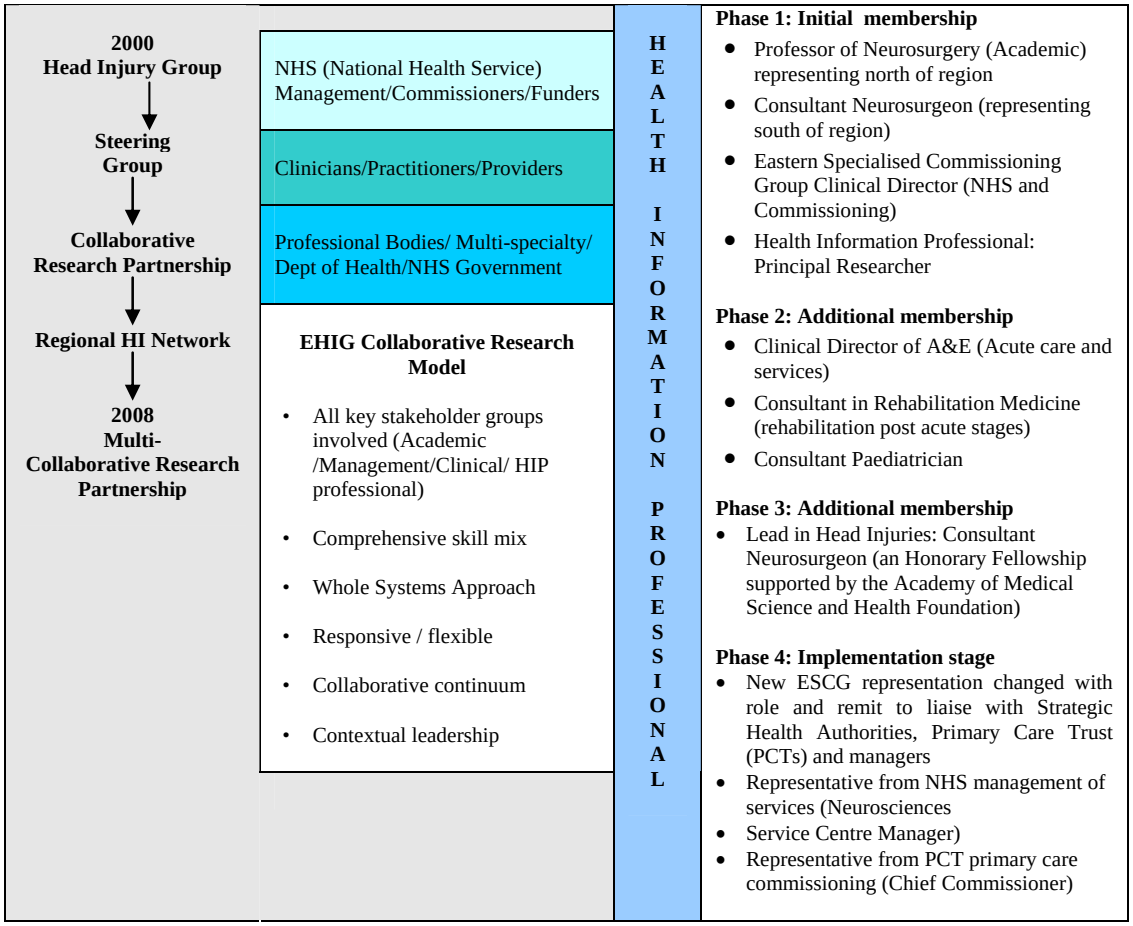

Fig. 2. The Composition and Development of the Eastern Head Injury Group

The HIP (HS) had several years experience working within the neurosurgery department and took on the role of the research co-ordinator / principal researcher. HS has a librarianship qualification, a postgraduate qualification in health information management, and registered for a doctorate at the start of the project under the co-author (CU). The post was jointly funded (NHS Research & Development, Eastern Specialised Commissioning Group, NHS, and University of Cambridge), thus creating shared ownership and strong commitment to the research work. The responsibilities of the role stretched widely across the research study (Table 1).

Methods

As the project was multidisciplinary and aimed at changing practice through collaborative learning, a participatory action research approach was used together with soft systems analysis techniques to explore the explicit and tacit knowledge management. Adopting a theory-driven approach to health services research is desirable (Brazil et al. 2005), but has challenges in terms of time, capacity of the researcher's and co-ordination of the research process. The dedicated role for the HIP freed clinical professionals from conducting some of the data collection "fieldwork," analysis, and report writing, and provided continuity, consistency, and stability to the overall study.

The methods used by the HIP in the action research (Table 1) incorporated all aspects of knowledge management, including literature review (clinical and policy issues), data collection and analysis, collating and comparing data (to help create new knowledge and produce evidence in context), developing tools for change, and devising appropriate dissemination strategies. The work therefore bridged traditional information management (of patient data) and the developing knowledge management roles (as defined by the UK National Health Service). The action research embraced cycles of planning and action, followed by reflection and learning to inform future planning.

Co-ordination was vital for management of the multiple research cycles and a successful outcome. The HIP co-ordinated the development of communication networks, such as the regional conferences and workshops that helped establish trust among the diverse groups involved. The HIP was also responsible for the development of improved information systems (e.g. for the patient care pathways, and creation of website) and development of the rehabilitation categories and codes that would help EHIG create new knowledge.

Results

The research programme produced a replicable service framework, service planning tools, a valuable research resource (regional Head Injury database), and a flexible collaborative learning network with strong leadership that included a model for the role of a HIP. The work and results of the research are published in a series of papers in peer-reviewed journals (Bradley et al., 2006; Pickard et al. 2004; Seeley et al., 2001; Seeley & Hutchinson, 2006; Seeley et al., 2006). Table 2 summarises the outcomes of the study in the development of systems for a comprehensive, co-ordinated responsive and flexible service framework for Head Injury. It also summarises the models, strategies, and methodologies developed that contribute to health services research.

The importance of good information and communication systems, together with co-ordination became increasingly apparent. The study not only developed strategies and initiatives to address the gaps and variability in services, but also created new and replicable information systems for planning and evaluation, which can be collated into the elements of a methodology for innovative change. This aspect is described in two further publications (Seeley et al., 2007; Seeley & Urquhart, 2008).

Table 1. Specific Methods Used

PLANNING AND ACTION – REVIEW

Collaborative development of service tools

1. Role of Principal Researcher
2. Groups: Research Group, focus groups, Head Injury (HI) Working Groups, Neurosciences Strategic Group.
3. Partnerships
4. Literature reviews
5. Initial survey (2000)
6. Reviews a) A&E b) Neurorehabilitation
7. Questionnaires (A&E, Neurorehabilitation)
8. Interviews and visits A&E, Rehabilitation Units
9. Retrospective audit: Head Injury admissions to Regional Neurosciences Centre + as many other hospitals as possible in Region (Numbers, Categories, Pathways/initial mapping, Resources, data quality); prospective audit of HI transfers; prospective regional audit of HI pts with disruptive behaviour
10. Assessment of impact and implications of new resource/technology/ role/ work patterns /change:
11. a) Observation Ward b)Minor HI clinic c)Traumatic Brain Injury follow-up clinic d)CT scanning, image transfer e) HI co-ordinator role > Business Plan: HI co-ordinator post
12. Evaluation /outcome studies
13. Piloting of HI standards
14. Piloting of Rehabilitation Codes
15. Detailed mapping
16. Development of standards
17. Development of rehabilitation codes
18. Development of Head Injury Co-ordination template

REFLECTION AND LEARNING - PLANNING

Dissemination and knowledge/information-sharing

19. Multidisciplinary conferences
20. Workshops
21. Working groups
22. Reports
23. Study days: HI training day for A&E staff; Aggression in HI seminar; Neurorehabilitation meeting
24. Working documents
25. Presentations at key professional bodies conferences
26. Liaison with Government and professional bodies
27. Links created with other regions
28. Publication of papers
29. Development of regional 'HI network' (Database of contacts, Website, Database, Helpline)

The HIP Role

A key component of the effectiveness of the research programme was the innovative HIP role, which was diverse, multi-functional, and objective (neither clinical nor managerial, not purely information management or knowledge management). The importance of the neutrality and the different skills were appreciated as essential to the effectiveness of the team, the research and the collaborative continuum.

The role has similarities to the informationist role, in which working in context, continuous learning, and domain knowledge are important (Bailey & Rudman, 2004; Holman, 2002). In this case some domain knowledge had been gained in clinical audit, prior to

starting in the principal co-ordinator role, but more domain knowledge was gained throughout the research (continuous learning while working in context).

More general research skills were also developed, partly as the HIP was undertaking doctoral research based around the role. However, these skills would have been necessary in any case, and some informationist roles stress them (Detlefsen, 2004). Literature searching and systematic reviewing are skills recognised in other studies (Beverley, Booth, & Bath, 2003), but in this study, the searching and reviewing covered the theory and evaluation of some of the processes for managing change in service delivery. The flexible nature of the post was important, allowing development of a variety of skills in organisation, administration, research methods, and analysis and dissemination (Figure 3).

The HIP was not working alone, and discussion and reflection with other members of the team helped address some limitations in experience and knowledge. The regular input of the research leadership group and the Collaborative Action Research (CAR) approach, enabled triangulation of different types of evidence, and thorough evaluation of the various cycles of the action research.

Table 2. Research Outcomes

Head Injury Services	**Strategies, methodologies and models**
Developed/created the systems for a comprehensive, co-ordinated responsive & flexible and sustainable service framework for Head Injury. **Service planning tools** to plan, develop, implement and evaluate an effective and comprehensive regional service for Head Injury. • Standards for the management of Head Injuries in Acute hospitals • Rehabilitation definitions and codes • Head Injury Co-ordination template **Templates** • Evaluating a new facility • Evaluating a new technology • Evaluating new evidence/research • Contextual mapping process **Resources** • Regional Head Injury network, including named Leads in HI amongst all key stakeholders • New and innovative posts: Brain Injury Liaison Officer linking Acute and Community sectors and NHS and voluntary sectors • New facilities • Funding through partnerships with private/voluntary sectors	**Established a model of collaborative cross-cultural working, including a model for effective and innovative partnership working** **Developed a whole systems approach to knowledge transfer and dissemination** **Established a collaborative cross-cultural Research Leadership model** **Developed a model for the role of a Health Information Professional in an academic and clinical setting** **Developed a methodology for developing and sustaining networks** **Contributed towards a theory of large scale transformational change in the health sector** Whole systems approach, drawing strength from cultural diversity, defining alternatives, looking at root causes, pushing the debate, broadening the agenda, creative direct action, contextual research leadership, approach to and theory of knowledge/evidence, comprehensive dissemination, sustaining networks

The "neutral stance" of the HIP role helped in communication among different professional groups. The HIP's awareness of the needs of different professional groups was helpful in disseminating information to all those involved. The HIP had a "helicopter" view of what was required, by whom, when, and in what format, such as a digest, workshop, or full report. The importance of sustaining a network became apparent during the research and evidence, was consulted (Chisholm, 1998; Church et al. 2002) to help in designing and creating a website, produce regular updates and reports and organise regional multi-organisational meetings.

Although part-time doctoral research may seem a very long process, in this case the five year timescale suited the nature of the research work. There was a considerable amount of co-ordination required among different organisations, each with their own cultures and ways of working. Time was required to understand how the different organisations worked, and how to achieve consensus on solutions to difficult problems.

The HIP organized and made available a very wide range of resources for learning while also acting as a resource, or gatekeeper, to be used by the research group and the wider stakeholder group, feeding back learning and research into a wider area. Enabling practitioners to enter into the process of action and reflection is more likely to result in learning through and about the process of practice. For example, as new issues arose, the research partnership was expanded to ensure inclusion of all stakeholders (See Figure 2).

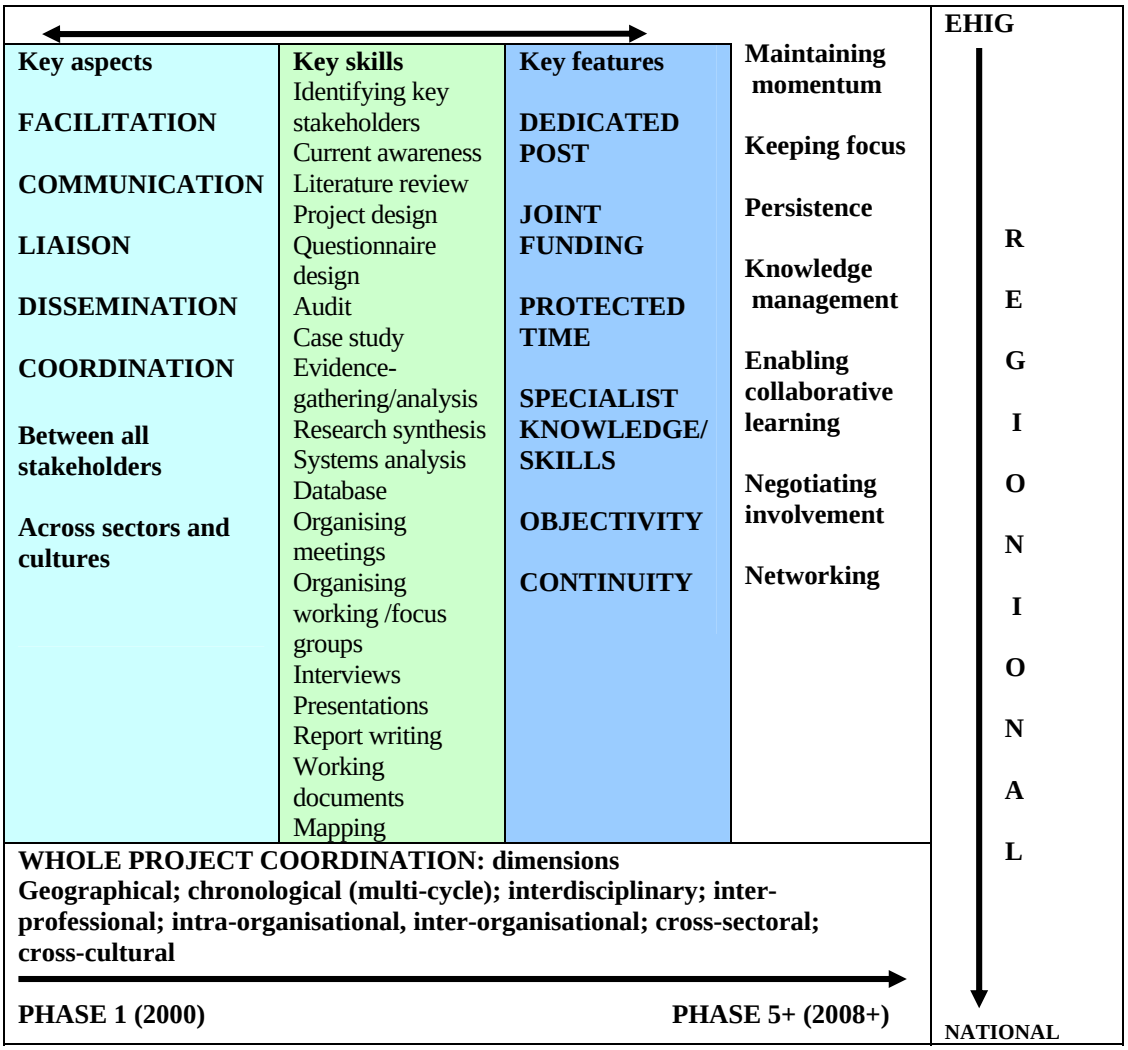

Fig. 3. Role and Scope of the Health Information Professional in the EHIG Research Study

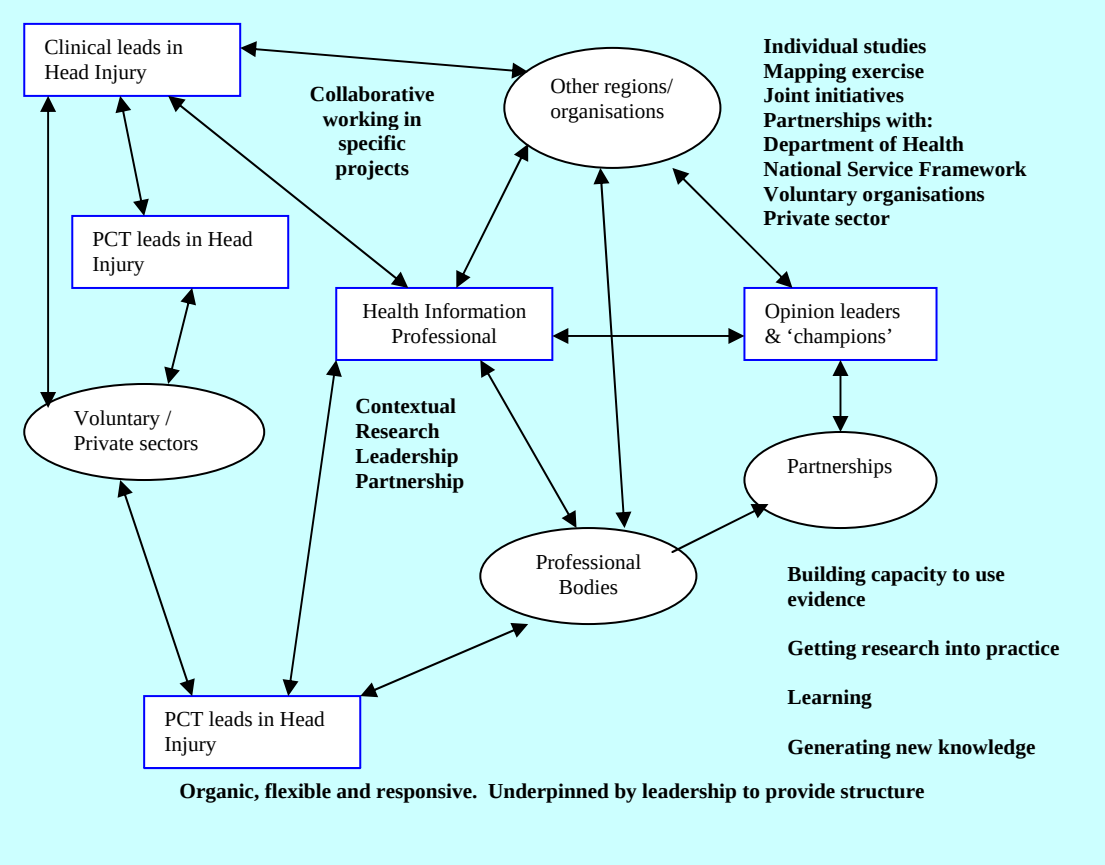

Fig. 4. The EHIG Collaborative Research Network

Collaborative Learning Network

As the project developed, it was clear that a collaborative learning network was necessary for the diverse groups to work together with shared purpose and values. Networks of practice may be viewed as a looser arrangement than communities of practice (Cox, 2007), and while social networks are hardly new, how they are enacted has changed (Castells, 2000). A key aim of the study was to provide leadership in developing a community of key personnel in the management of head injury. The co-ordination, facilitation, and continuity provided by the research leadership group and the HIP role enabled the development of an effective research and learning network (Figure 4).

The aim of the collaborative learning network was to implement and sustain change in health service delivery. To help ensure that change would happen, the HIP consulted the change management literature: the horizontal and vertical structure within the research network reflects the evidence on the most effective ways of initiating and sustaining change (e.g. Kaluzny, Veney, & Gentry, 1974; Sine, Mitsuhashi & Kirsch, 2006; Stinchcombe, 1965).

Although collaboration and participation are important in the change process, senior management support is essential in implementing organisational change in projects (Hart, 2006; Meyer, 1993; Pinto, Pinto, & Prescott, 1993). Senior managers were sent research summaries by the HIP regularly, and health service commissioners were involved in the initiation of the research programme and kept informed of developments.

Discussion

Table 3 summarises the HIP roles and tasks identified in the literature.

Table 3. The Information Specialist Roles and Tasks Identified in the Literature

Roles	Tasks/skills
Analyst Clinical librarian Communicator Critical appraiser Disseminator Educator Facilitator Gatekeeper Information architect Information scientist Knowledge manager Knowledge counsellor Liaison Mediator Primary Researcher Research Resource manager System designer Teacher	• Research & development • Data storage / retrieval • Systems development / design • Systems analysis • Database development • Information management • Information scientist • Identification and ranking of information needs • Location & selection of appropriate information sources • Appropriate manipulation and processing of information to disseminate to target audience • Information networking: development incl. identification of potential participants • Design and implementation of standard methods for acquisition, control and exchange of information • Developing and building necessary infrastructures for sectoral and multi-sectoral information systems • Co-ordination of services • Training and support of new technologies

Rankin et al. (2008), in a systematic review of the informationist role, found that that domain knowledge, continuous learning, and working in context (embedding) were crucial to success. This project confirmed these findings, but also emphasised the importance of co-ordination across disciplines, organizations, and cultures, plus the ability to work across traditional library information analysis (research literature discovery and appraisal) and information analysis of patient data sets.

The HIP role developed in this study has some features of the role of "boundary spanner," in that it fulfilled an important boundary role between a number of organisations and cultures; the HIP received, filtered, and disseminated the flow of information between the research group and the wider collaborative network (Figure 4). This seems critical to sustainability and the spread and implementation of innovative change. The HIP was proactive in finding, sorting, processing, applying, negotiating, transmitting and reframing and sharing knowledge.

There has been a shift from education as training to a learner-centred view, where the learner constructs their own knowledge through "collaborative learning, authentic tasks, reflection and dialogue" (Mayes, 2001, p.16), and this shift has changed the role of the academic subject librarian (Pinfold, 2001). Health librarians are now often described as "learning facilitators" or "knowledge mobilizers" (Brice & Gray, 2004, p.82) with new responsibilities (Bury, Lindsey & Roberts, 2006). This research project demonstrated the need for new structures as well as knowledge brokerage. Moore (2003) noted how information specialists, and learning centre services changed to meet new student learning requirements in a university. Urquhart et al. (2006; 2007) and Burdick (2004) discussed similar changes in the role of the clinical librarian to assist in team learning. In this project brokerage included signposting, sourcing, interpretation, distillation, and commentary on quality and dissemination of evidence and capacity building in terms of support for collection and analysis of new evidence.

Successful knowledge networks create and disseminate, share new knowledge, have well-defined management structure and communication strategy, transcend the boundaries between sectors (Clarke, 2001), and play an important part in innovative processes. There is some evidence that the difficulties in creating successful knowledge networks can be overcome by including a "knowledge activist" responsible for energising and co-ordinating the knowledge creation (Dyer & Nobeoka, 2000; Eisenhardt & Martin, 2000; Seufert, von Krogh, & Bach, 1999; Swan et al., 1999). Von Krogh, Nonaka, and Khijo (1997) also found that knowledge activists working as network co-ordinators are the main driving force in a successful knowledge network. In this research, the HIP may have fulfilled the role of the knowledge activist.

In many ways, this study confirms the diverse nature of professional employment for health informatics professionals (Norris & Brittain, 2000) as well as the particular needs of those working within the health sector in the UK (Pearson & Urquhart, 2002; Urquhart et al. 2005) and in the US (Giuse et al. 2005; MLA, 2007), where there is an informatics impetus as well (Helms et al., 2004; Hersch, 2002; Oliver & Roderer, 2006; Perry, Roderer, & Assar, 2005). For an informationist to be successful, Rankin, Grefsheim & Canto (2008) conclude from their systematic review, that subject knowledge is essential. Another study (Petrinic & Urquhart, 2007) suggested that scientific knowledge certainly helps health librarians initially, but that such knowledge can be gained while in post.

For a HIP to be accepted, their work must be credible to the team of health professionals. Case studies of management consultants working on knowledge transfer suggest that there are four dimensions to credibility (Jacobsen & Goering, 2006). They are the scientific credibility (accuracy of the data), the expertise of the communicator, the authority of the communicator, and the neutral stance of the communicator. In this study, there was an emphasis on obtaining and generating accurate data and information for planning, with regular collaborative discussion and comprehensive feedback. The HIP's responsibilities include accurate data capture, interpretation, and intelligent dissemination (i.e. communicating it in an appropriate, meaningful and accessible format). Working with the research partnership (a source of expertise) helped to put a stamp of authority on the information analysis. The neutrality of the role, whilst important in data analysis, did not necessarily contribute to the credibility of the research, but as the project progressed, the credibility of the HIP probably increased, as responsibilities became greater.

Rankin, Grefsheim, and Canto (2008) also conclude that an embedded informationist is more likely to provide a credible, acceptable, and sustainable service. Shumaker and Talley (2010) reviewed the model of the embedded information professional in the literature and found that embedding might be physical (co-location), organisational, or virtual, and the ability to build good relationships was vital. Even in the health sector, where the concept is accepted (although names are debated), the evidence for the effectiveness of the informationist role is only slowly emerging in the US (e.g Giuse et al., 2008; Robison, Ryan & Cooper, 2009; Whitmore, Grefsheim, & Rankin, 2008).

However, the costs of specialist HIPs need to be justified, and they need to be placed where the need is greatest (Hill, Section 10.10, 2008). Health librarians themselves doubt that the funding will be sufficient to support Information Specialist in Context posts (Sathe, Jerome & Giuse, 2007). In the EHIG project, there was a definite identified need for change in service delivery, and specific funding was allocated. It was perhaps fortunate the funding continued over a period of time, which allowed not just the development of services, but sustainable systems that could perhaps operate without direct intervention of the health information professional in the future.

Conclusion

The innovative role described here is the health information professional (HIP). As a member of the research team, the HIP was involved in health services research to change the model of health service delivery for a region. A theory driven approach was chosen, with the HIP providing ideas and evidence from the literature on how to manage the change process. An important part of the role was to support learning, and co-generation of new knowledge within the research team and the health professionals and other organisations involved in the care of head injury patients. The HIP collected and analysed patient data, and helped design improved systems for that purpose.

This role helped to sustain the project throughout the various cycles of action research, and a measure of success is the continuation of the role throughout the project. With shorter projects, HIPs may have less time to develop the credibility that this setting allowed.

As evidence will increasingly come from routinely collected patient data sets and randomised clinical trial data sets, informationists or HIPs will work with and among health professionals to assist in analysis and synthesis of patient data, as well as providing the external research evidence (from databases). In this project the process of health care delivery was also of interest.

Evaluations of informationist and clinical librarian projects will help to delineate the skills in information management, information synthesis, and informatics that will be required for embedded HIPs to flourish in such interesting, but also challenging, work environments.

Acknowledgements

The authors thank all those involved in the EHIG project for their support. We thank the referees for their helpful and constructive comments.

References

Bailey, J., & Rudman, W. (2004). The expanding role of the HIM professional: where research and HIM roles intersect. *Perspectives in Health Information Management, 1*(7), 1-6.

Beverley, C., Booth,A., & Bath, P. The role of the information specialist in the systematic review process: a health information case study. *Health Information Libraries Journal, 20*(2), 65-74.

Bradley, L., Kirker, S., Corteen, E., Seeley, H., Pickard, J. & Hutchinson, P.(2006). Inappropriate acute neurosurgical bed occupancy and short falls in rehabilitation: implications for the National Service Framework. *British Journal of Neurosurgery, 20*(1), 36-39.

Brazil, K., Ozer, E., Cloutier, M., Levine, R., & Stryer, D. (2005). From theory into practice: improving the impact of health services research. *BMC Health Services Research, 5*(1) doi:10.1186/1472-6963-5-1

Brice, A., & Gray, M. (2004). What is the role of the librarian in 21st century health care? *Health Information and Libraries Journal, 21*(2), 81-83.

Burdick, A. (2004). Informationist? Internal medicine rounds with a clinical medical librarian. *Journal of Hospital Librarianship*, *4*(1), 17-27.

Bury, R., Lindsey, M., & Roberts, S. (2006). Achieving change through mutual development: supported online learning and the evolving roles of health and information professionals. *Health Information and Libraries Journal, 23*(Supplement 1), 22-31.

Castells, M. (2000). Towards a sociology of the network society. *Contemporary Sociology, 29*(5), 693-699.

Church, M., Bitel, M., Armstrong, K., Fernando, P. et al. (2002) Participation, relationships and dynamic change: new thinking on evaluating the work of international networks. Development Planning Unit, Working Paper No. 121. London: UCL, 2002.

Chisholm, R. (1998). *Developing network organisations: learning from practice and theory.* London: Addison Wesley.

Clarke, H. (2001). *Formal knowledge networks – a study of Canadian experiences*. Winnipeg, Canada: Internal Institution for Sustainable Development, 2001.

Cox, A.M. (2007). Beyond information-Factors in participation of networks of practice: a case study of web management in UK higher education. *Journal of Documentation, 63*(5), 765-787.

Davidoff, F., & Florance, V. (2000). The informationist: A new health profession?" *Annals of International , 132*(12), 996-998.

Debons, A., Home, E., & Cronenweth, S. *Information science: An integrated view*. Boston: Massachusetts,1988.

Detlefsen, E. (2004). Clinical research informationist. *Reference Services Review,* 32(1), 26-30.

Dyer, J. & Nobeoka, K. (2000). Creating and managing a high-performing, knowledge-sharing network: the Toyota case. *Strategic Management, 21*(3), 345-367.

Eisenhardt, K., & Martin, J. (2000). Dynamic capabilities: what are they? *Strategic Management, 21*(10/11), 1105-1121.

Fleck, I., & Bawden, D. (1995). The information specialist: attitudes and images: examples from information services in law and medicine. *Journal of Librarianship & Information Science, 27*(4), 215-226.

Gray, M. (2001). *Evidence-based healthcare*. Edinburgh: Churchill-Livingstone.

Giuse, N. B., Koonce, T.Y., Jerome, R.N, Cahall, M. Sathe, N.A., & Williams, A. (2005). Evolution of a mature clinical informationist model. *Journal of the American Medical Informatics Association, 12*(3), 249–255.

Harrison, J., & Sargeant, S. (2004). Clinical librarianship in the UK: temporary trend or permanent profession? Part II: present challenges and future opportunities. *Health Information and Libraries Journal, 21*(4), 220-226.

Hart, E. (2006). Action research as a professionalizing strategy: issues and dilemmas. *Journal of Advanced Nursing, 23*(3), 454-461.

Helms, A., Bradford, K.D., Warren, N.J. & Schwartz, D.G. (2004). Bioinformatics opportunities for health sciences librarians and information professionals. *Journal of the Medical Library Association, 92*(4), 489-493.

Hersh, W. (2002). Medical informatics education: an alternative pathway for training informationists. *Journal of the Medical Library Association*, *90*(1), 76-79.

Hill, P. (2008). Report of a national review of NHS health library services in England: from knowledge to heath in the 21st century. Retrieved April 2, 2010, from http://library.nhs.uk/nlhdocs/national_library_review_final_report_4feb_081.pdf

Homan, J. M., & McGowan, J. (2002). The MLA: Promoting new roles for health information professionals. *Journal of the Medical Library Association*, *90*(1), 80-85.

Houser, S.H, Tesch, L., Hart-Hester, S., & Dixon-Lee, C. (2008). Roles and challenges of the health information management educator: A national HIM faculty survey. *Perspectives in Health Information Management*, *6*(4):1-6.

House of Commons Health Committee 2000. Head injury rehabilitation: third report, together with the proceedings of the committee, minutes of evidence and appendices. London: House of Commons Papers, Session 2000-01; 307.

Jacobson, N., & Goering, P. (2006). Credibility and credibility work in knowledge transfer. *Evidence & Policy, 2*(2), 151-165.

Kaluzny, A.D., Veney, J.E., & Gentry, J.T. (1974). Innovation of health services: A comparative study of hospitals and health departments. *Milbank Memorial Fund Quarterly*, *52*(1), 51-82.

Lewis, R., Urquhart, C., & Rolinson, J. (1998). Health professionals' attitudes towards EBM and the role of the information professional in the exploitation of research evidence. *Journal of Information Science, 24*(5), 281-290.

Mann, M., Sander,L., & Weightman, A. (2006). Signposting Best evidence: A role for information professionals. *Health Information and Libraries Journal*, *23*(Supplement 1), 61-64.

Mayes, T. (2001). Learning technology and learning relationships, In: Stephenson J. (ed.). *Teaching and learning online: pedagogies for new technologies*, p.16-26. London: Kogan Page.

Medical Library Association (MLA) (2007). Competencies for lifelong learning and professional success: educational policy statement of the Medical Library Association. Retrieved April 2, 2010 from http://www.mlanet.org/education/policy/

Meyer, J. E. (1993) New paradigm research practice: the trials and tribulations of action research. *Journal of Advanced Nursing, 18*(7), 1066-1072.

Moore, K. (2003). Building new partnerships: changing institutional relations, In: Oysten, E. (ed.) *Centred on learning: academic case studies on learning centre development,* p.127-152. London: Ashgate.

Norris, A. & Brittain, J.M. (2000). Education, training and the development of healthcare informatics. *Health Informatics Journal, 6*(4), 189-195.

Oliver, K.B., Dalrymple,P., Lehmann, H.P.,McClellan, D.A., Robinson, K.A., & Twose, C. (2008). Bringing evidence to practice: A team approach to teaching skills required for an informationist role in evidence-based clinical and public health practice. *Journal of the Medical Library Association, 96*(1), 50-57.

Oliver, K.B., & Roderer, N.K. (2006). Working towards the informationist. *Health Informatics Journal, 12*(1), 41-48.

Oswitch, P.A. (1990) The role of the information professional in development. *Information Development*, *6*(1), 28-34.

Pearson, A., & Urquhart, C. (2002). Health informatics education: working across the professional boundaries. *Library Review, 51*(3/4), 200-210.

Perry, G.J., Roderer, N.K, & Assar, S. (2005). A current perspective on medical informatics and health sciences librarianship. *Journal of the Medical Library Association, 93*(2), 199-205.

Petrinic, T. & Urquhart, C. (2007). The education and training needs of health librarians - The generalist versus specialist dilemma. *Health Information and Libraries Journal, 24*(3), 167-176.

Pickard, J., Seeley, H., Kirker, S., Maimaris, C., McGlashan, K., Roels, E., Greenwood, R., Steward, C., Hutchinson, P., & Carroll, G. (2004). Mapping rehabilitation resources for head injury. *Journal of the Royal Society of Medicine, 97*(8), 384-389.

Pinfold, S. (2001). The changing role of the subject librarian. *Journal of Librarianship and Information Science, 33*(1), 32-38.

Pinto, M., Pinto, J. & Prescott, J. (1993). Antecedents and consequences of project team cross-functional co-operation. *Management Science, 39*(10), 1281-1297.

Publicover, M., Giles, G., Bolton, B., Shemilt, C. & Urquhart, C. (2006). Listening to our clinical colleagues: how are they finding their evidence to support Trust clinical governance. *Health Information and Libraries Journal, 23*(Supplement 1), 57-61.

Rankin, J.A., Grefsheim, S.F., & Canto, C.C. (2008). The emerging informationist specialty: A systematic review of the literature. *Journal of the Medical Library Association, 96*(3), 194-206.

Robison, R.R, Ryan, M.E., & Cooper, I.D. Inquiring informationists: A qualitative exploration of our role. *Evidence Based Library and Information Practice, 4*(1), 4-16.

Royal College of Surgeons of England. (1999) *Report on the Working Party on the management of head injured patients (Galasko report).* London: RCSE.

Sathe, N.A., Jerome, R., & Giuse, N.B. (2007). Librarian-perceived barriers to the implementation of the informationist/information specialist in context role. *Journal of the Medical Library Association, 95*(3), 270-274.

Seeley, H. (2007). Developing services for head injury: Obtaining the data. *Health Informatics Journal, 13*(2), 135-153.

Seeley, H.M., Hutchinson,P., Maimaris, C., Carroll, G., Kirker, S., Tasker, R., Haynes, K., & Pickard, J. D. (2006). A decade of change in regional head injury care: A retrospective review. *British Journal of Neurosurgery, 20*(1), 9-21.

Seeley, H., & Hutchinson, P. (2006) Rehabilitation following traumatic brain injury: challenges and opportunities. *Advances in Clinical Neurosciences and Rehabilitation, 6*(2), 22-28.

Seeley, H.M., Maimaris, C., Carroll, G., Kellerman, J. & Pickard, J.D. (2001). Implementing the Galasko Report on the management of head injuries: The Eastern Region approach. *Emergency Medicine Journal, 18*(5), 358-365.

Seeley, H.M., Maimaris, C., Hutchinson, P.J., Carroll, G., White, B., Kirker, S., Tasker, R.C., Steward, C., Haynes, K., Hardy, D. & Pickard, J.D. (2006). Standards for head injury management in acute hospitals: Evidence from the six million

population of the Eastern region. *Emergency Medicine Journal, 23*(2), 128-132.

Seeley, H. & Urquhart, C. (2008). Action research in developing knowledge networks. *Health Informatics Journal, 14*(4), 279-296.

Seufert, A., von Krogh, G. & Bach, A. (1999). Towards knowledge networking. *Journal of Knowledge Management, 3*(3), 180-190.

Shipman, J. P. (2007). Informationists or information specialists in context (ISIC): Six years after conception. *IFLA Journal, 33*(4), 335-339.

Shumaker, D. & Talley, M. (2009). Models of embedded librarianship. Final report. (prepared under the Special Libraries Association Research Grant, 2007).

http://www.sla.org/pdfs/EmbeddedLibrarianshipFinalRptRev.pdf

Sine, W.D., Mitsuhashi, H. & Kirsch, D.A. (2006). Revisiting Burns and Stalker: formal structure and new venture performance in emerging economic sectors. *Academy of Management Journal, 49*(1), 121-32.

Society of British Neurological Surgeons. *Safe Neurosurgery*. (2000). London: SBNS.

Stinchcombe, A. (1965). Social structures and organisations. In: March, J. (ed.) *Handbook of organisations*, p.142-193. Chicago: R McNally.

Swan, J., Newell, S., Scarborough, J. & Hislop, D. (1999). Knowledge management and innovation: Networks and networking. *Journal of Knowledge Management, 3*(4), 262-275.

Urquhart, C., Spink, S., Thomas, R. & Durbin, J. (2005). Systematic assessment of the training needs of health library staff. *Library and Information Research, 29*(93), 35-42.

Urquhart, C., Turner, J., Durbin, J. & Ryan, J. (2006). Evaluating the contribution of the clinical librarian to a multidisciplinary team. *Library and Information Research*, *30*(94), 30-43.

Urquhart, C., Turner, J., Durbin J. & Ryan, J. (2007). Changes in information behavior in clinical teams after introduction of a clinical librarian service. *Journal of the Medical Library Association, 95*(1), 14-22.

von Krogh, G., Nonaka, I., & Ichijo, K. (1997). Develop knowledge activists! *European Management Journal, 15*(5), 475-483.

Wagner, K.C., & Byrd, G. D. (2004). Evaluating the effectiveness of clinical medical librarian programs. *Journal of the Medical Library Association, 92*(1), 14-33.

Whitmore, S.C., Grefsheim, S.F., & Rankin, J.A. (2008). Informationist programme in support of biomedical research: A programme description and preliminary findings of an evaluation. *Health Information and Libraries Journal, 25*(2), 135-141.

Winning, M.A., & Beverley, C.A. (2003). Clinical librarianship: A systematic review of the literature. *Health Information and Libraries Journal, 20*(Supplement 1), 10-21.